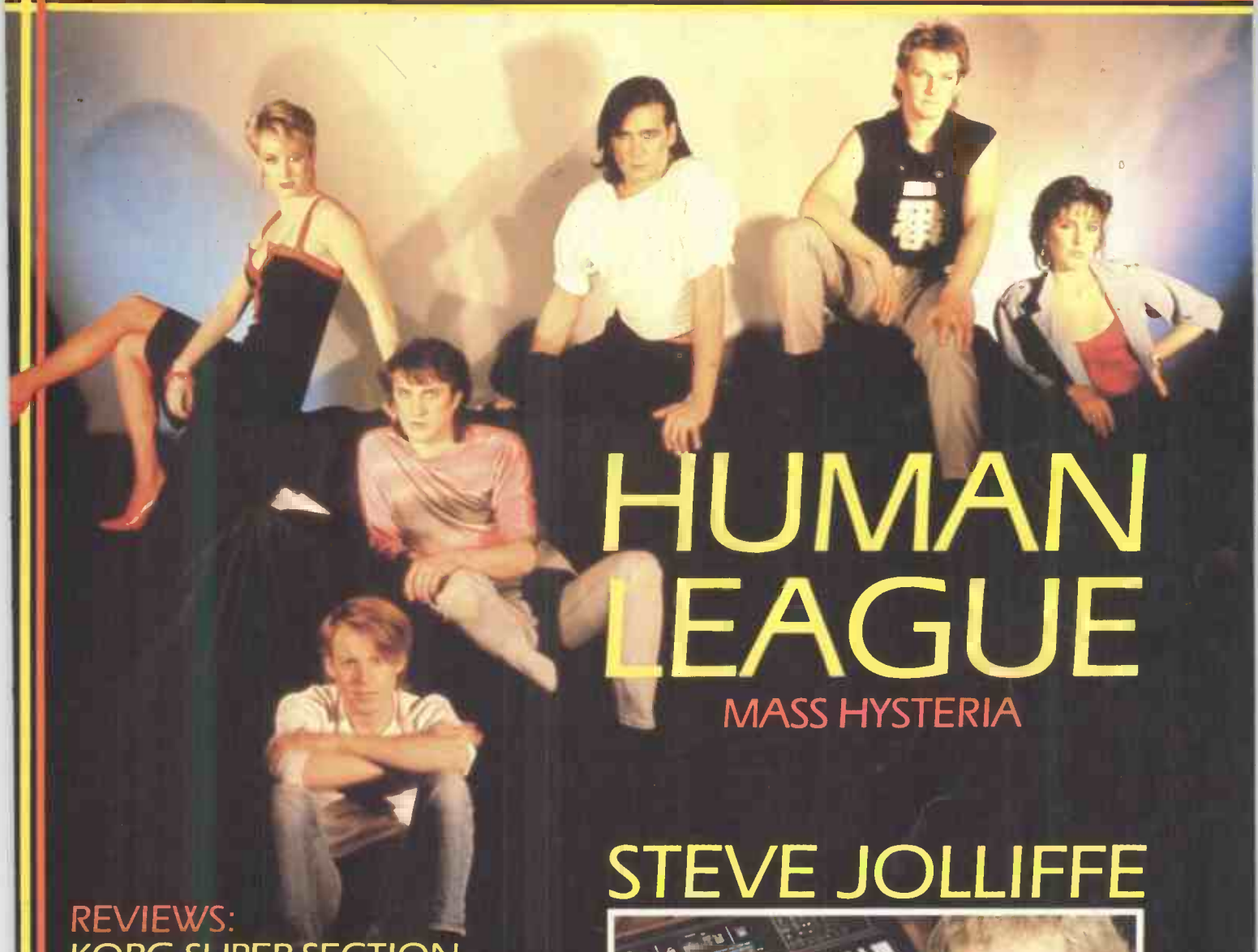
Electronics & Music Maker
JULY 1984 95p
INCORPORATING COMPUTER MUSICIAN



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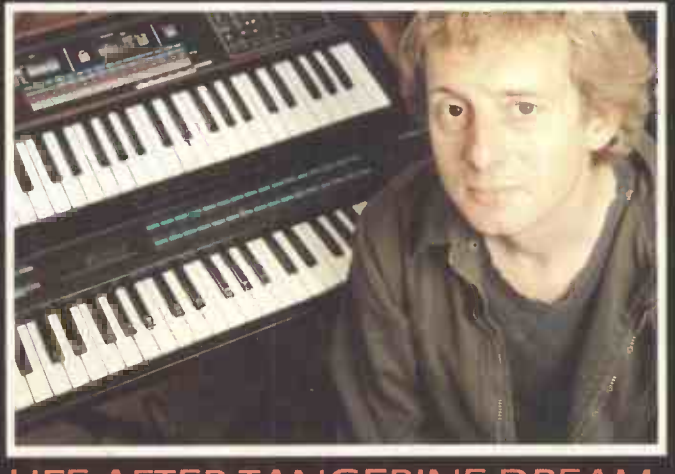

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REVIEWS:
KORG SUPER SECTION
TED DIGISOUND
YAMAHA MK100 PERSONAL KEYBOARD
JMS MIDI SOFTWARE
MICROSOUND 64 KEYBOARD
IBANEZ DM1100 DIGITAL DELAY

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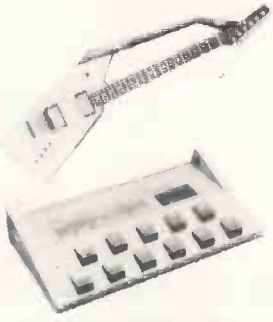

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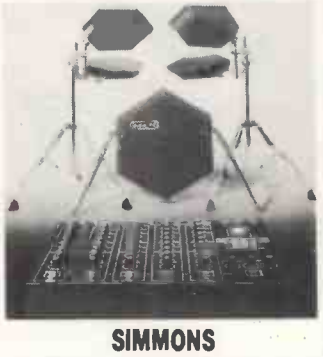

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Electronics & MUSIC Maker

JULY 1984 Volume 4 Number 5

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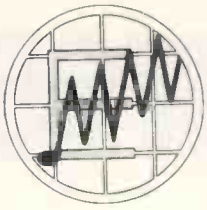

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Back to Basics

If there is one theme that runs through this month's E&MM (or most of it anyway), it is that money doesn't necessarily bring musical nirvana.

Nobody can deny the awesome power of instruments such as the Fairlight and Synclavier, and the ways in which they can benefit the modern composer or arranger, but what a couple of this month's interviewees have brought home to us is that no musical instrument is perfect, no matter how high its price-tag or massive its reputation.

It must also be apparent to all but the most stubborn of musical hardware snobs that only a tiny minority of today's musicians can even hope to afford the Synclaviers or Emulators of this world, and that aiming one's sights a little lower doesn't necessarily involve vast amounts of musical compromise. This month's *Synthesis on a Budget* feature came about as a direct result of our receiving impassioned pleas from readers just starting out on the road to synthesiser fulfilment and happiness – few of them can afford a basic polysynth, let alone a computer-controlled instrument costing rather more than a decent-sized house – and one fact that does emerge from the survey is that the generally downward trend exhibited by new synth prices has had its effect on used synth values as well. To the extent that, say, £350 now buys the young musician what would have been considered quite a sophisticated instrument only a matter of a few years ago. And yes, that instrument is capable of providing said musician with a good many hours of musical enjoyment.

Even if the sonic capabilities of a modest synthesiser aren't in themselves particularly rivetting, the vast range of budget effects units currently available enables its audio horizons to be broadened in interesting and original ways, and in many cases their acquisition makes purchasing a more expensive keyboard instrument less of an attractive proposition, at least in the short term.

So, if the possibilities open to the electronic musician on a budget are so great, how come most media attention is still focussed on the wonders of the Big League? Because the technology used by Big League instruments is generally more interesting and further towards the forefront of hardware development. This is a point even E&MM finds hard to ignore (which is why next month's issue sees the start of a special feature on exactly how the Fairlight does its job), but there are already plenty of signs that the Big League's technology is working its way downwards into more accessible territory.

This issue highlights a number of products that use state-of-the-art technology without their makers charging the earth for them. TED's Digisound modules bring sampled percussion (albeit at a fairly basic level) within the reach of almost everybody, Yamaha's MK100 uses a 3.2kByte RAM to store solo and accompaniment variations of the user's choice within its Multi Menu module, Korg's Super Section brings PCM-encoded sounds within reach of the solo performer, while the Ibanez DM1100 gives a greater maximum delay time than any other budget unit, without even so much as a hint of passing on any price penalty.

What all this boils down to is that, despite the fact that almost all today's most successful electronic music acts use Big League instruments of some description, to ignore the more realistic side of things would probably take us back into the situation that existed ten years ago, when a musician new to the world of synthesisers firmly believed he would not succeed in a professional capacity without buying the latest state-of-the art equipment, and synthesisers struggled to gain mass acceptance as a result.

And that's a situation that should never be allowed to arise again.

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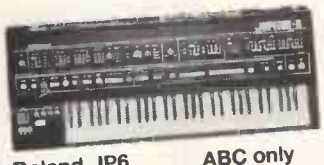

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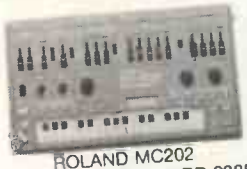

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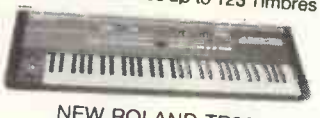

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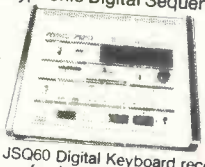

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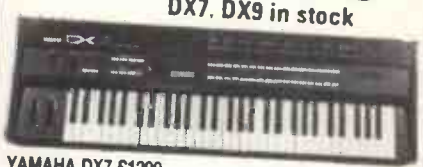

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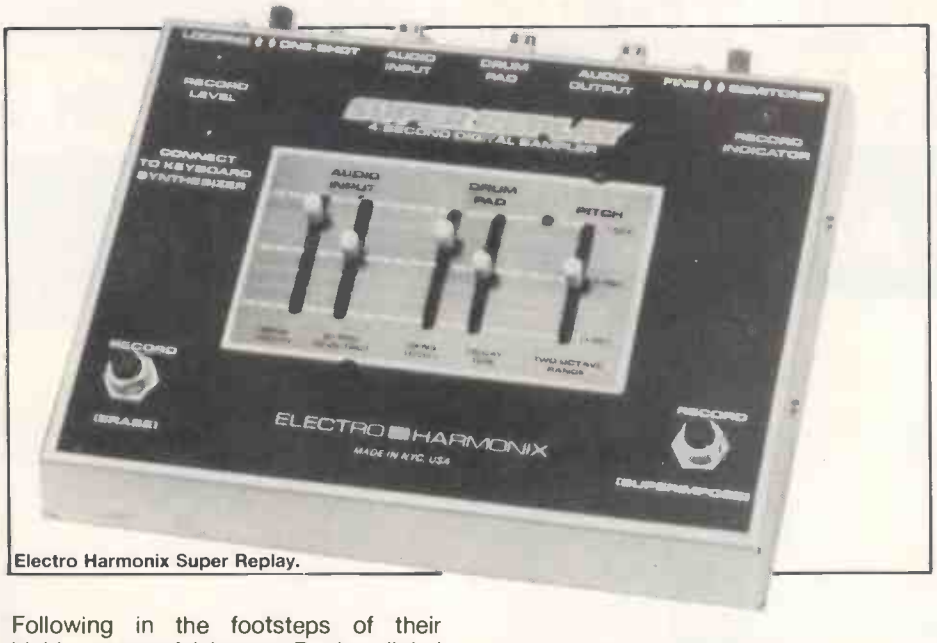


Electro Harmonix Super Replay.

Following in the footsteps of their highly successful Instant Replay digital sampler, **Electro Harmonix** have now released details of a more refined version, the Super Replay. This features a maximum sample time of four seconds, with a bandwidth (−3dB) of 3·1kHz. Sampling rate is 9kHz to 36kHz, sampling itself being carried out using 12-bit words.

The Super Replay accepts audio signals from several different sources: microphones, electric guitars, keyboards, tape decks and so on. Once sampled, sounds can be triggered from pads (eg. Simmons drums) or from the electronic pad included in the Super Replay's RRP. Alternatively, the unit will work off the trigger output of a drum machine, but more excitingly, you can also control the pitch of a sampled sound using any one-volt-per-octave synth with CV and gate outputs.

A unique sound-on-sound feature enables the user to layer samples on top of one another, and the characteristics of all samples can be altered onboard using the unit's built-in decay time and pitch slider controls. RRP of the Super Replay in the US is $675, and further information can be had from *Electro Harmonix, 27 West 23rd Street, New York, NY 10010, USA.* No details of UK distribution have yet been finalised.

Hire company **Advanced Sounds** have informed us that several pieces of music hardware were stolen from their premises recently. Rewards are in the offing for anybody who supplies information leading to some or all of this equipment being recovered, and the items in question (complete with serial numbers) are as follows:

Simmons SDS7 (70052)
Yamaha DX7 (5096)
Emulator (244)
Roland SDE1000 Delay (352831)

Any readers who might know of the whereabouts of any of the above instruments should contact *Advanced Sounds, 1 Homemead Road, Bromley Kent. Tel: 01-467 4603.*

The latest news and interviews in the electronic music world are included on **Inkeys** number 8. As always, the tape is well recorded and packed with lots of goodies.

It includes material from Klaus Schulze and others on his new InTeam label, Robert Schröder, Mainframe talking about their Apple computer drum system, Jade Warrior's Tony Duhig, himself featured elsewhere in this issue of E&MM, and excerpts from tapes released on the Darkstar label, plus a good deal more besides.

The cassette costs £2.50 including VAT and UK postage and packing.

Inkeys have also just released the programme for this year's **UK Electronica** festival. The festival will be held on Saturday September 8 at Sheffield University, a welcome change of venue.

The day's events have been organised on a similar basis as last year, with a main evening headlining band, Neuronium, and daytime acts which will include ex-Tangerine Dreamer Steve Jolliffe (see interview elsewhere this issue), Carl Matthews, Paul Nagle, Progressive rock band Tamarisk, Dr Phil from France and Konstruktivits. Two separate types of ticket are available, daytime tickets cost £4.00 (this includes a £1.00 food voucher) while evening tickets are £3.00. This year accommodation will be available on the University Campus and will cost £11.73 per person for bed & breakfast; accommodation is in single rooms only. All accommodation must be paid for in advance, and cheques should be made payable to UK Electronica for both the tickets and accommodation, including an SAE.

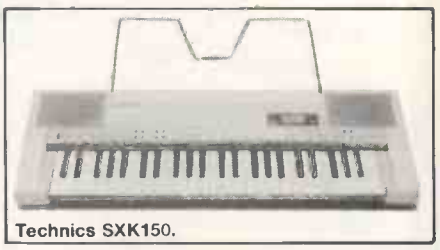
Organisations interested in display stand space should contact Inkeys directly *at 50 Durrell Road, Dagenham, Essex, RM9 5XU, England.*

Finally, E&MM will be at the show with our own stand, so come and have a chat with the staff – we'll be pleased to see you.

Having successfully applied Pulse Code Modulation techniques to their range of upmarket home organs, Technics have now released two personal keyboards that utilise the same technology. The models in question are titled SXK150 and SXK250, and the latter incorporates eight monophonic PCM factory preset voices, Clarinet, Pan Flute, Trombone, Flute, Saxophone, Trumpet, Synthe Chopper, and Cosmic Wah(!)

Both instruments are provided with PCM-generated percussion sounds in their built-in rhythm machines. Like most members of the personal keyboard species, the Technics models feature auto-accompaniment, and in this case the facility goes under the guise of the 'Fullband Setting Computer'. Accompaniments can be created by the musician using this system and then stored on Technics' custom RAM packs, one of which is supplied with both the 150 and 250.

Further information on both instruments is available from Panasonic UK, 300/318 Bath Road, Slough, Berkshire, SL1 6JB. Tel: (0753) 34522.


Technics SXK150.

The British Paraplegic Sports Society might not sound like a group of budding concert promoters, but in fact they've already organised six annual music festivals to tie in with the British Wheelchair Games at Wandsworth in South London. This year's events looks like being the best yet, with one of this month's featured artists, Steve Jolliffe, heading a line-up of acts that includes Mark Shreeve, Mainframe, Classix Nouveaux and Mensana.

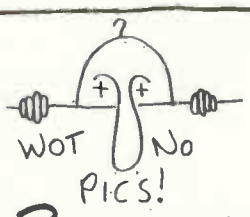
The event takes place over the weekend of July 14–15, and tickets (£9.00 each for both days) are available by mail order only from one of the festival's sponsors, *Upstream Computer Systems Ltd, 49 Bransgrove Road, Edgeware, Middlesex. Tel: 01-952 9105.*

All proceeds go to charity, of course.

As part of the annual Peterlee Festival, **Ian Boddy** will be performing a concert of live electronic music on Saturday July 21 at 7.30.

Boddy, who won the Brightest Hope for 1984 nomination in E&MM's readers' poll and penned this month's *Stagefright* article on playing electronic music live, will be performing excerpts from his last album *The Climb* plus new works from a forthcoming LP release. The concert will take place at the Peterlee Leisure Centre and tickets (£1.00 plus SAE) and further information are available from *Peterlee Arts & Information Centre: Tel: (0783) 864450.*

FREEDMANS



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READERS' LETTERS

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One-Way Traffic

Dear E&MM,

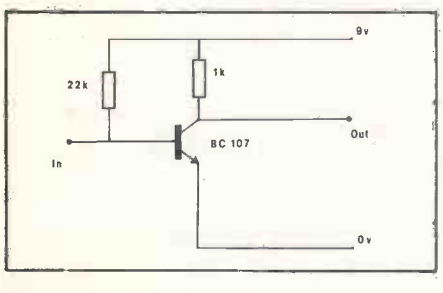
With reference to your S-trigger converter project published in E&MM March '84, I have a Korg MS10 synthesiser and a Roland CSQ600 sequencer which I wish to use to control the Korg. As I understand it, the S-trigger converter will allow Roland gate pulses to trigger the Korg, but what about the other way round?

Would it be possible to publish a circuit which would allow me to trigger a Roland from the Korg?

Tony Reed
Brighton

You are quite right in your understanding of the S-trigger converter. However, we're not quite sure why you want to trigger your Roland sequencer from the Korg; perhaps you've forgotten to explain the full story in your letter!

Anway, we've come up with a little circuit (Figure 1) that should help you overcome your triggering problems. We haven't actually tried out the circuit ourselves, but our resident engineer has complete confidence(!) The circuit uses a nine-volt battery and should provide a big enough trigger pulse: if it doesn't, you'll need to increase the power supply to 12 volts.



ZX81 Sequencer

Dear E&MM,

Thank you for the articles on MIDI and also for the series on synth patches: the Roland System 100M patch you published helped me finally discover the value of the Sample & Hold module.

As the owner of a Sinclair ZX81 computer, I was wondering whether there is an interface which would turn my computer into a sequencer so that I can control the System 100M.

K A James
Worlingham
Suffolk

The Sinclair ZX81 is capable of being used as a sequencer and in fact E&MM has published constructional articles on this very subject. To our knowledge, there are no ready-built interface units on the market at the present time, and we can therefore only refer you to the Micromusic articles printed in E&MM January and February '82. The ZX81 sequencer which these articles deal with is capable of controlling up to seven synthesisers independently, and would be an ideal unit for the control of the System 100M as it will allow you to control the oscillators' pitch, filter cutoff, envelopes, and so on.

Transpozer Control

Dear E&MM,

In June '84 you published the Multi-waveform LFO construction project. Could you please tell me whether or not this unit will operate the CV input on my E&MM Transpozer, and is there a PCB available for the LFO?

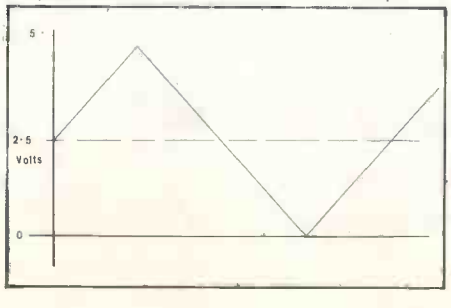
R Kettlety
Gloucester

The E&MM Multi-waveform LFO was designed to be used for a variety of modulation purposes and in the majority of situations it's ideally suited. However, in this particular case a small problem needs to be solved. The Transpozer CV input accepts a 0V to +5V control voltage whereas the LFO produces one of 0V to 10V. But don't panic! The LFO circuit is easily modified to overcome this problem.

Solution: replace VR2 with a 22K log pot and insert a 22K resistor between the pot and pin 1 of IC2a. If you build the project using the PCB, you'll have to cut away the track which normally links the pot to pin 1 of IC2a and solder the resistor between the two points.

Operation: Adjust the shift control so that it produces a 2·5 volt positive offset – this can be done with the aid of a voltmeter or, if you don't have access to one, you can always adjust it by ear until the modulation sounds good. The purpose of this exercise is illustrated in Figure 2. As the Transpozer only operates between 0 and +5, the 2·5 volt offset level has to be used as a centre point around which the modulation occurs. The circuit modification already mentioned takes care of the voltage difference between the two devices.

Finally, a PCB is available: see the special listing elsewhere in this issue.



Time Pulses

Dear E&MM,

As a synthesiser and recording freak I'm particularly interested in the tape sync facility on many of today's synths. I recently bought a Roland MC202 Microcomposer which I use with my Roland TR606 Drumatix.

Unfortunately, I'm experiencing some difficulty in getting the MC202 to read its own sync pulse back off tape. I have a Cutec four-track cassette machine and use one of its tracks to record the MC202 sync pulse onto, but no matter what level I record the pulse at, it just won't retrigger the MC202. Could I possibly be doing something wrong?

On a similar note, I'm having problems loading pattern data back from cassette into the MC202 memory. It's quite frustrating having to write my patterns down instead of being able to store them on a cassette tape. Please help!

Sean Murphy
Birkenhead
Merseyside

We have spoken to Roland on your behalf and they have suggested the following.

The tape sync problem would seem not to be an electrical fault and they ask you to read the instruction manual very carefully to make sure you understand how to use the tape sync mode.

The second point regarding the problem of program storage may indeed be related to the cassette recorder that you're using to store the data on. This is a common problem which many synthesisers and home computers suffer from. Try borrowing a friend's mono cassette recorder to see if it will work. If you have no luck at all, then both Panasonic and Ferguson (among many others) make cheap mono cassette recorders for under £30 which should be eminently suitable.

State of Transition

Dear E&MM,

Thank you for the write-up of our program *Music Mate* in E&MM June.

In your discussion of its use of probabilistic techniques, you state that no transition rules are involved. I should like to point out that this is not in fact the case: the parameters can be set to range from complete random selection to a steady *ostinato*. The choice of parameters is designed in such a way as to make the aural result quite predictable.

One final point. We've noted your comments concerning interfacing Music Mate to a synth *via* MIDI. . .

Per Hartmann
Hi-Yin Music
Launton
Oxfordshire

Korg PSS50 Programmable Super Section

In what represents something of a break from most current electronic music hardware development, synthesiser giants Korg have come up with the Super Section, a programmable 'backing band in a box' comprising drums, bass and instrumental accompaniment. Paul White **gives us his report.**

Korg blimey, what will they think of next? The Korg PSS50 is the perfect gift for the musician who has everything – except a band.

Based on technology developed in the field of sequencers and the more sophisticated home organs, the PSS50 allows backing tracks to be built up from a bank of preset rhythms and fill-ins, whilst bass and accompaniment circuitry organises your choice of chords into *its* idea of a tasteful and sympathetic musical pastiche.

The percussion voices are generated using digital PCM techniques which produce tight and authentic drum sounds more closely resembling those of an acoustic kit than the familiar rhythm box, the computer allocating suitable voicings and accompaniment patterns depending on the rhythm chosen.

If you are dissatisfied with this Orwellian style of electronic dictatorship, you can programme up to 16 accompaniment patterns of your own choosing by assembling various parts of the existing patterns into new combinations. An entire backing track may be assembled and stored for future use, or the machine may be operated in real time by means of the one-octave, touch-sensitive keyboard.

Construction

The first thing that you notice about the PSS50 is its small physical size. Measuring a mere 310×210×50 mm, this harmless looking plastic box weighs in at only 1·25kg, and that's *including* eight AA-type batteries. Styling is typically Japanese – very tasteful and incorporating plenty of LEDs and numeric indicators. Because of the complex nature of this type of instrument, most of the controls are dual function – and with a little cunning reprogramming, the internal computer would no doubt be capable of navigating a starship to Alpha Centauri, assuming the mains lead would reach.

The internal construction holds no surprises as one piece of computer circuitry looks very much like another, but it is thoughtfully engineered and tidily laid-out.

In terms of physical strength, the PSS50 would probably not take kindly to being dropped, but if it is treated with the same reverence as a multitrack cassette machine, it should survive OK.

Control Panel

All the switches on the front panel are of the touch-sensitive, calculator type and are concealed behind the flexible plastic facia which incorporates the one-octave keyboard, the numeric keypad, and all the parameter switches.

The rotary controls enable the various voicings to be balanced, the tempo to be adjusted and the master volume set. A six-way rotary selector doubles as both a power switch and a mode selector which is used to play or write arrangements.

Four numeric LED indicators are fitted at the top of the unit, these having different functions depending on the mode of operation – and a row of four LEDs labelled 'conductor' indicate the current position within a measure. A chart is also printed on the front panel to indicate the 40 preset backup patterns and eight break and ending patterns available. 16 further locations are indicated but left blank for the storage of user-modified patterns. and these are allocated numbers 71 to 88 inclusive.

Operation

To programme, a backing pattern is selected and then chords allocated to each half of each bar of the arrangements. The mode selector is set to write and the backing pattern is then invoked by inputting the column and row numbers from the front panel chart. For example, Disco 2 is column one, row eight and is therefore entered as 18. The desired chord is then stored by pressing one or two buttons; for example, D minor seventh would be entered as D and m7 separately. When this has been done, the enter key is pressed and a click informs you that your offerings have been accepted.

If a drum fill is required in a particular bar, the rhythm fill-in button is also used before pressing enter, and the other measures within the song are built up in this way until the complete backing track is finished.

In the event of a mistake being made, the clear key may be used to step back half a bar so that the error can be corrected. When the song is complete, switching the mode selector to play enables the piece to be played, and up to eight separate songs may be stored. Further editing facilities allow stored songs to be modified or lengthened, but I won't go into too much detail here as this would entail reprinting great chunks of the manual, a compendious tome over 40 pages in total length. . .

A table in the aforesaid manual lists the various accompaniment voicings for each backing pattern, there being almost as many voices as there are patterns. All patterns consist of drums, (including handclaps), bass and accompaniment parts, the accompaniment voice being preset by the system (examples: banjo for 'Blue Grass' and distortion guitar for 'Heavy Metal').

As previously intimated, these patterns can be broken down and reassembled to form 16 new user-arrangeable patterns, so that, for instance, a waltz with heavy metal distorted guitar voicings can easily be brought into existence, if that's what you really want. The computer chooses not only voicing but also phrasing, all these being selected to be appropriate to whichever style of music corresponds to the basic rhythm, and some of them are surprisingly sophisticated.

If you want to play the unit in real time, the mode selector is set to play, so that the keyboard can be used to change the chords whilst the computer looks after the rhythm and the phrasing. Chords only change on the half-bar, so if you can play slightly ahead of yourself the music will always change in the right places, though this does take a bit of practice. There are eight modifications available to the major chord, ranging from the simple minor to

the augmented, so there shouldn't be many occasions where the machine can't come up with appropriate chords, unless, of course, you're into something like obscure jazz.

Composing

A song chain is composed of steps, each step being selected from amongst the song memories. Up to 16 steps may be used within a song and, as a song memory holds up to 80 bars, the total possible chain length is 16 times 80, which is 1280 bars. When all 16 steps have been written, all four conductor LEDs illuminate to inform you that any subsequent offerings will be ignored due to lack of available memory.

When using the chain write mode, the last bar in the last step should be pattern number 61 or (without fill-in) 68. If you don't have a song number that meets these final step requirements, then one must be created.

This may sound complicated but, again, the manual contains all the relevant information and it all makes sense if you start at the beginning. Once programmed, the song memories can be dumped onto a standard cassette for posterity.

Sounds

The basic drum unit is really very good, consisting as it does of bass drum, snare drum, toms, hi-hat, cymbals and handclaps. These voices are prepanned to form a distinct stereo image.

A synth bass voicing is used throughout for all the bass parts, and this is a fairly bland, inoffensive sound that fits in reasonably well with most styles.

The accompaniment section is where the designers have really gone to town: the available voicings are extremely varied, while the stereo control being used to provide what *appears* subjectively to be a mild stereo chorus effect. There are, in fact, more voicings in this section than can practically be listed, but they include rock guitar, strings, brass and banjo, this last sounding rather like Earl Scruggs meets Vince Clarke at a home organ convention.

Most of the patterns are at least adequate and some have quite an interesting feel to them: particularly the Fusion section and the Boogie pattern which incorporates a pretty convincing bar room piano. By simply punching in a few jazzy chords, this setting produces an almost ad lib boogie piano piece and I would imagine this could become a popular pattern for jamming.

Other combinations worthy of note are Disco with it's clavinet preset, and Reggae 2, which incorporate a convincing 'cheap organ' accompaniment.

Conclusions

The Korg PSS50 is neither cheap nor particularly simple to use but, within the limitations imposed by its design philosophy, it does its job very well.

Of course, this *genre* of machine is not going to appeal to everybody, due mainly to its 'preset' style of operation; indeed, it could be said that its behaviour is rather akin to that of a sophisticated 'even the family pet can play it' home organ automatic accompaniment section, the main difference being the degree of programmability.

I can foresee great interest in this type of system coming from the cabaret or solo performer, but the storage limitation (only eight songs) may mean that for live use, the backing tracks could well end up being recorded on cassette and then replayed conventionally on a suitable machine. The serious music composer, on the other hand, may frown upon the way the PSS50 restricts him to having to use rhythm patterns and phrasing devised by someone else.

Programming is, I suspect, about as user friendly as is possible for a machine of this complexity, but it may appear daunting to some potential purchasers, especially if they are Country and Western guitarists whose only previous technical achievement has been fitting a set of strings. . .

No instrument can be all things to all people but, if you are prepared to have a proportion of your musical taste and artistic direction dictated to you by a machine in exchange for an easy life, then this new Korg invention could be just the thing.

Paul White **E&MM**

The Super Section carries an RRP of £449 including VAT, and further information is available from the importers, Rose Morris, at 32-34 Gordon House Road, London NW5 1NE. Tel: 01-267 5151.

Nine Times out of Ten

A User Report on the Yamaha DX9

The charge: that Yamaha's DX9 FM polysynth has been unfairly neglected by most of the electronic music fraternity whilst most of the emphasis has been placed on its more expensive relative, the DX7. Speaking for the prosecution: Steve Howell.

Unless you've spent the last 18 months or so in a Tibetan monastery you will no doubt be aware that Yamaha, after an apparent disappearing act, recently released a range of electronic keyboards that utilised a technique of sound creation called 'FM Digital Synthesis'. These keyboards come in the form of two incredible console organs, two electric pianos, two preset polyphonic keyboards and, most importantly perhaps, two user-programmable polyphonic synthesisers – the DX7 and DX9. These keyboards are the result of years of research in the field of FM synthesis which originally produced the GS1 and GS2 but, in the DX synthesisers, Yamaha have brought what was once the province of the wealthy megastar into the hands of more ordinary folk, and such are these instruments' capabilities that many of the aforementioned stars now have them alongside their Fairlights, which only proves that they are not a poor man's compromise for 'the real thing'.

There is one problem, however. It takes a bit of readjustment to create sounds with them if you're used to using analogue techniques of filtering and shaping existing waveforms but, believe me, it's not that difficult if you approach the procedure logically. It's not a technique that lends itself to the 'let's-have-a-fiddle-and-see-what-happens' attitude, but then again that's not necessarily such a bad thing. But I'm not here to impart the whys, wherefores and wonders of FM programming as that is already adequately covered in our 'Understanding the DX7' series of articles.

Instead, I propose to give you my impressions of the DX9. Now, this is possibly the first *full* review you've seen of the DX9 as it has received little more than a passing mention in the music press, while all and sundry have been foaming over the DX7. However, having owned a DX9 for about six months now, and having used a DX7 on many occasions – I feel there is much to be said in favour of the DX9. So, let the review begin...

Background

The DX9 is a 16-voice, programmable FM synthesiser. It has four Operators per voice which can be patched together in various configurations *via* eight algorithms. Each Operator has a digital sine wave oscillator, an eight-stage envelope generator and associated VCA, and the user has complete control over coarse and fine frequency, detune, the four envelope rates and levels, LFO modulation level of the oscillators and VCAs, along with the delay and waveform selection which gives sine, triangle, rising and falling sawtooth, square and random sample and hold. Each Operator has variable key and rate scaling which affects each Operators' output and envelope shape over the range of the five-octave keyboard. You can switch through the eight algorithms and adjust the feedback loop (which can be used to create sawtooth waveforms and, with extreme settings, white noise) and all of these parameters can be stored in 20 memories which can be permanently or temporarily edited at will.

There are also numerous 'Function' buttons which allow a wide range of control over pitch bend range (up and down a maximum of one octave), portamento, mono or polyphonic keyboard modes, and vibrato, tremolo and tone colour, using either the modulation wheel or the optional breath controller. Loading and saving sounds on cassette is also possible. As on the DX7, all these functions are memorised, but in this case they affect *all* the sounds, and cannot be assigned to individual voices – you have to buy the £10,000 DX1 for that facility.

Programming

Programming is theoretically quite straightforward. You press 'FUNCTION' and 'VOICE INIT' and the LCD screen will ask you 'ARE YOU SURE?', to which you answer 'YES' using the incrementor button to the right of the data entry slider. You will then be assignd a portion of buffered memory on position '0' (shown on the red LED display) and you now have control over all the voice parameters (purple) labelled beneath the memory selectors (turquoise) and adjustments are made with either the data entry slider to the left of the front panel or with the incrementor buttons. When you've successfully(!) created your sound, you can store it simply by pressing 'MEMORY SELECT' and 'STORE' and an appropriate memory position only, and you can also turn Operators on and off temporarily (this feature is not programmable) to home in on certain elements of any sounds for comparative purposes.

Should you wish to edit any of the 120 sounds that are supplied with the DX9 (or indeed one of your own) simply press the purple 'EDIT/COMPARE' button and you can alter any of the voice parameters in the same way as you did when creating a sound. If you want to compare the edited version with the original you simply press 'EDIT/COMPARE' again and the red LED will flash: you can then hear the original sound. Should you accidentally lose your half-created sound by pressing Memory Select and selecting a memory when you meant to bring in another voice parameter (and believe me, it's easily done!) you can retrieve it by pressing 'FUNCTION' and 'EDIT RECALL' and, as with 'VOICE INIT', you will be asked 'ARE YOU SURE?' to which you answer 'YES': you will then be given your edit exactly where you left it. This feature also works when you switch the instrument off, so should you wish to recall a particular edit a few days later, and provided you haven't edited anything else in the meantime, 'EDIT RECALL' will give you edit at the point where you left off – damned clever, these Japanese... Should you wish to store an edited sound, you proceed as before and press 'MEMORY SELECT', the pink 'STORE' button and an appropriate memory location.

As already mentioned, the DX9 gives the facility to store up to 20 sounds and, although this is by no means a massive amount by today's standards, it's quite enough for most purposes especially if, like me, you only work in studios. You can, however, store your sounds on cassette, and this is done using the 'FUNCTION' buttons and, as with other functions, the LCD screen will guide you politely through the procedure, so it's all quite user-friendly. It takes about 20 seconds or so to load and save the full memory and you can either load sounds into the synthesiser *en masse* (ie. the full memory of 20 sounds) or you can load

them singly, which is handy – if only you could *save* them one at a time as well.

Beware, though. If you've just made up some sounds but haven't saved them on cassette, loading in new sounds will write over them and they'll be lost forever, so it's wise always to save sounds on cassette for safekeeping.

So, with that technical resumé out of the way, what are my impressions of the DX9? I love it. It's one of the best synthesisers I've used. It can sound extremely 'expensive', very 'acoustic', breathtakingly delicate and also quite aggressive (although as with the DX7, recreating analogue synthesiser sounds is not its greatest virtue). It also has MIDI In, Out and Thru, but although it works well with other MIDI keyboards, I've experienced some problems with MIDI sequencers (naughty!). It also looks and feels good.

The Comparison

One question still remains, of course, why should anybody want a DX9 when for a few pounds more they can have a DX7?

It must be said that the more expensive Yamaha *does* have a little more in the way of facilities than the subject of this report, and in most cases I suppose it'll simply be a question of whether or not these facilities matter suficiently to the individual purchaser. However, it's my belief that a number of the DX7's advantages are not quite as significant as they might at first appear.

Perhaps the DX7's most promising feature is its touch-sensitive keyboard, something that accounts for quite a fair proportion of the price difference betwen these two FM synthesisers. Sensing of initial key velocity is extremely useful, but it's my contention that, unless you're a keyboard player whose early training was on classical piano, you'll find touch-sensitivity a feature that's not as frequently used as you thought it would be. Many of the DX7's factory presets don't lend themselves particularly well to manipulation by a touch-sensitive keyboard, and although the after-touch facility is in theory a useful one, in practice the standard Yamaha breath controller is a more precise way of controlling things. You'll probably have guessed by now that I'm *not* a piano-trained keyboard player, but you get my point.

The DX7 also incorporates more elaborate key and rate scaling than its cheaper brother, but every time I've used a 7 I've found their effects fairly subtle. Besides, on many of the 7's factory voices, scaling is set up so that it sounds identical to the sound's equivalent on the 9, while the extra variability this feature provides can cause the user some confusion at the programming stage. So, another feature I could probably live without. . .

Operators

The DX7 has six of these as against the cheaper synth's four, which – theoretically – should be quite a major difference. However, I've transferred a number of patches from a friend's DX7 onto my own instrument, and believe me, even if an oscilloscope can tell the difference, your ears probably won't!

On the algorithm front, the more expensive Yamaha has a lead of 32 to 8 – not a difference to be taken lightly, you might think. Well, I suppose it must be said that having that number of algorithms *does* give you an awful lot of operational flexibility but, again, one important point to bear in mind is that some of the 32 are very similar to each other and that, in case you hadn't noticed, all eight algorithms on the DX9 have rough counterparts on the 7, so that as with the Operators themselves, the different configurations available are sufficient to enable 'copying' of voices from the 7 to the 9 without too much in the way of audible discomfort.

Memory

The two DX instruments differ not only in the number of patch memories they provide but also in the way those patches are stored.

If you're going to use your FM synth for a lot of live work, the DX7 scores over its less expensive counterpart because you can have up to 96 sounds instantly recallable from cartridge. In economic terms, however, building up a library of your own programs on the DX7 is an expensive business because Yamaha's RAM cartridges cost £40 each, while ordinary audio cassettes – which are what the DX9 uses – are rather cheaper, particularly when you consider that one C60 cassette is capable of storing literally hundreds of presets, whereas one RAM cartridge stores only 32.

There are a few other detail differences between the two DXs. One thing the 7 does offer that might conceivably be of use to a few musicians is the provision for giving user programs names. Ths can be useful (particularly if you find yourself programming morning, noon and night), but unless you've got an overtly hard-working imagination you might have trouble thinking of appropriate patch names in the first place, and then you've got to go through the rather tedious process of trying to remember which names you gave to which sounds. So, a handy luxury, but by no means an essential fitment.

In fairness, though, I should just mention that DX7's footpedal control which really is a nice feature that I for one would like to see included in the DX9's spec also (come think of it, I can't understand why Yamaha haven't already done this: can it really be that expensive to incorporate?), but even this failing is made up for in part by the breath control mentioned earlier.

Conclusions

The final criterion, as with any musical instrument, must be the sound these two synthesisers make. It's my view – and I've hinted at this in the facilities rundown above – that the DX9 can come a lot closer to the sonic output of its senior partner than most people give it credit for.

To put this into some sort of practical perspective, a number of people have come into my studio to do sessions recently and remarked on the fact that my DX is a 9 and not a 7. Without exception, all of these doubting Thomases have changed their opinion about half an hour into recording.

Not so long ago I did some music for a television programme using the DX9 almost exclusively, and a couple of members of the studio staff commented – on hearing the final tape – that I must have been using a PPG, an Emulator and a DX7. Need I say more?

So, If you've budgeted for a DX7 at £1300, I suggest you give the smaller DX9 serious consideration. If you're still not convinced by my remarks concerning the two keyboards' relative facilities and sonic capabilities, remember that the difference in price between the two could buy you a second MIDI synthesiser (I bought a JX3P with the money I saved), a polyphonic sequencer, or a drum machine. Alternatively, you might find you don't have to part-ex your Juno 60 (or whatever) in order to get the FM synthesiser of your dreams.

Naturally I don't expect you to rush out and buy a DX9 simply on the strength of my own experiences, but I do think you should give it a fair hearing. Don't get me wrong, the DX7 is an incredible instrument and worth twice its normal selling price, but then again, and contrary to what a lot of the music press have said, so is the DX9.

Steve Howell **E&MM**

Readers may be interested to know that a cassette recording of some of the best DX9 sounds is now available free from Yamaha DX stockists or from the importers, Kemble Yamaha. Standard DX9 voices are used throughout the ten-minute sampler, which was recorded without the use of multitracking techniques and with a bare minimum of studio effects.

The reverse side of the cassette (called 'Playing with Reality') contains the voice data for loading the demonstrated sounds direct into a DX9 (once this has been purchased by a suitably impressed listener), and interested readers who live a long way from their nearest dealer should contact Martin Tennant at Kemble Yamaha, Mount Avenue, Bletchley, Milton Keynes, MK1 1JE. Tel: (0908) 71771.

Meanwhile, if you've already got a DX9 and fancy the chance to win a four-track cassette machine simply by spending a little time programming it, you'll no doubt want to enter a competition that's being organised by the DX Owners' Club in conjunction with Kemble Yamaha.

The competition's aim is to find 20 new voices for the DX9, and the programmers of these voices will each receive a £25.00 cash prize, while the sound that's judged as being best of all will earn its creator a free Yamaha MT44 four-track cassette machine. Following the competition, the 20 new voices will be released on cassette, and the only criterion you must fulfil to be able to enter the competition is that you must be a member of the aforesaid cub.

Full details, rules, and an entry form are available from Tony Wride of the DX Owners' Club at 28 Balk Top, RAF Dishforth, Thirsk, North Yorkshire.

Autographics Microsound 64 Keyboard

The Microsound system is designed to give the Commodore 64-owner access to the computer's internal SID chip and to bring it under the real time control of a conventional music keyboard. Mick Jones **has been living with one for several months, and here outlines his impressions.**

As a Commodore 64 owner I was pleasantly surprised to discover that a couple of firms had begun marketing relatively inexpensive computer-music interface packages. Although a great deal of smoke had been made about 64 link-ups by major synth manufacturers, for the most part I'd been unable to discover any real evidence of fire. The MIDI legend was in a constant state of flux, I'm far too mean to spend £1000 on a keyboard that's likely to be obsolete within a couple of months, and although SCI's sequencing cartridge *was* a possibility, I couldn't really afford a new Prophet 600 to go with it. I suppose I could have sold all my other keyboards and got round the problem that way, but that wasn't really the sort of thing I had in mind.

The Microsound 64 is unlikely to be a threat to the sales of DX7s and the like, but it it's something to be going on with while the synthesiser Big League sort themselves out. The system itself is hard to classify. On the one hand, comparisons with something like the Roland SH101 or Moog Rogue monosynths aren't particularly flattering since the Microsound is quite a bit more versatile, while on the other, the sheer difference in price between this unit and systems like the alphaSyntauri makes grouping of the Autographics design with its American counterparts a rather pointless exercise. Assuming you already have a Commodore 64, the Microsound will give you change out of £150. . .

Now, for that price you wouldn't expect lots of multi-coloured LED displays and the like, which is just as well because the Microsound doesn't give you any. What you do get however is a basic, lightweight four-octave keyboard, with two slider pots mounted on its left and a flat top suitable for mounting either the computer itself or a second keyboard instrument. You also, of course, get a load of software (in tape or disk format) and a well-presented user's manual that takes the form of a typed essay housed in a black loose-leaf ring binder.

The keyboard plugs directly into the two games ports on the back of the 64, giving the user direct real time control over the now (in)famous internal SID chip. No scanning is involved, so it's possible to play runs and trills at a speed that should satisfy all but the Oscar Petersons of this world. There's a choice of either monophonic or three-voice poly modes, and you can even select the in-between variant of two voices, should you find that prospect appealing.

The strongest part of the system – for me at least – is the clear and simple screen display that allows you to organise the various available parameters for each 'sound', before storing it on disk or cassette for future use. Autographics provide no preset voices or silly suggestions about how to make the sound of a violin (one of these days I'm going to see if I can play the violin so that it sounds like a Commodore SID chip. . .), which is undoubtedly a good thing.

Modes

A major hiccup is encountered when you switch from monphonic to three-note polyphonic for the first time – it rapidly becomes apparent that making use of any of the filter parameters switches off oscillator 3. This can be quite a let-down if you prefer to patch your sounds envelope first, filter later as a lot of people do: it follows that if you're going to fiddle with any of the filter parameters, you'll have to stick to just two oscillators. What also follows is that, unfortunately, you can only get true three-voice polyphony if you don't use the filtering, though there is some compensation in the form of a second screen display that goes by the name of 'patching mode'.

It's this display that brings the keyboard's slider controls into use – filter cutoff and pulse width can be assigned to either of the two controls, and can in turn be controlled by either the waveform amplitude or the ADSR of oscillator 3. It's also possible to turn this oscillator into a modulating LFO, again controlled by either slider.

One point worth mentioning however is that oscillator 3 can add a little background noise of its own even when it's being used for filtering of LFO modulation, and an option contained within the main screen display to mute the oscillator's output solves this problem. In general, I found the signal-to-noise ratio rather worse than would normally be acceptable in the context of a conventionally-packaged, self-contained synthesiser. I'm afraid that this (along with one or two other sonic shortcomings) is more an integral characteristic of the SID chip itself, rather than a weakness of the system under review: I'm sure Commodore themselves would be the first to point out that the chip was originally intended for 'home entertainment' purposes and not as a pro musician's tool.

Programming

The program loads in two sections, lasting 42 and 27 seconds respectively if you use a disk drive as I did. From tape, the whole process takes a total of about eight minutes. On the debit side though, the 100-note three-part sequence took longer to load from disk than the main program itself, which is a mite annoying.

Moving back to the screen display mentioned above, the first thing that strikes you when it appears for the first time is that there is a good deal of information packed onto it. You may already be aware that the SID chip has three oscillators, and the top left of the screen allows you to select these using a cursor up/down control: each oscillator can have triangle, sawtooth, pulse of noise waves assigned to it. Selection of the last mentioned automatically cancels the other three, but any combination of the non-noise waveshapes is possible. However, I found in practice that using more than one waveform per oscillator tended to reduce output level somewhat.

The oscillators can also be synchronised, ring modulated together, or filtered – each of these functions being switched into the chosen oscillator by toggling a particular key on the 64 on and off (5 to 8 for the waveforms, S, R and F for the others). Filtering can be low, high or band pass in character, and low and high can also be used together to create a sort of 'notch reject' effect. Still on the subject of filtering, there are also controls for cutoff frequency and resonance, these being adjusted by means of the 'C' and 'V' keys respectively, starting with a default value of zero and rising with each

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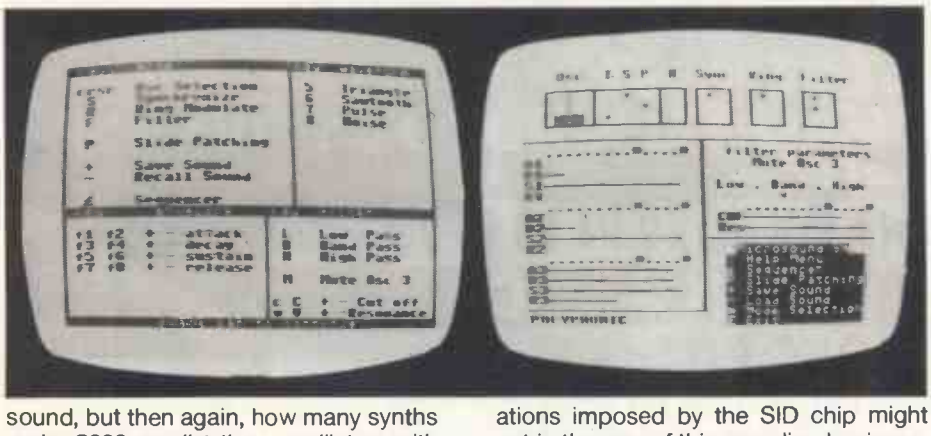
strike to the maximum of 15. Adding the shift key to the process gives a decrease instead of an increase, and in general I found this system quite logical as it isn't all that far removed from the slider controls synthesiser-players have come to know and love(?)

Much the same technique is used for controlling the ADSR parameters (these are independent for each channel), with the exception that you start with a default value of 10 for each of the 12 values. (Well, it didn't confuse me, so it shouldn't confuse you!).

Unfortunately, no pitch-bend or transpose facilities are available on the Microsound, but then again, how many synths under £200 can list three oscillators with independent envelope controls as part of their spec sheet?



Sequencing

It has to be said from the outset that the Microsound's sequencing is not as well thought out as the main control program: it certainly took me rather too long to get used to. Note-programming is possible only in step time, with notes coming from the music keyboard and rests being inputted *via* either the cursor right or '@' keys on the computer.

The graphics on this screen display are only average (I was really rather pleased to discover that switching off the display altogether facilitated higher speeds on sequence playback) but it must be said that the opportunity to store three 200-note sequences – or 200 triad chords – looped as many times as you like and at a wide range of speeds makes it well worth struggling with. By the way, the higher tempi need to be used with care since I discovered that the sequence would occasionally trip over itself if pushed too hard.

A further problem (presumably confined only to early disks like mine) came to light in the form of a 'blip' that inserts two notes (or spaces) when you only inputted one: I'm reliably informed that this bug is now better employed pushing up daisies, but it might be worth checking you've got updated software if you do decide the Microsound is for you.

The most serious omission from the program – in my view anyway – is the lack of a proper insert/delete function. It's possible to amend a particular note by replacing it with another one or with a rest, but you can't remove a note (or notes) and then close the gap and nor, for that matter, can you open a gap in which to insert new and/or omitted notes.

The Future

Development of the Microsound 64 is far from complete, and at present Autographics have two major projects in the pipeline – a piece of add-on hardware for digital sound sampling and an external trigger facility designed to be compatible with a number of popular keyboard systems.

As most readers will no doubt be aware, digital sampling has been – up until now – an extremely expensive business, but if Autographics' plans come to fruition, that situation could change very rapidly. If you're worried that the limitations imposed by the SID chip might get in the way of this sampling business, let me put your mind at rest – SID himself will not be involved, and as I understand it, the new hardware will be doing the donkey work, leaving the 64 to do what it does best, ie. organise and display. Like the Fairlight, the Autographics sampling system will feature a modifyable waveform display on screen, though apparently light pens are not favoured as they're considered not 'musician-friendly' enough.

The trigger unit, meanwhile, will obviously make the sequencer more worthwhile, even in its present form (you've guessed it, modifications are on the way). Assuming Autographics make the unit compatible with synths from the major manufacturers (Moog, Roland, Korg and so on) it could open up quite a sizeable market for them.

Conclusions

Reaching a sensible verdict on the Microsound 64 has to be done with considerable care, since normal yardsticks of synth reviewing are inappropriate. As I indicated above, on paper this system is not strictly comparable with budget-priced synths because its aims (and its methods of achieving them) are completely different. The worthlessness of such a comparison is confirmed by the results of a user test: on the one hand, the noise levels generated by the Microsound are far too high, while on the other, no commercially-available mono-synth has the potential to be upgraded into a digital sound-sampling device in the foreseeable future. Perhaps most important of all, as a performance instrument for live work the Microsound is a complete non-starter. What it needs is the facility to read a directory of sounds and sequences without leaving the program, while some space within the program to store 10 or 12 favourite sounds for immediate recall would also come in more than handy.

In terms of the quality of sound and facilities offered, the Microsound is of course more than a little outclassed by the likes of the alphaSyntauri and other Apple-based packages. However, whereas almost all of those transatlantic systems presuppose quite an extensive knowledge of music theory and the principles of synthesis on the part of the end-user, the Autographics system's clarity and ease of use should enable musicians of very limited knowledge to get to know it very quickly, and learn a great deal at the same time.

As the system stands at the moment, I would recommend it heartily not only to musicians like myself who are trying to get into computers before our children overtake us entirely, but also to computer buffs seeking a relatively painless introduction to the world of music-making.

Looking ahead a little, if the digital sampling add-on can be developed without too many problems – and the sequencing software brought up to the standard of the main control program at the same time – this system could well become strong enough to persuade non-Commodore owners to invest in a 64, and that's saying something.

Mick Jones **E&MM**

Further information on the Microsound 64 system is obtainable from Autographics, 3a Reading Road, Henley-on-Thames, Oxon PG9 1AB. Tel: (0491) 575469.

Postscript

As this issue of E&MM went to press, Autographics informed us that their sound-sampling add-on for the Commodore 64 is now fully developed. The hardware incorporates an input amplifier suitable for mic or line signals, programmable output attenuation and a 24dB roll-off low pass filter. Companding techniques are applied to input and output signals, and the unit connects *via* the cartridge expansion port.

On the software side, maximum sampling rate is 32kHz, the sound being stored in 30K of RAM. Timbre and amplitude of the sampled sound can be modulated *via* an on-screen waveform display, and resulting samples/waveforms can be dumped onto disk or cassette. Pitch and amplitude information can be derived in real time from the Microsound 64 Keyboard.

Cost of the basic hardware/software package (excluding controlling keyboard) is expected to be between £150 and £200, and further information should become available when the system goes on sale later this year.

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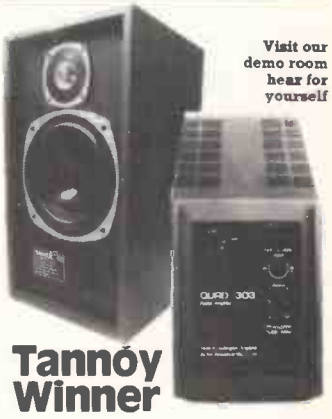

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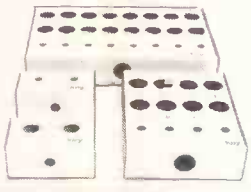
303 (45W/ch) £135
405 (80W/ch) £215
Full range available, also JBL

D.I. Box choice

For the best results when feeding a high Z instrument into low Z mike inputs, use the BSS active DI box. **£59.00** For line or speaker level signals, the passive EMO works well. **£31.00.** Both types feature jack in, XLR out, and an earth isolation facility.

Mike Boxes

Custom boxes for studio or multiway applications.
16 XLR(f) & 8 jack **£21.00**
8 XLR(f) & 4 jack **£12.15**
2 XLR (m or f) or 2 jack **£4.30**. Connectors extra.



The widest choice of four track systems and accessories

1 Fostex Producer System the 250 complete with AKG D80 microphone, leads and ten cassettes, so you get started the minute you get home.
Fostex 250 . . . . . £589

2 244 Producer Packages from Tascam,includes the same package of start up accessories as with the Fostex.
Tascam 244 . . . . . £619

3 MT44 Challenger This is Yamaha's contendor. Full simulsync and the latest Dolby C are featured. **FREE** Model 1478 four channel mixdown mixer with bass, treble and pan controls when you buy.
Yamaha MT44 . . . . . £294

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Heavy duty cable made to withstand the roughest treatment. Thick, rubber-like outer that's flexible in hot or cold weather. It wont kink, and is very easy to strip. Stocks are matt black, also in various pearl finish colours to special order.
Mike Cable (twin) **50p/m**
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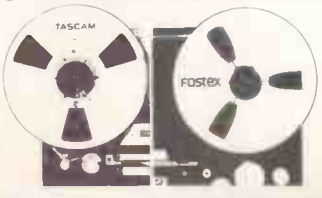
Speaker Cable, twin . . . **48p/m**
Sample on request. Drum prices quoted for longer lengths.

Eight track Wars

Call us for our confidential price on both Fostex and Tascam eight.



15% VAT must be added to all prices shown.

Our Postage charges are;
up to £9 . . . . . £1.00
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THE LONDON ROCK SHOPS SALE SUMMER

The London Rock Shop Summer Sale is on! Interest-Free Credit (0% APR) on SELECTED items and great savings on all our regular lines. Please note that on the hottest, newest items stock availability can be a problem — so please ring to check before travelling any great distance.

London's musical multitrack centre in our first floor showroom is packed full of recording gear. We are London's leading outlet for all Fostex multitrack hardware — right from the amazing, new 16-track on ½" tape to the portable X-15 "baby tracker".

So, if it's 16, 8, 4 or 2-track you're after why not come and get some "Sound advice at a better Price"?

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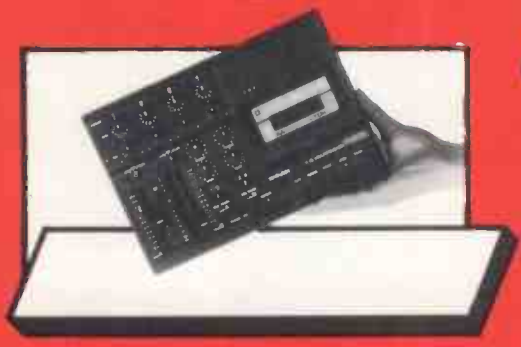

Fostex

Please Note: all OUR prices include 15% VAT

FOSTEX: B-16 NEW 16-track on ½" tape £3363
FOSTEX: 8090 remote control for B-16 ..... £343
FOSTEX: A-8 8-track on ¼" tape £1259
FOSTEX: A-2 2-track reel-to-reel ..... POA
FOSTEX: 350 8 into 4 into 2 mixer £488
FOSTEX: 3060 6 way meter bridge for 350 ..... £85
FOSTEX: 250 4-track Multitracker £661
FOSTEX: X-15 NEW baby 4-track cassette £299
FOSTEX: MN-15 4-1 mini mixer with compress.
FOSTEX: 8070 X-15 AC mains adaptor £26.40
FOSTEX: 9060 "Orange" foot drop in/out £6.85
FOSTEX: 3180 Stereo spring reverb £338
FOSTEX: 3070 Stereo compressor/limiter £262
FOSTEX: 3050 Digital dealy with mod £199
FOSTEX: 3030 Dual 10-band graphic eq £164
FOSTEX: 3040 4 ch. Dolby C noise red £275
FOSTEX: 2050 10 × 2 line mixer £143
FOSTEX: 6301 Powered mini monitor £80
FOSTEX: SP-11 200w mini monitor 2×4" £79
FOSTEX: 3010 32 way phono patch bay £45
FOSTEX: 8030 A-series remote control £42
FOSTEX: 8050 250/A-8 drop in switch £8.44

★★★★★ Special cash prices on all Fostex recording equipment during our July sales promotion: please call in person to our London or Bristol stores for full details of our extra special July deals! (must end July 31st.) Instant Credit (Club 24) up to £1,000 on all Fostex recording gear for credit card holders (subject to status). Please ring for further details.....

Please note: ALL our prices include VAT

SOUNDTRACS: 16-8-16 desk for Fostex B-16 ..... POA
SECK: NEW 12-2 mixer ergonomically superb! £499
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MTR: NEW 12-8-2 8 track mixing desk £424
CUTEC: MR-808 "Octette" 8 track Beta cassette £899
MTR: 6-4-2 mixing desk for Yamaha MT-44/Aria £226
ARIA: R504 4 channel multitrack cassette £474
YAMAHA: RM-804 8-4-2 recording desk £799
YAMAHA: MT-44 4 ch. cassette deck ..... ONLY £339
YAMAHA: RC-10 remote control for MT-44 ..... £45
YAMAHA: MM-30 mixer with echo/graphic for MT44 ..... £199
YAMAHA: PB-44 patch board for MT-44/MM-30 ..... £79
YAMAHA: RB-20 New rack for MT-44 system £149
YAMAHA: MS-10 20watt self-powered mini monitor £129
YAMAHA: MM-10 portable 4 channel mixer £95
YAMAHA: MA-10 headphone amp with ambience £79
THEATRE PROJECTS: active D.I. box ground lift £75
VESTA-FIRE: TB-1 passive D.I. box £25
ACCESSIT: Stereo reverb unit exc. power supply £132
ACCESSIT: Compressor, Noise gate, Dual eq ..... ea. £51
ACCESSIT: Single 30v power supply unit £8
ACCESSIT: 4-way power supply £33
FOSTEX: 3010 all phono patch bay £45
ACCESSIT: Patch Bay (jacks or phonos at rear) £73
ACCESSIT: set 8 × 0.5m phono-phono cords £7
ACCESSIT: Headphone splitter box, Stereo 15w power amp ..... all in stock

★ Please send 25p in stamps for ACCESSIT brochure ★

BOSE: New Home studio monitor speakers due July
ROCKMAN: X-100 updated lower noise unit £235
ROCKMAN: NEW Bass unit with compression £225
BOSS: HA-5 Play Bus Rockman type unit £79
MPC: Sync Track Roland TR-606/808 tape sync £39.95
TDK Tapes: full range stocked at competitive prices
AMPEX: Grand Master GM-1800 tape for Fostex A-8 ..... £8
AMPEX: 456 ½" tape for Fostex B16 ..... £26
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MICROPHONE STANDS: Beyer & budget booms ..... from £16.95
HEADPHONES: Sennheiser, Beyer & Roland

Personal Multitrack

DRUM MACHINES

OUR PRICE

OBERHEIM: DMX extra memory & s'ware updates £2609
OBERHEIM: DMXe Main Frame choose your own cards
OBERHEIM: Replacement cards for DMX ..... from £99
OBERHEIM: DX now with sync-to-tape £1257

★Unbeatable Oberheim prices to personal callers★

MXR: Digital Drums £1295
SEQUENTIAL CIRCUITS: DrumTraks tuneable £950
DRUMULATOR: New 64 song model crash or ride £895
ROLAND: TR-909 digital/analog hybrid RAM pack £695
ROLAND: TR-808 original rhythym composer £495
YAHAMA: RX-11 digital 16 voice & RAM packs £795
YAMAHA: RX-15 digital 12 voice tape dump £44
ROLAND: CR-8000 Compurhythm variable programs £34
ROLAND: CR-5000 Compurhythm presets..to order £24
ROLAND: PB-300 Rhythm plus for HP pianos £24
ROLAND: TR-606 "Drumatix" £285 £19
MPC: Sync Track sync-to-tape for TR-606/808 ..... £39.9
BOSS: DR-110 New Dr. Rhythm £135 £9
YAHAMA: MR-10 presets with playing pads £89 £7

RACK-MOUNTING UNITS

Please note: ALL our prices include VAT

DIGI-ATOM: 4800 analog to MIDI interface £79
VESTA-FIRE: SF-010 Dual flanger/chorus rack £27
VESTA-FIRE: Dual Compressor/limiter £29
IBANEZ: HD-1000 pitch shifter + dig. delay £29
ASHLEY: SC-33 stereo noise gates £29
APHEX: Model B Aural exciter £44
ROLAND: SDD-3000 dimension D £29
ROLAND: SBF-325 stereo flanger £23
ROLAND: SVC-350 rack-mount vocoder £47
IBANEZ: GE-3101 31 band graphic equaliser £23
IBANEZ: GE-1502 2 × 15 band graphic equaliser £25
WASHBURN: Bottom Line bass effect unit £15
WASHBURN: Stack-in-a-rack guitar rack effects £15
WASHBURN: Rack Time echo/flanger/chorus all 3! £23
ARIA: rack-mounting analog echo £11

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OUR PRIC

ROLAND MKB-1000 NEW "Mother Keyboard" touch-responsive 6 octave midi controller keyboard £145
ROLAND MKS-30 NEW midi 19" rack-mounting poly synt for MKB-1000 or expander use £74
ROLAND Juno 106 NEW midi polysynth £8
ROLAND JX-3P Programmable/Preset/Polyphonic £6
ROLAND PG-200 Optional programmer for JX-3P £14
ROLAND Juno 60 Poly synth 64 memories £6
ROLAND Juno 6 Poly synth w/arpeggiator ..... S/
ROLAND Jupiter 8A split k'board patch memories ... £27
ROLAND Jupiter 6 midi split keyboard £12
ROLAND MC-202 Microcomposer sync-to-tape £2
ROLAND SH-101 Monophonic synth with built-in 100 ste sequencer and arpeggiator £2
ROLAND MGS-1 hand grip and mod. control for SH-101
KORG Poly 800 NEW midi polyphonic synth £4
OBERHEIM OB-8 midi polyphonic synth £39
OBERHEIM XPANDER amazing new analog/digital hybri
OBERHEIM DSX multi voice polyphonic sequencer £17
SEQUENTIAL CIRCUITS Prophet 600 w/sequencer £11
SEQUENTIAL CIRCUITS Prophet 5 the original £19
SEQUENTIAL CIRCUITS Prophet T-8 amazing! ..... PO
SEQUENTIAL CIRCUITS Six Traks midi polysynth £6
MOOG Source new model with clock in, sync in £3
YAMAHA DX-7 midi 32 memories + RAM storage £13
YAMAHA DX-9 midi 20 memories FM sounds £7
YAMAHA CS-01 incredibly versatile mini synth ..... PO
YAMAHA Breath controller for CS-01 and DX-7 ..... £2

REVERB UNITS

Please note: ALL our prices include VAT

MXR: NEW digital reverb stereo outputs £1944
DYNACORD: NEW DRP-16 8 presets with pre-delay £650
YAMAHA: R-1000 digital 4 delay settings £574
FOSTEX: 3180 stereo spring with pre-delay £338
VESTA-FIRE: RV-1 mono in stereo out spring £229
GREAT BRITISH SPRING: updated black tube model £229
ACCESSIT: mono in stereo out spring inc. psu £140
BOSS: RX-100 mono/stereo in/out spring £165 £115

ELECTRIC PIANOS

YAHAMA: CP-80 Electric Grand – to order: ..... RRP: £4599
YAMAHA: CP-70B Electric Grand – to order: ..... RRP: £4299
YAMAHA: PF-15 FM 88-note weighted keys £1049
YAMAHA: PF-10 FM 76-note touch sensitive £849
YAMAHA: CP-7 5 octave stereo chorus £399 £325
ROLAND: HP-400 & HP-300 Home pianos
ROLAND: HP-70, HP-60 & HP-30 Piano Plus
ROLAND: EP-11 piano plus rhythms/auto acc.

★Full details of the Roland "Piano Plus" range may be obtained from our Bristol store only★

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WE STOCK A SELECTION OF CAREFULLY PICKED MODELS: **RRP**

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FENDER SQUIER: '52 butterscotch Telecaster
FENDER SQUIER: '57 (m/n) and '62(r/n) Precisions
FENDER SQUIER: '62 Jazz basses (s/bst, white, black)
FENDER SQUIER (Popular series): '70s Strats
FENDER SQUIER (Popular series): Telecaster
FENDER SQUIER (Popular series): Jazz basses
WASHBURN: Tour 24 tasty black 'n' red locking vib
YAMAHA: SG-200 guitars and BB-300/400 basses
TOKAI: a selection when available
IBANEZ: Musician 924 (fretted) 940 (fretless) bass
ARIA: a few tasty models from this enormous range
WESTONE: Thunder 1A Active bass R/H, L/H, fretless
WESTONE: Thunder & Concord budget basses
ROLAND: US-2 GR-splitter box for GR-300+700 ..... £99
ROLAND: NEW GR-700 midi guitar polysynth £1500
ROLAND: NEW G-707 guitar synth controller £699
ROLAND: G-808 Neck thru' body guitar synth £610
ROLAND: G-303 same shape as 808 fitted neck £500
ROLAND: G-505 with trem: blue, red or sbrst £510
ROLAND: G-202 nat., red or blue with case £355
ROLAND: GR-300 blue floor unit for all models ..... S/H
STEINBERGER: NEW headless guitar now in!
STEINBERGER: Fretted and fretless basses
STATUS: headless bass dark/light woods £1096
STATUS: NEW guitar dark/light woods £1096
BOND: Please ring for details re release date.

All prices quoted are list price (RRP). Please call in person to check availability and SALE prices.

COMPUTER MUSIC

YAHAMA: QX-1 8 channel Midi composer/editor £2349
YAHAMA: T8-PR 8 module FM synthesis 19" rack £3995
YAHAMA: CX-5 MSX music computer ..... due October
SEQUENTIAL CIRCUITS: Commodore 64 sequencer £184
AMDEK: CMU-800 Compu-music and Apple II's s'ware £249
SIEL: Sequencing software for Commodore 64
SIEL: Sequencing/Arpeggiator for Sinclair Spectrum
SIEL: Midi Interface box for above software
MIDITRACK: Step-time sequencer for BBC B £159
ROCKSOFT: Multi program for any MIDI keyboard and BBC B micro. Real-time polyphonic sequencer and step-time with loading from keyboard. Also displays Yamaha DX-7 parameters and 3D envelope generator graphics. Please send 35p for full details and sample print-out ..... POA

ROSETTI MUSIC SOFTWARE: Commodore 64 sequencer
RMS Software: Sinclair Spectrum MIDI arpeggiator
RMS Software: Sinclair Spectrum MIDI sequencer
RMS Software: Sinclair Spectrum DX p'meter display
ROLAND: MSQ-700 Midi sequencer + sync-to-tape ... £899
ROLAND: MM-4 4-way Midi thru' box £49
ROLAND: JSQ-60 sequencer for Juno 60/JP-8A £199
ROLAND: MD-8 DCB (Juno 60/JP-8A) to MIDI £265

DIGITAL & TAPE ECHO UNITS

Please note: ALL our prices include VAT

ROLAND: SDE-3000 8 memories all functions £799
ROLAND: SDE-1000 4 memories long delay £399
ROLAND: SRE-555 rack-mounting chorus echo £550
ROLAND: RE-501 chorus echo with reverb £450
ROLAND: RE-201 original tape "space echo" £350
BOSS: DE-200 digital echo with trigger input £279
KORG: SDD-3000 9 memories 1024 ms. delay £799
KORG: SDD-1000 NEW model with trigger input ..... POA
IBANEZ: DM-2000 digital delay with readout £325
IBANEZ: DM-1100 NEW long delay model £295
YAMAHA: D-1500 NEW 16 memory MIDI digital £639
VESTA-FIRE: NEW budget model excellent value £249
FOSTEX: 3050 ADT/flanger/chorus add-on unit £199
... plus many more analog echo & delay pedals

AMPS, CABS & COMBOS

		£RRP	£SALE
ROLAND Cube 60K Keyboard (silver)		£289	£199
ROLAND Cube 40K Keyboard (silver)		£225	£155
ROLAND Cube 60CH Chorus (grey)	NEW..	£255	£179
ROLAND Cube 40CH Chorus (grey)	NEW..	£215	£159
ROLAND Cube 100 (orange) dual overdrive		£359	£249
ROLAND Cube 60 footswitch overdrive		£239	£167
ROLAND Cube 40 1x10" w/master volume		£199	£139
ROLAND Cube 20 w/master vol. + reverb		£155	£109
ROLAND Cube 60 Bass portable studio combo.		£259	£179
ROLAND Spirit 50 Bass 50w 1x15" w/castors		£245	£169
ROLAND Spirit 30 Bass 30w 1x12"		£185	£129
ROLAND Spirit 15 Bass practice combo		£135	£99
ROLAND Spirit 50 w/reverb 50w 1x12"		£225	£155
ROLAND Spirit 25A w/reverb	NEW..	£165	£115
ROLAND Spirit 10A with master volume		£89	£69
ROLAND Jazz Chorus JC-50 1x12"		£315	£229
ROLAND Jazz Chorus JC-120 2x12" w/castors		£559	£419
ROLAND Bolt 30 1x12" valve overdrive		£345	£199
ROLAND Bolt 60 1x12" valave overdrive		£449	£299
ROLAND P.A. 150 8ch. stereo mixer/P.A. amp.		£699	£489
ROLAND P.A. 250 8ch. 2x12 watt mixer/amp		£799	£599
ROLAND SST-40 40 watt monitor/PA/k'brd cab		ea	£133
ROLAND SST-60 60 watt monitor/PA/k'brd cab		ea	£157
ROLAND SST-80 80 watt 1x12" + 3xpiezo cab		ea	£189
BOSS MA-1 mini guitar belt amp		£46	£32
BOSS MA-5 5 watt practice keyboard combo		£76	£49
BOSS MA-15 15 watt excellent monitor/combo		£130	£89
CARLSBRO Cobra 90 keyboad combo 1x15" 3ch		£288	£245
CARLSBRO Cobra 90 keyboard head		£192	£165
CARLSBRO Cobra 90 bass combo 1x15"		£237	£199
CARLSBRO Cobra 90 bass head compr. par.eq.		£142	£129
CARLSBRO 1x15" cab to match Cobra 90 head		£119	£99
CARLSBRO Hornet 45 k'bd combo 2 ch. w/rev		£199	£169
CARLSBRO Hornet 45 lead combo 1x12" w/rev		£177	£158
CARLSBRO Hornet 45 bass combo 1x12" w/comp		£165	£148
CARLSBRO Stingray bass head 150 watt		£213	£179
CARLSBRO Stingray bass combo 1x15" 150w		£347	£295
CARLSBRO Cobra 90 PA. head 4 ch. w/rev.		£196	£166
CARLSBRO Marlin 150w PA. head 6 ch. reverb		£294	£249
CARLSBRO Marlin 300w PA. head 6 ch. reverb		£392	£333
SESSIONETTE 75 watt 1x12" amazing guitar combo			£239
SESSIONETTE 75 watt 2x10" combo		£291	£259
SESSIONETTE 120 watt 4x10" bass combo		£425	£382
TRACE ELLIOTT AH-150 watt head 7-band graphic eq.			£333
TRACE ELLIOTT 1110 150w 4x10" combo 11-band eq.			£641
TRACE ELLIOTT 7410 150w 4x10" combo 7-band eq.			£580
TRACE ELLIOTT NEW 1518 1x15" 200w speaker cab			£324
TRACE ELLIOTT AH-250 watt head w/11-band graphic			£567
TRACE ELLIOTT GP-11 11-band graphic eq. preamp			£239
TRACE ELLIOTT 1115 150w 1x15" combo 11-band eq.			£665
TRACE ELLIOTT 7115 150w 1x15" combo 7-band eq.			£604
TRACE ELLIOTT 4x10" 200 watt 8 ohm speaker cabs			£305
TRACE ELLIOTT 1x15" 1514 200w 4 ohm cab			£327
TRACE ELLIOTT AH-500 500 watt head with X-over			£721
TRACE ELLIOTT RA-500 rack mounting power amp			£475
TRACE ELLIOTT 1524 2x15" 400 watt 4 ohm cab			£621
TRACE ELLIOTT 1084 8x10"/400 watt 4 ohm cab			£598

All Trace Elliott prices are nett of discount

BOSS EFFECTS UNITS

	£RRP	£SALE
DR-110 NEW Doctor Rhythm (patterns & tracks)	£135	£99
DE-200 Rack-mounting digital delay with trig	£375	£279
DD-2 NEW digital delay pedal 800ms. echo	£175	£129
DM-100 Analog delay + stereo chorus unit	£195	£110
DM-2 Analog delay pedal: discontinued few left at		£79
CE-2 Original mono chorus pedal pale blue	£92	£59
CE-3 Stereo chorus pedal metallic blue	£85	£59
HA-5 "Play Bus" rockman-type multi effect	£115	£79
RH-11M Headphones + mini microphone for HA-5	£69	£49
HC-2 Hand clap unit with ext. trigger or pad	£69	£55
PC-2 Percussion synth syndrum type w/ext. trig.	£69	£49
HM-2 Heavy metal pedal ideal for power chords	£55	£39
SD-1 Overdrive pedal with tone control	£63	£44
DS-1 Distortion pedal fuzz box type	£63	£44
PD-1 Rocker distortion foot controllable	£89	£59
PW-1 Rocker wah-wah pedal variable depth	£99	£69
PV-1 Rocker active boost volume pedal + 20db	£95	£66
BCB-6 Carrying case/pedal board for 5 units	£69	£49
PSM-5 Power supply/effects loop for BCB-6	£75	£49
PSA-220 Mains adaptor for SH-101 synth	£16	£12
ACA-220 Individual pedal battery eliminator	£16	£12
PH-1R Phaser pedal with added resonance	£89	£59
OC-2 Octaver pedal with 1 & 2 octaves down	£65	£48
TW-1 Touch Wah auto triggered wah-wah pedal	£74	£49
VB-2 Vibrato pedal excellent for bass h'monics	£79	£55
GE-7 7-band graphic equaliser with boost	£89	£62
GE-10 10-band graphic equaliser (mains)	£125	£87
BF-2 Flanger pedal 4 controls purple	£95	£69
FA-1 FE.T. preamp ideal for transducer p/ups	£37	£27
MA-1 Mascot amp with belt clip 6 line in	£46	£32
MA-5 Mini 5 watt mains practice combo 2 inputs	£76	£49
MA-15 Ace 15 watt keyboard/practice combo	£130	£89
MS-100 100 watt 2x4" mini mic stand monitor	£99	£69
MS-100A Microphone stand adaptor for MS-100	£25	£19
FV-100 Volume pedal with minimum vol setting	£65	£45
FV-200 Stereo volume pedal also filter pedal	£75	£52
J-44 Junction box phono-mini jack-jack	£21	£14
J-5 5-way interconnected jack socket splitter	£22	£15
KM-2 2 into 1 useful mini mixer & pre-amp	£27	£19
KM-04 4 into 1 battery powered compact mixer	£53	£37
BX-400 4 into 1 mixer	£99	£69
BX-600 6 into 2 stereo mixer lightweight	£149	£99
TU-12 Chromatic auto guitar/bass tuner (grey)	£52	£35
TU-12H NEW extended range auto tuner (white)	£55	£38
RX-100 Mono or stereo add-on spring reverb	£165	£115

Boss batteries available for all battery powered units

Full colour Boss catalogue available in limited quantity: Please send 35p in stamps to cover postage. Mail Order: just ring Bristol store with your credit card number and we will despatch within 24 hours. Personal cheques take some time to clear.

CATALOGUE REQUESTS: Please state exactly what products interest you and enclose 35p in stamps to cover postage costs. All mail order enquiries to our Bristol store will receive immediate attention.

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TED Digisound

Paul White **and a new Dutch product that enables digitally stored sounds to be replayed manually or by means of a trigger signal from a drum machine, a computer, or even a microphone.**

The most popular current electronic music buzzwords must surely be 'digital' and 'sampling', and both of these apply to the Digisound circuitry. Basically, a read only memory (or ROM) chip is programmed with a short burst of 'real' sound which can be regurgitated on demand by applying a trigger pulse to the circuit.

As it is only cost effective to store relatively short bursts of sound by this method, its application is generally limited to reproducing percussive effects, and it is in this field that the Digisound modules are designed to be used.

Each Digisound module contains one percussive sound which may be triggered by means of the built-in switch, a trigger pulse from a rhythm machine or a piezo-electric microphone. Although the voice module is interchangeable, achieving this requires an inordinate amount of dismantling, and I would imagine that most units would be returned to the distributors if this service is ever needed.

The units require an unstabilised power supply capable of delivering a minimum of ±18 volts and a maximum of ±24 volts and, although the current requirements are not stated, I would estimate that it would be in the order of 150ma per module. Two power supplies are manufactured by TED for this purpose, the DG2 being capable of powering two units and the DG10 of powering ten.

Currently available voicings include both conventional drum kit and Simmons sounds, and more sounds are expected to be available later in the year.

Construction

Housed in a steel box 240mm×120mm×45mm, the Digisound is singularly flat (much like its country of origin). The power in and power link connectors are three-pin DIN sockets, whilst both trigger in and audio out sockets are quarter-inch mono jacks.

There are three rotary controls for pitch, trigger sensitivity and output level, in addition to the pushbutton which permits direct manual triggering.

Internal construction is fairly conventional, being based on fibreglass PCBs, but the sound module, or 'DSBB Hart' as it is called, is not just a standard EPROM but a plastic encapsulated circuit with special connectors. This is used *ostensibly* to increase reliability (the Hart is guaranteed for eight years), but I suspect it has more to do with industrial security, it being impossible for anybody to duplicate the Hart programme using an EPROM copier.

The circuitry contains its own voltage regulators, and anti-aliasing filters are provided to prevent the clock frequency appearing at the output.

In Use

The two modules reviewed here were programmed with 'bass drum' and 'Simmons tom' voicings respectively, both of which were of high quality with no perceptible background noise (quoted S/N ratio is 72dB).

Manual triggering by means of the pushswitch worked well, but more unexpectedly, the external trigger facility was found to be particularly versatile, in that it would trigger not only from pulses but also from the analogue voice outputs on a drum machine. I used a Roland TR606 Drumatix that's been modified to produce separate voice outputs, and the Digisound triggered from all these, including the cymbal voice, providing that the accent was not programmed on any of the cymbal beats, otherwise retriggering occurred during the decay period of the cymbal sound.

John Hornby Skewes kindly provided one of Digisound's contact mics, which would normally be used to trigger the modules from conventional drums but can also be used to convert your ironing board into a novel drum synth. This worked very well, though the sensitivity has to be adjusted to optimise reliable triggering, and by taping the mics to your shoes, you can tap dance to the accompaniment of real drum sounds. This opens up new horizons for technically minded buskers who could now actually play the drums just be tapping their feet. . .

Conclusions

One recommended use of the Digisound system is to trigger the module's sounds from real drums in order to avoid miking up problems. This does work very well but there is no dynamic control over the sounds which may be limiting for music other than disco styles, though on the other hand, it might help to tighten up uneven playing dynamics.

The tuning control works over more than one octave, but at slower settings the sound quality suffers, as the clock frequency is low enough to pass through the output filters. In practice, there is more pitch control than strictly necessary and a good range of usable sounds is available without going to either extreme.

At an RRP of £69·95 per module (not including power supply or contact mike), the Digisounds are undoubtedly good value if only a few are required but, if you're in the market for a full drum kit, there are less expensive, more flexible systems available that not only produce sounds but also offer sequencing and dynamic control. The TED Digisound does what it does exceedingly well, sounds good and is easy to operate. It provides a convenient method of improving the sound of a poor drum kit for live or studio use, and I'm sure it will be readily accepted by the home recording fraternity.

The beauty of the system lies in its flexibility: if you only want a bass drum, you can buy just a bass drum. Perhaps the TED Digisound will mean that your old analogue drum machine isn't obsolete after all. . .

Paul White **E&MM**

TED Digisound Modules: D1001-3 £69·95, D9002 2-unit power supply £19·00, D9004 Trigger mic with lead £2·95, D9005 Connector Cable £3.50. Further information: John Hornby Skewes, Salem House, Garforth, Leeds, LS25 1PX. Tel: (0532) 865381.

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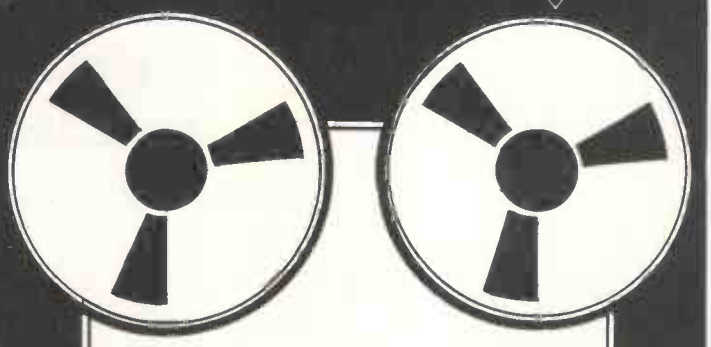

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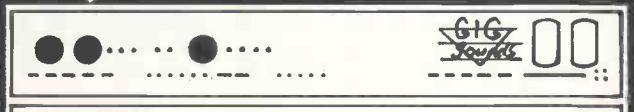

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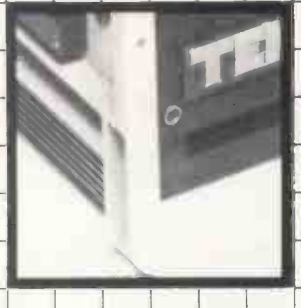

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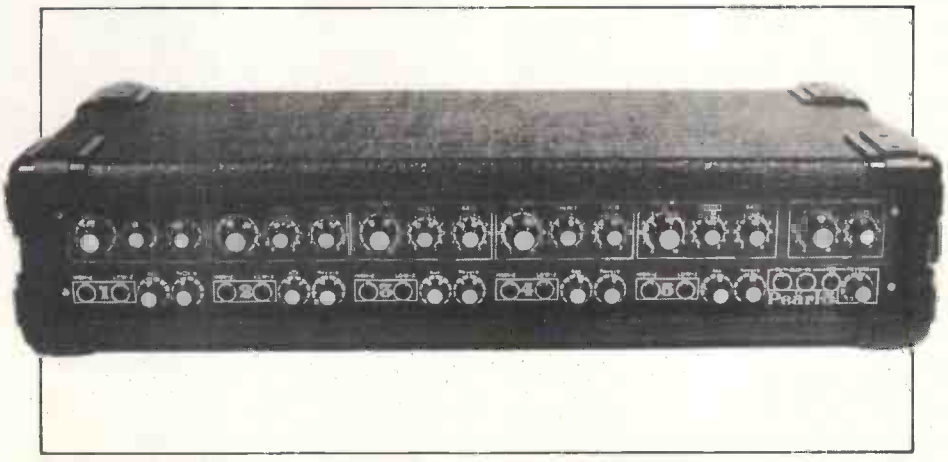
TransAm Pearl Five Amplifier

Paul White **takes a look at a five-channel mixer amplifier with built-in reverb, suitable for keyboard or PA applications.**

This British-built amplifier, although similar in appearance to some of its contemporaries, offers not only 150 watts of power but also independent control of reverb and auxiliary levels for each channel. The high and low impedance inputs mean that most types of microphone will be compatible and, although the Pearl Five is predominantly a PA amplifier, the design is eminently suitable for multikeyboard applications where the variable auxiliary send could be a real asset to many players.



Construction

The cabinet is manufactured from heavy duty plywood, finished in deeply grained vinyl with tough plastic corners, whilst the front and back panels house the preamplifiers and power stage respectively. This form of construction offers no surprises, being absolutely conventional in almost every respect. It's a well-tried design, both rugged and visually attractive, and offers easy access for servicing. The front panel is manufactured from steel and finished in black (powder coating I suspect) with white legending, a perspex panel being fitted to the upper half to give quite a sophisticated appearance.

The preamp circuitry is built on fibreglass PCBs which mount directly behind the pots, and is based around the industry standard 741 IC which, although no longer a state of the art device, nevertheless offers an economical blend of reliability and reasonable performance. Also mounted on the front panel is a dual-spring long delay line which produces the inbuilt reverb effect.

A conventional bi-polar power amplifier supplies the drive, and this shares the back panel with the power supply and output sockets, the whole panel being utilised as a heatsink. Internal loose wiring is minimal, which makes for an amp that is both reliable and easy-to-produce, the only exception being the coax feeding the reverb spring, which is not restrained and dangles rather too near to the springs for comfort.

Controls

Each input channel has a high and low impedance input, a volume control and two-band EQ (bass and treble). In addition, there are auxiliary and reverb controls, a master footswitch socket being fitted so that these effects may be disabled when not required. To the right of the panel is the master volume control, the presence control and the master reverb control.

The Auxiliary in and out sockets are located below the master volume control rather than on the back panel where many manufacturers choose to put them, and this is a great help when connecting up on a dimly lit stage. On the rear panel are the usual mains input, mains switch and speaker outputs, in addition to which a slave in/out socket is also provided, enabling a slave amp to be connected or the Pearl itself to be used as the slave.

Performance

In use, the Pearl Five does its job with little fuss and a minimum of background noise, which is surprising considering the use of 741s in the input stage: hats off to the designers on this point. Even the low impedance mic inputs are quiet enough for live use, though they probably wouldn't satisfy many studio engineers; then again, that isn't what they're designed for. The low Z mic inputs are unbalanced and will not accept balanced inputs on stereo jacks, so if you normally use these you'll need to make up some more leads, or at least some adaptors.

At first sight, the Pearl Five may seem to be a very ordinary PA amp, but it transpires that the design, finish, and sound quality are all to a very high standard and, what is more, the RRP is surprisingly low at only £245. The EQ is more than adequate for PA or keyboard amp uses and the spring reverb also works well in either application. As is the case with most spring reverbs, over-application can result in unpleasant 'twangy' effects, particularly where drum machines are concerned, but a little care on the part of the user should render this problem insignificant.

Having a variable auxiliary send for each channel is unusual in an amp of this price, and for keyboard use this is a definite advantage as you're unlikely to require the same amount of the same effect on all instruments. Even a guitar sounds decent through this amp (rarely the case with PA equipment) so the Pearl Five will also be of interest to the cabaret performer who wants to play everything into one system.

Conclusions

All in all, the TransAm looks great and should last for a good few years; there's a two-year guarantee to back this up, and being British, spares for the amp are easy to come by. Only the Welsh could come up with such an English design and then put an American name on it, but seeing that they're offering so much performance at such a modest price, I think they can call it whatever they like!

The TransAm range extends to slave amps and speaker systems, while a further PA amp, similar in specification to the Pearl Five, is also produced with built-in analogue delay effects under the model name of Diamond Five and at an RRP of £450.

Paul White **E&MM**

TransAm amplification is manufactured by TransAm (UK), Cwmfelin, Cross Keys, Newport, Gwent NP1 1JU (Tel: (0495) 200220) and distributed in England by GC Music (Gary Charman) on (0386) 553025. Review model supplied by Sound Centre Cardiff. Tel: (0222) 34018.

Ibanez DM1100 Digital Delay

It could be argued that Ibanez have more experience of designing budget-priced delay units than any other manufacturer. Now they've come up with a rack-mounting digital model that incorporates a maximum delay time in excess of three-and-a-half seconds. Paul White **analyses its potential.**

This new Ibanez delay incorporates state-of-the-art circuitry and includes modulation and hold facilities in addition to straight delay effects. A maximum delay time of 3600ms is available, but it should be realised that the maximum bandwidth has been restricted to 8kHz in order to facilitate this.

The input is converted into eight bits, but pre-emphasis and low-noise companding circuitry enable the equivalent input noise to be kept down to a surprisingly respectable −95dBm, with the minimum of distortion.

Controls

The input is immediately followed by level and tone controls, the level control incorporating a pull switch that configures the input stage as a microphone amplifier, which means that a mic can be plugged directly into the input without the need for a mixer or special preamp. A five-section LED meter enables the input level to be matched accurately for optimum performance.

Next in line is an eight-position rotary delay time selector, and a fine delay time control pot that enables delays of between seven and 3600ms to be quickly and easily set up. There's no numeric readout of delay time – undoubtedly a cost-cutting move – but for most purposes this is not an essential facility.

The modulation and speed controls come next, and these are used to produce chorus, flanging and vibrato effects. Another pull switch is incorporated into the feedback pot to reverse the phase of the feedback signal, and this means that subtle changes of colour can be introduced into flanging and chorus effects. This is a useful facility and one I was pleased to see on a unit in this price category.

Instead of the more usual level and balance controls, delayed and dry signals have independent level pots, which some users may find more convenient. The array of front panel controls is completed by the bypass and hold switches, rear panel jacks being provided for remote switching facilities.

All pushbuttons – including the mains switch – have an LED status indicator, which is a sensible idea considering the dimly-lit venues in which this sort of outboard unit is likely to be used.

Construction

As is the current fashion, the DM1100 is built into a 1U rack-mounting case, and in this instance both internal and external design has been implemented to a high standard. Another – perhaps somewhat less useful – fashion is the system block diagram mounted on the lid, something that seems to be a standard fitting on almost every delay unit of Far Eastern origin these days. The 1100 is no exception, but Ibanez have also provided a chart of sample settings, reproduced – in more detail – in the comprehensive user's manual.

As a departure from current design trends (certainly makes a change. . .) the front panel of the review sample was finished in a pale metallic finish as opposed to the almost ubiquitous black, and matching brackets of pretty robust construction are provided for rack fitting.

In Use

In terms of sound quality, the DM1100's performance was everything you would expect from a digital delay in this price bracket (ie. mostly quite clean and quiet), so the unit is more likely to be judged on the sorts of facilities it has to offer the potential purchaser.

I've already mentioned the lack of a delay time readout, and it's not inconceivable that this could make life very difficult in live or recording situations in which, say, it's necessary to set the delay time to a precise multiple of the tempo of a piece of music. Even a single LED to flash at the repeat rate would have been helpful, but sadly the 1100's designers have not seen fit to include this, either.

On the other hand, the effects this unit is capable of producing deserve some praise. The flanging available is some of the deepest I have heard from a digital unit, while the feedback invert switch gives a useful extra degree of control over sound colour. Chorus and vibrato were also deep and bright and, despite the bandwidth limitation mentioned earlier, there was no noticeable loss of top end using either guitar or keyboard input material.

Unusually, the hold function causes the repeat time to correspond to the longest delay time range, so that, for example, if you're using a delay of only a few milliseconds, the hold time will still be between 900 and 3600ms, depending on the setting of the fine delay control. Used intelligently, this can be a good feature as very short hold times are of little practical use. However, if the hold is switched in when a modulation effect is in operation, the frozen sound is characterised by wild pitch sweep components that are unlikely to be considered musically viable outside a Van Halen concert.

Finally, the provision of footswitch sockets enables all the essential functions to be controlled in an ongoing live music scenario, though the generally high sound quality would probably make the Ibanez suitable for use in all but the most exacting recording situation.

Conclusions

Ibanez have sacrificed both bandwidth and resolution in order to provide the 3600ms delay, but having said that, the DM1100's performance in these areas is more than adequate for most applications, and the quality of the modulation effects is refreshingly high. Meanwhile, the long delay should make this unit particularly appealing to fans of the Robert Fripp school of music performance: after all, you can store an awful lot of notes in three-and-a-half seconds. . .

As I see it, the only notable omission – delay time readout apart – is the lack of a triggering facility that would enable the hold function to be used as a simple triggered sampling system, though this is something that's rarely found on delay units in this price category despite the fact that such an addition costs little in manufacturing terms.

Summing up then, the DM1100 offers all the more common DDL facilities plus a wonderfully long maximum delay time for the price of a standard budget unit. The quality of the modulation-related effects is well above average, and at a typical retail price of just over £300, this Ibanez has got to be value for money, whatever the application.

Paul White **E&MM**

The DM1100 carries a TRP of £333 including VAT, and further information should be available from the importers, Summerfields, at Saltmeadows Road, Gateshead, NE8 3AJ, Tyne and Wear. Tel: (0632) 770431.

Yamaha Portasound MK100

Programmable Personal Keyboard

First shown at the Frankfurt Music Fair earlier this year, the MK100 represents Yamaha's first attempt at giving the much-maligned personal keyboard some degree of user-programmability. Vince S. Hill **managed to get his hands on the first example to hit the UK.**

The MK100 is instantly recognisable as being a rather different animal to most other members of the personal keyboard species by the fact that, above a panel containing the more commonly found function controls, it features a second control panel labelled the Multi Menu, and it's here that the instrument's user-programmable functions are to be found.

First things first, though.

The MK100 has a miniature seven-note polyphonic, four-octave keyboard (C-to-C) and in common with several competing models, can be powered in one of three ways: using internal batteries, an optional AC power adapter (PA1) or a second adaptor (CA1) that fits into a car cigar lighter socket. Output is stereo, and two integral amplifiers feed two watts per channel into the eight-ohm, 9cm diameter speakers situated at either end of the keyboard's control panel.

Concentrating first on the lower – more conventional – panel of controls, these are from right to left, the power on/off switch (complete with LED indicator), the voice selectors (labelled 'Orchestra'), the rhythm machine controls, auto bass chord section, and master volume control.

There are 12 preset tones, selectable using six pushbuttons and a bank switch that incorporates two LEDs to indicate which bank of voices has been chosen. The sounds are Organ, Trumpet, Saxophone, Piano, Harpsichord, Synthe (I & II), Guitar, Music Box, Oboe, Violin, and Piccolo. This selection represents a nice mix between percussive and chordal textures (though the Multi Menu can be used to alter tone and envelope, more on this anon), and all preset voices can be 'improved' by the use of the 'Stereo Symphonic' pseudo-chorus unit. This has three modes. In the Off position, no effect is produced and the MK100's output remains in mono, the Chorus position provides a slow, phasing modulation, while switching to Tremelo gives a more rapid modulation somewhat reminiscent of that produced by a rotary speaker. Perhaps not surprisingly, this last variant is at its most effective when used in conjunction with the Yamaha's organ presets.

There is also a dual-mode sustain option, this being capable of simulating both a long, concert hall-type sustain (Mode 1), or a shorter effect more akin to that produced by the sustain pedal on a piano (Mode 2). In general terms, voices such as Violin, Music Box, and the Synthe tones worked best in the former mode, while more percussive sounds (eg. piano and harpsichord) were at their most effective with the latter.

Rhythm Unit

As with the preset voices, there are 12 pre-programmed rhythm patterns from which to select, and this is done by using the same bank system described above. The preset rhythms are as follows: Disco, Rock and Roll, 8-Beat, Rhumba, Swing, March, 16-Beat, Shuffle, Bossa Nova, Samba, Slow Rock and Waltz. Two sliders are used to determine rhythm unit volume and tempo, the latter also setting the rate for the Auto Bass Chord section. Seven percussion sounds make up these rhythms, and these are of quite passable quality considering the MK100's price category. Pre-programmed fill-ins are also available, these being activated by use of the Fill-in bar – tapping this once gives one fill in isolation, while holding it down results in the roll sounding continuously.

The Auto Bass Chord section has four slider levers, a volume control, and a three-way switch for Normal Keyboard (ie. off), Single Fingered Chord, and Fingered Chord modes. The section operates over the lower 19 notes on the MK100's keyboard, and although in most respects the system's operation is pretty conventional, one point worth mentioning is that unlike many such systems, the auto-accompaniment switches itself off when a fill-in is selected, which certainly makes the backing more effective.

The Melody Plus feature works in conjunction with the Auto Bass Chord section, and supplies either one or two harmonising notes to each note of an auto-chord, depending on whether it's switched to Duet or Trio.

Multi Menu

Thus far, the Yamaha has been little more than a run-of-the-mill personal keyboard with a couple of clever 'sound enhancement' features and a conspicuously low price tag. However, it's the Multi Menu section above the main control panel that really sets the MK100 apart from the crowd. Broadly speaking, this section is made up of nine different functions (or 'menus'), and I think it's worth examining each of these in turn.

Waveform Synthesiser

This option also goes by the name of Melody Voice Vari 1, and enables the user to alter the waveshapes of any of the MK100's factory preset voices using eleven different shaping alternatives. To change a sound, all you do is select the Orchestra voice required, and select two waveforms from those displayed by the menu. Since each preset sound is only made up of two waveforms in the first place, the menu enables you to change a preset voice beyond all recognition, particularly if you add vibrato (switch 12) when there was none to begin with, or vice versa. As an example of how the system works, I managed to turn

Yamaha's trumpet approximation into quite a plausible clarinet, simply by changing the waveforms to 4 + 11 and removing the vibrato. Once you've got a sound you're happy with you can store it in a memory bank, labelled 'Custom' to distinguish it from Yamaha's own group of voices (labelled 'Preset'). Your own tone colours then remain stored in memory even if you subsequently select another menu or even turn the power off.

Envelope Synthesiser

It will come as no surprise to most of you that this menu also goes by the name of Melody Voice Vari 2, and that this section operates in a similar manner to Vari 1 except that in this case the subject for user-variation is the envelope of a sound. The menu works in an almost identical way to the waveform synthesiser, except that in this case there are only ten variations available, switches 3 and 12 being inoperative. The MK100's menu display lists the variable parameters as attack, decay and sustain, but in fact this last is more accurately described as release time in traditional synth terminology. Each of the ten operating pushbuttons refers to a distinct (non-programmable) envelope pattern, these being graphically illustrated on the above-mentioned display, so user confusion is unlikely.

Incidentally, combining the sound-adjustment possibilities presented by Melody Voice Vari 1 and Vari 2 results in a total of no fewer than 1376 tone colours being available – quite a remarkable figure, even if only a small number of those permutations is particularly musical.

Melody Mixer

A relatively simple menu, this one enables you to play two instrument tones combined in unison, regardless of whether they are Preset or Custom voices. The menu display details all the Custom sounds you've stored in the MK100's memory, and all you do is select one Orchestra preset to go with your chosen user-programmed voice. It should be noted however that the Trio function within the MK's Melody Plus section will not work once you've mixed two sounds together, though quite why this should be the case isn't particularly clear . . .

Chord Voice Vari

This menu allows you to program a selection of different sounds to take the parts presented to them by the built-in Auto Bass Chord feature discussed above. Once you've selected which preset voice you'd like assigned to the ABC (and again, this can be either a Custom or a Preset sound), that voice remains in this particular menu's memory, even if you subsequently change the sounds using either or both of the Melody Voice Vari menus.

Bass Voice Vari

In its normal (ie. not messed about by the machinations of the Multi Menu section) mode of operation, the MK100 automatically assigns the Guitar factory preset to the built-in bass line function, but as with the ABC menu above, this one allows that arrangement to be altered by the user, so that either Preset or Custom sounds can be used to play the bass line in sync with the drum machine and auto bass chord accompaniment.

Although this might not sound a particularly notable facility, in practice it's quite useful since the bass line subtly alters the envelope of whichever voice you've selected to play it, so that, for instance, the Music Box factory preset becomes transformed into a series of pretty realistic steel drums. All rather clever stuff, really.

Custom Drummer

This menu, perhaps not surprisingly, allows you to create your own drum patterns in memory and store them. Small graphic representations of each of the available percussion sounds (bass drum, snare, open and closed hi-hat, banjo (!) and conga) manifest themselves above six of the Multi Menu section pushbuttons, while a further three of these take on the functions of Preset, Custom Program, and Cancel, switches 3 and 5 being inoperative in this case.

Slightly confusingly – though quite logically – rhythm patterns are created in much the same way as custom instrumental voices, ie. you select a preset rhythm that's fairly close to the one you're looking for and then cancel or insert the various percussion voices until you've got what you're after. The selected preset rhythm pattern repeats in a two-bar pattern to make custom editing a little easier than the above description might make it appear. Pressing Rhythm Stop automatically stores your 'customised' rhythm in memory, and a maximum of 12 such patterns is recallable, though unfortunately you can only modify the preset patterns once each, which can make editing some of the less usable factory presets a rather laborious process.

Custom Bassist

No prizes for guessing that this menu enables you to load your own bass lines into the Multi Menu's memory in place of Nippon Gakki's pre-programmed riff. You can program – using four of the 12 pushswitches, labelled Preset, Custom, Program, and Cancel – one bass line per rhythm, or 12 in all. However, these can be either Preset or Custom patterns, and the menu will also memorise which bass sound you choose to play your custom riff with. All in all, a pretty powerful menu . . .

Music Programmer

This menu has three basic functions. It allows you to store either chord progressions or melodies, and also allows you to edit the auto bass feature.

Controls on the Music Programmer are as follows: Start/No Chord, Melody/Manual Bass (off-record-playback), Melody, Manual Bass, Chord (off-record-playback) and Auto Bass Edit.

Storing chord progressions (maximum space in memory 250 chords or bars, whichever comes first), is accomplished in real time. All you do is select Chord record (switch 10) upon which a metronome LED begins flashing and you can start playing. The menu will store all information concerning arrangements of preset voices, rhythm patterns and so on, and the real time mode of operation means that any fill-ins etc. you insert during your performance are also stored in memory.

Alternatively, you can store monophonic melody lines (maximum 750 notes) either on top of an existing memorised chord progression or in isolation. This is done by pressing Melody record (switch 4) and Chord playback (1). As with polyphonic recording, any changes you may make in tone colour, sustain, vibrato and so on are recorded and stored in the menu's memory.

There are also two ways of changing the pre-programmed bass line contained within this menu, these going by the names of Auto Bass Edit (ABE) and Manual Bass respectively. In general terms, the former system is used for altering lines entered into the Multi Menu's memory in step time (either by the user or by the MK100's Japanese programmers), while the latter process must be adopted if the line was recorded in real time in the context of a stored chord or melody progression. A manual bass cannot be changed using the ABE, and vice versa.

Tape Interface

This final menu enables you to store sounds, rhythm patterns and chord melody sequences on ordinary cassette tape, thereby leaving space for further electronic fun within the memories of the individual menus. A tape recorder can be connected to the MK 100 *via* the Tape In/Out jacks on the instrument's rear panel, and four of the Multi Menu pushswitches take on the functions of Save, Load, Stop and Load OK respectively. Information takes about 80 seconds to be loaded, and LED indicators provide visual confirmation that all is functioning as it should be, so you can't really go wrong.

Conclusions

So that's about it! This new Yamaha uses a miniature keyboard that isn't uselessly small, contains some pretty reasonable factory preset voices, and above all, incorporates the Multi Menu system which allows the individual musician to take creative decisions for himself, and that, for me anyway, is what music is all about.

A technological monster of an instrument at an *incredible* price.

Vince S. Hill **E&MM**

The Yamaha MK 100 carries an RRP of £329 including VAT, though it is typically discounted to around £269. Further information is available from Yamaha MI, Mount Avenue, Bletchley, Milton Keynes, Bucks MK1 1JE. Tel: (0908) 640202.

Spectrum MIDI

Much-maligned in some circles, the Sinclair Spectrum is nonetheless still the most cost-effective way for many musicians to get into the field of computer music. In May of last year E&MM published details of *MicroMIDI*, a self-build hardware interface to link MIDI instruments to the Spectrum. Now Jim Grant **has come up with a revised, simpler version of this unit, *MicroMIDI II*, and some software that enables control parameters of SCI's SixTrak polysynth to be displayed on screen, while** Steve Parr **has developed a similar program for the Yamaha DX7. A PCB for *MicroMIDI II* will be available shortly, while a limited quantity of E&MM's May '83 issue is still available, price £1.10.**

For those who might have missed this magazine's original MicroMIDI feature, part of the design is reproduced below. The circuit remains unchanged except that the component count has been pruned down to the bare essentials necessary for MIDI communication, so it's farewell to the 8255 PIA and its associated decoding.

Table 1 gives the register addresses within the MC6850 serial transmitter/receiver, while Tables 2 and 3 detail the control words necessary to configure the chip to suit different applications. For MIDI we must first output a Master Reset (OUT 159, 3) followed by clock divide and word length information (OUT 159, 86). All numbers are in decimal.

Table 1. MC6850 register addresses.

Address	Selection
159	6850 Control
191	Transmit Register
223	6850 Status
255	Receive Register

Table 2.

Data Bus Line No	Buffer Address: Transmit Data Register (Write Only)	Receive Data Register (Read Only)	Control Register (Write Only)	Status Register (Read Only)
0	Data Bit 0*	Data Bit 0	Counter Divide Select 1 (CR0)	Receive Data Register Full (RDRF)
1	Data Bit 1	Data Bit 1	Counter Divide Select 2 (CR1)	Transmit Data Register Empty (TDRE)
2	Data Bit 2	Data Bit 2	Word Select 1 (CR2)	Data Carrier Detect (DCD)
3	Data Bit 3	Data Bit 3	Word Select 2 (CR3)	Clear to Send (CTS)
4	Data Bit 4	Data Bit 4	Word Select 3 (CR4)	Framing Error (FE)
5	Data Bit 5	Data Bit 5	Transmit Control 1 (CR5)	Receiver Overrun (OVRN)
6	Data Bit 6	Data Bit 6	Transmit Control 2 (CR6)	Parity Error (PE)
7	Data Bit 7	Data Bit 7	Receive Interrupt Enable (CR7)	Interrupt Request (IRQ)

*Leading bit = LSB = Bit 0

Table 3.

CR6	CR5	Function
0	0	$\overline{RTS}$ = low, Transmitting Interrupt Disabled
0	1	$\overline{RTS}$ = low, Transmitting Interrupt Enabled
1	0	$\overline{RTS}$ = high, Transmitting Interrupt Disabled
1	1	$\overline{RTS}$ = low, Transmits a Break level on the Transmit Data Output Transmitting Interrupt Disabled

CR4	CR3	CR2	Function
0	0	0	7 Bits + Even Parity + 2 Stop Bits
0	0	1	7 Bits + Odd Parity + 2 Stop Bits
0	1	0	7 Bits + Even Parity + 1 Stop Bit
0	1	1	7 Bits + Odd Parity + 1 Stop Bit
1	0	0	8 Bits + 2 Stop Bits
1	0	1	8 Bits + 1 Stop Bit
1	1	0	8 Bits + Even Parity + 1 Stop Bit
1	1	1	8 Bits + Odd Parity + 1 Stop Bit

CR1	CR0	Function
0	0	÷ 1
0	1	÷ 16
1	0	÷ 64
1	1	Master Reset

Transmitting and receiving MIDI information is quite straightforward. The presence of received data can be checked by reading the Status Register (IN 223). Bit 0 is set if the Receive Register is full, and the data can be accessed by an IN 255 statement. Sending MIDI codes is achieved by writing to the Transmit Register using an OUT 191, nn statement.

One of the great advantages of the MIDI is the degree of control that can be effected over a sophisticated instrument, using only a few chips and a knowledge of BASIC programming . . .

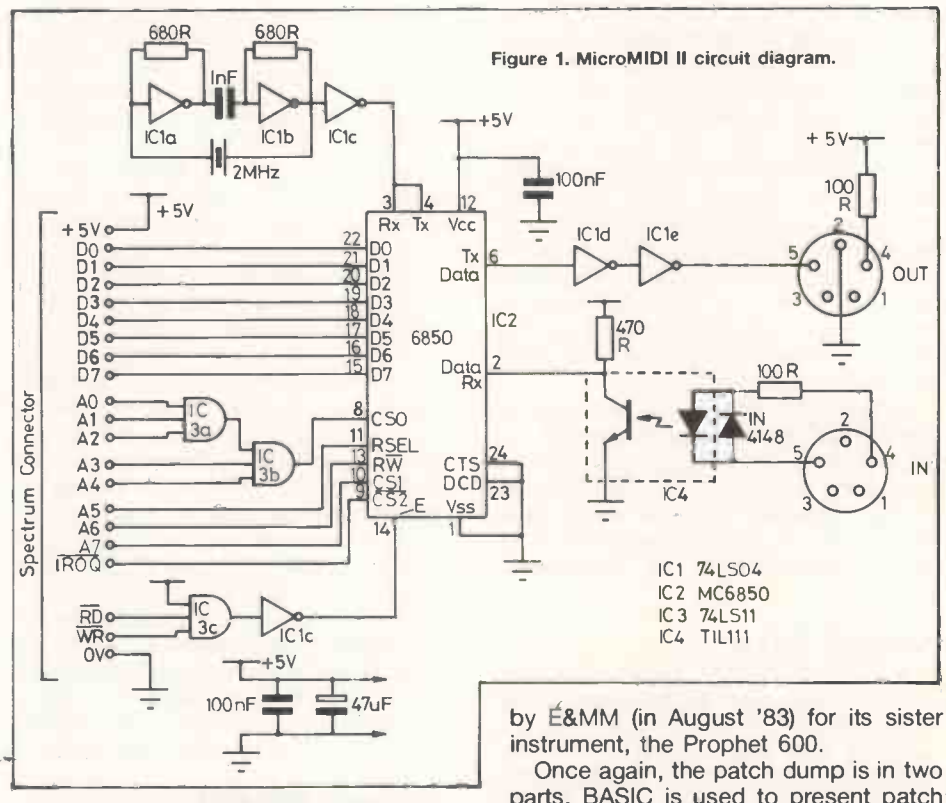


Figure 1. MicroMIDI II circuit diagram.

SixTrak Patch Dump

One of the most interesting synthesisers to become available recently is Sequential Circuits' SixTrak polysynth, also known as the Prophet 610. It offers a wide range of features at a surprisingly reasonable price, and is also the first MIDI synth to offer a homophonic capability.

In the interests of keeping production costs down to a minimum, SCI have given the SixTrak the keypad and parameter control system. For example, if you want to change, say, the filter resonance, the number 20 must be keyed in for that parameter before the actual value can be altered. So, unless you key in each one individually, all the control settings for a given patch remain hidden, and the 610 is therefore an obvious candidate for the Patch Dump program first implemented by E&MM (in August '83) for its sister instrument, the Prophet 600.

Once again, the patch dump is in two parts. BASIC is used to present patch data and provide a screen dump if requested, while machine code is responsible for communicating with the SixTrak. To initiate a patch dump, the Spectrum transmits five bytes as follows:

1) F0H –System Exclusive Data Follows
2) 01 – SCI Identification
3) 00 – Program Dump Request
4) XX – Program Number
5) F7H – End of System Exclusive Data

This can be seen in the assembler listing, lines 670–760. The Prophet 610 responds by transmitting a dump in the following format;

1) F7H – System Exclusive Data Follows
2) 01 – SCI Identification
3) 05 – Program Dump Follows
4) XX – Program Number
5) 0X – 32 bytes of program information transmitted in right justified nibbles
6) F7H – End of Exclusive data

The data is collected by the assembler and the 32 nibbles are packed into 16 bytes, these having the format shown in Table 4. After this, the remainder of the program uses the parameter length data held in lines 50–410, to sort the 16 bytes into 32 bytes of parameter information. This is held in the DUMP table (line 30).

Table 4. SixTrak Program Bit Map.

16 bytes of program data

BYTE	MS BIT						LS BIT	
0	B1	B0	A5	A4	A3	A2	A1	A0
1	D0	C3	C2	C1	C0	B4	B3	B2
2	F0	E3	E2	E1	E0	D3	D2	D1
3	H0	G3	G2	G1	G0	F3	F2	F1
4	I4	I3	I2	I1	I0	H3	H2	H1
5	K2	K1	K0	J3	J2	J1	J0	I5
6	M0	L4	L3	L2	L1	L0	K4	K3
7	N1	N0	M6	M5	M4	M3	M2	M1
8	O3	O2	O1	O0	N5	N4	N3	N2
9	Q3	Q2	Q1	Q0	P3	P2	P1	P0
A	S3	S2	S1	S0	R3	R2	R1	R0
B	U1	U0	T5	T4	T3	T2	T1	T0
C	W1	W0	V3	V2	V1	V0	U3	U2
D	Y1	Y0	X3	X2	X1	X0	W3	W2
E	Z5	Z4	Z3	Z2	Z1	Z0	Y3	Y2
F	-	-	ZB	ZA	Z9	Z8	Z7	Z6

POT BITS/RESOLUTION

A= OSC FREQ/6
B= FINE/5
C= GLIDE/4
D= OSC ENV AMOUNT/4
E= OSC ENV ATTACK/4
F= OSC ENV DECAY/4
G= OSC ENV SUSTAIN/4
H= OSC ENV RELEASE/4
I= PULSE WIDTH/6
J= LFO FREQ/4
K= LFO AMOUNT/5
L= MIXER/5
M= FILTER CUTOFF/7
N= RESONANCE/6
O= FIL ENV AMT/4
P= FIL ENV ATTACK/4
Q= FIL ENV DECAY/4
R= FIL ENV SUSTAIN/4
S= FIL ENV RELEASE/4
T= OSC TRI AMOUNT/6
U= VOICE VOLUME/4
V= AMP ENV ATTACK/4
W= AMP ENV DECAY/4
X= AMP ENV SUSTAIN/4
Y= AMP ENV RELEASE/4

SWITCH BITS

Z0	OSC SAW	Z6	LFO SHAPE (1= TRI)
Z1	OSC TRI	Z7	LFO OSC
Z2	OSC PULSE	Z8	LFO PULSE
Z3	OSC ENV INVERT	Z9	LFO FILTER
Z4	FIL ENV INVERT	ZA	FIL HALF (Only one of
Z5	UNISON	ZB	FIL FULL these can be on.)

Each parameter byte contains a value specific to a control on the SixTrak.

Once the machine code has done its job, control is passed to the BASIC, which accesses the parameter information and displays it on screen. Most of the BASIC is concerned with printing the 610 controls, while the position co-ordinates for each parameter to be printed are held in the DATA statements.

DX7 MIDI Dump

Although a wondrous beast in many ways, the Yamaha DX7 is no easy animal to program or edit, one of the main difficulties being that each parameter has to be accessed individually to see how it's affecting the overall patch. The DX7 dump program not only lets you see all the parameters laid out on a VDU, but also allows the user to save and load both single voices and 32-voice memories to and from tape, saving £££s on expensive RAM cartridges and providing backup for Yamaha's ROM packs, just in case you accidentally throw them out with the rubbish. In fact, it was because the writer cleverly succeeded in accomplishing this latter event that he was forced to write the program in the first place.

The software utilises a 48K Spectrum computer and the original MicroMIDI interface board published in E&MM May '83. The data for each DX7 voice is stored in the instrument's memory as a series of 155 bytes followed by a single checksum byte. This is preceded by six bytes of information ID to signify that what follows is a voice dump. Similarly, the data for the 32-voice memory is stored as a series of 32 chunks (each one 128 bytes long), and as before, this is followed by a single

Table 5. SixTrak patch dump machine code listing.

```
0010          ORG  32000
0020 PROG     DEFS 1
0030 DUMP     DEFS 17
0040 ;
0050          DEFB 6
0060          DEFB 5
0070          DEFB 4
0080          DEFB 4
0090          DEFB 4
0100          DEFB 4
0110          DEFB 4
0120          DEFB 4
0130          DEFB 6
0140          DEFB 4
0150          DEFB 5
0160          DEFB 5
0170          DEFB 7
0180          DEFB 6
0190          DEFB 4
0200          DEFB 4
0210          DEFB 4
0220          DEFB 4
0230          DEFB 4
0240          DEFB 6
0250          DEFB 4
0260          DEFB 4
0270          DEFB 4
0280          DEFB 4
0290          DEFB 4
0300          DEFB 1
0310          DEFB 1
0320          DEFB 1
0330          DEFB 1
0340          DEFB 1
0350          DEFB 1
0360          DEFB 1
0370          DEFB 1
0380          DEFB 1
0400          DEFB 1
0405          DEFB 2
0410 PLEN     DEFB 2
0420          DEFS 37
0430 DATA     EQU  $-1
0440 ;
0450 ;
0460 TX       IN   A,(223)
0470          BIT  1,A
0480          JR   Z,TX
0490          OUT  (C),B
0500          RET
0510 ;
0520 RX       CALL 1F54H
0530          RET  NC
0540          IN   A,(223)
0550          BIT  0,A
0560          JR   Z,RX
0570          IN   A,(255)
0580          RET
0590 ;
0600 OUT      LD   A,3
0610          OUT  (159),A
```

```
0620        LD   A,86
0630        OUT  (159),A
0640
0650        LD   C,191
0660        LD   HL,PROG
0670        LD   B,240
0680        CALL TX
0690        LD   B,1
0700        CALL TX
0710        LD   B,0
0720        CALL TX
0730        LD   B,(HL)
0740        CALL TX
0750        LD   B,247
0760        CALL TX
0770
0780 IN     LD   HL,DUMP
0790        CALL RX
0800        RET  NC
0810        CP   240
0820        JR   NZ,IN
0830        CALL RX
0840        RET  NC
0850        CP   1
0860        JR   NZ,IN
0870        CALL RX
0880        RET  NC
0890        CP   5
0900        JR   NZ,IN
0910        CALL RX
0920        RET  NC
0930        LD   (HL),A
0940        INC  HL
0950
0960 LOOP   CALL RX
0970        RET  NC
0980        CP   247
0990        JP   Z,SORT
1000        LD   C,A
1010        CALL RX
1020        RET  NC
1030        SLA  A
1040        SLA  A
1050        SLA  A
1060        SLA  A
1070        ADD  C
1080        LD   (HL),A
1090        INC  HL
1100        JR   LOOP
1110
1120 SORT,  LD   B,37
1130        LD   DE,PLEN
1140        LD   HL,DATA
1150 AGAIN  PUSH BC
1160        LD   A,(DE)
1170        LD   B,A
1180 FILL   CALL SHIFT
1190        RL   (HL)
1200        DJNZ FILL
1210        POP  BC
1220        DEC  DE
1230        DEC  HL
1240        DJNZ AGAIN
1250        RET
1260
1270 SHIFT  PUSH BC
1280        PUSH HL
1290        LD   B,16
1300        LD   HL,DUMP+1
1310 ROT    RL   (HL)
1320        INC  HL
1330        DJNZ ROT
1340        POP  HL
1350        POP  BC
1360        RET
1370        END
```

Table 6. SixTrak patch dump BASIC program.

```
  1 REM ***************
  2 REM *   610 MIDI   *
  3 REM * BY J.GRANT  *
  4 REM *   FEB 1984   *
  5 REM ***************
  6 REM
 10 CLEAR 31999
  15 BORDER 0: PAPER 0: INK 7: C
LS
  20 POKE 23658,8
  40 CLS : PRINT AT 9,4;"LOADING
 MACHINE CODE..."
  50 LOAD "MIDICODE"CODE
  60 CLS : PRINT " SCI 6 TRAK MI
DI DUMP"
  70 INPUT "PATCH NUMBER ";P
  80 IF P<0 OR P>99 THEN GO TO P
ATCH
  90 POKE 32000,P
 100 RANDOMIZE USR 32115
 110 CLS : PRINT "SCI 6 TRAK MID
I DUMP PRESET:"; INK 6; BRIGHT 1
;P'
 115 PRINT
 120 PRINT "VCO"
 130 PRINT "Freq coarse:     fine
:
 150 PRINT "SAW:     TRI:     PULS
E:     PW:
 160 PRINT "VCO ENV MOD"
 170 PRINT "ENVMOD:     ATTACK:
  DECAY:
 180 PRINT "SUSTAIN:     RELEASE:
    INV:
 200 PRINT "VCF"
 210 PRINT "CUTOFF:     RES:     K
YBD:
 220 PRINT "VCF ENV MOD     VCO:
 230 PRINT "ENVMOD:     ATTACK:
  DECAY:
 240 PRINT "SUSTAIN:     RELEASE:
    INV:
 260 PRINT "VCA"
 270 PRINT "ATTACK:     DECAY:
"
 280 PRINT "SUSTAIN:     RELEASE:
"
 300 PRINT "LFO"
 310 PRINT "FREQ:     SHAPE:     W
MOD:
 320 PRINT "VCO:     PW:     VCF:
"
 340 PRINT
 350 PRINT "VOICE VOL:          CL
ICK:
 360 PRINT "VCO/NOISE MIX:      UN
ISON:
 370 FOR N=32055 TO 32079
 380 LET POT=PEEK N
 390 READ X,Y
 400 PRINT AT X,Y;"   ";AT X,Y;
BRIGHT 1; INK 6;POT
 410 NEXT N
 420 DATA 3,12,3,21,20,25,6,7,6,
18,5,28
 430 DATA 7,8,7,20,4,29,17,5,17,
24,21,14
 440 DATA 9,7,9,15,11,7,11,18,11
,28,12,8,12,20
 450 DATA 10,18,20,10,14,7,14,17
,15,8,15,20
 460 FOR N=32080 TO 32089
 470 LET SW=PEEK N
 480 READ X,Y
 490 LET S$="ON"
 510 IF N=3208 AND SW=0 THEN LET
 S$="SQ"
 520 IF N=3208 AND SW=1 THEN LET
 S$="TRI"
 530 PRINT AT X,Y;"   ";AT X,Y;
INK 6; BRIGHT 1;S$
 540 NEXT N
 550 PRINT AT 9,24;"   ";AT 9,24
; INK 6; BRIGHT 1;PEEK 32090
 560 DATA 4,4,4,12,4,22,4,29,7,2
8,12,28,21,25
 570 DATA 17,15,18,4,18,11,18,19
 580 FOR I=32055 TO 32090: POKE
I,0: NEXT I
 590 RESTORE 390
 600 PRINT #1;"     C-COPY  P-PRE
SET  X-EXIT"
 610 LET K=CODE INKEY$
 620 IF K=67 THEN COPY
 630 IF K=80 THEN GO TO 60
 640 IF K=88 THEN STOP
 650 GO TO 610
```

checksum byte and preceded by its identification code. In the case of the single voice data, this code is 240 67 0 0 1 27, while for the 32-voice memory it is 240 67 0 9 32 0. Each chunk is a condensed form of the single voice data, and for the purposes of this program, the information itself is not interpreted but merely shuttled about from keyboard to computer to tape and back again, with just a listing of the 32 patch names extracted from it. However, the computer *does* interpret and display the single-voice data parameter-by-parameter on four successive screens, the last of which gives the user the opportunity to allocate a file name to the data before dumping it onto tape.

The machine code program begins at location 35028 by loading DE with the address of the six identification bytes, HL with the address of the keyboard data dump, and BC with the relevant number of bytes to be transferred. It then checks the incoming bytes against the identification data, which has been poked into the location 35000 by the BASIC program by calling the Receive subroutine at 35006; if all is well, it then downloads the DX7 data into location 35200 onwards.

To transfer data back into the keyboard, the program loads the successive bytes in 35200 *via* the Transmit subroutine at 35019, decrementing the BC register each time until it reaches 0. For those interested in a fuller breakdown of the TX and RX routines, this is given in Ken McAlpine's article *Interrogate Your Prophet 600*, E&MM August '83.

The BASIC program starts by initialising the MIDI interface and poking system variables to set caps lock and keyboard click. It displays the menu after loading the machine code.

Line 1000 prints loading instructions and line 1020 pokes the data file with the appropriate bytes, prior to running the machine code at 35028 for the 32-voice memory: line 3000 does the same for the single-voice memory.

Line 2000 prints the loading instructions, pokes the number of bytes to be transferred into the BC register and runs the machine code at 35067 for the 32-voice memory: this time, line 4000 does the same for the single voice. Line 5000 checks that 32-voice data is resident in memory and then prints out all the parameters. If there is no data present it returns to the menu. Line 5500 does the same for the single-voice memory, but this time it prints out all the parameters on screen, having interpreted and normalised them.

Line 6000 lets you give your file a name and saves it to tape, while line 7000 will

Table 7.

```
10 FOR F=35000 TO 35089
20 INPUT 'INPUT M/C BYTE'; I
30 POKE F, I
40 PRINT F, PEEK F
50 NEXT F
```

Table 8.

240	219	128	119	16	35
67	255	137	19	244	193
0	201	1	35	201	13
0	219	0	16	33	32
0	223	0	243	128	244
0	203	197	193	137	14
205	79	6	205	1	255
84	40	6	190	0	16
31	250	26	136	0	240
208	237	79	119	197	201
219	65	205	35	70	
223	201	190	13	14	
203	17	136	32	191	
71	184	185	248	205	
40	136	32	14	203	
246	33	250	255	136	

Table 9. DX7 patch dump machine code listing.

ADDRESS	ROUTINE	ASSEMBLER	COMMENTS
35000			Data bytes.
35006	RX S/R	CALL 84 31	Checks break key
35009		RET N/C	routine in ROM.
35010		IN A, 223	
35012		BIT 0,A	Checks status
35014		JRZ, RX	register and loads
35016		IN A, 255	accumulator.
35018		RET	
35019	TX S/R	IN A, 223	Checks transmit
35021		BIT 1, A	register and loads
35023		JRZ, TX	byte into C.
35025		OUT C, B	
35027		RET	
35028	INITIALISE	LD DE, addr data	
35031		LD HL. addr dump	
35034		LD RC, counter	
35037	INPUT	PUSH BC	Loads data and
35038		LD B, 6	checks it against
35040		LD A, (DE)	input from DX7
35041		LD C, A	
35042	LOOP	CALL RX	
35045		CP A, C	
35046		JRNZ, LOOP	
35048		LD (HL), A	
35049		INC DE	
35050		INC HL	
35051		DJNZ, LOOP	
35053		POP BC	
35054	LOOP	CALL RX	Inputs bytes from
35057		LD (HL), A	DX7 voice data
35058		INC HL	and stores them
35059		DEC C	in dump location
35060		JRNZ, LOOP	
35062		LD C, 255	
35064		DJNZ, LOOP	
35066		RET	
35067	INITIALISE	LD HL, addr dump	
35070		LD BC, counter	
35073	OUTPUT LOOP	PUSH BC	Loads B with data
35074		LD B, (HL)	bytes and outputs
35075		LD, C, 191	them from C and
35077		CALL TX	decrements until
35080		INC HL	BC=0
35081		POP BC	
35082		DEC C	
35083		JRNZ, LOOP	
35085		LD C, 255	
35087		DJNZ, LOOP	
35089		RET	
35090	END		

Table 10. DX7 patch dump BASIC program.

```
 10 CLEAR 34999
 20 OUT 159,3
 30 OUT 159,86
 40 POKE 23658,8: POKE 23609,150
 50 CLS : PRINT " YAMAHA DX7 DUMP  BY STEVE PARR "
 60 PRINT AT 10,6; FLASH 1;"LOADING MACHINE CODE"
 70 LOAD "DCODE"CODE 35000,90
 80 CLS : PRINT AT 0,10;" MAIN  MENU "''''''
 90 PRINT "PRESS S TO SAVE DATA (32 VOICES)"
100 PRINT "PRESS L TO LOAD DATA (32 VOICES)"
110 PRINT "PRESS V TO SAVE DATA (1 VOICE)"
120 PRINT "PRESS B TO LOAD DATA (1 VOICE)"
130 PRINT "PRESS D TO LIST VOICES IN FILE"
140 PRINT "PRESS F TO LIST SNGLE VOICE DATA"
150 PRINT "PRESS T TO SAVE DATA TO TAPE"
160 PRINT "PRESS Y TO LOAD DATA FROM TAPE"
170 INPUT A$
180 IF A$="S"  THEN  GO TO 1000
190 IF A$="L" THEN  GO TO 2000
200 IF A$="V" THEN  GO TO 3000
210 IF A$="B" THEN  GO TO 4000
220 IF A$="D" THEN  GO TO 5000
230 IF A$="F" THEN  GO TO 5500
240 IF A$="T" THEN  GO TO 6000
250 IF A$="Y" THEN  GO TO 7000
260 IF A$<>"S" AND A$<>"L" AND A$<>"V" AND A$<>"B" AND A$<>"D" AND A$<>"F" AND
A$<>"T" AND A$<>"Y" THEN  GO TO 80
1000 CLS : PRINT AT 9,0;"SET DX7 TO ""SYS INFO AVAIL"" (FUNCTION CONTROL £8)  TH
EN ""MIDI TRANSMIT?"""
1010 PRINT          PRESS YES/ON ON DX7"
1020 POKE 35003,9: POKE 35004,32: POKE 35005,0: POKE 35035,17: POKE 35036,17
1030 BEEP 1,1: RANDOMIZE USR 35028
1040 CLS : PRINT AT 11,2;"32 VOICE SAVING COMPLETED": GO SUB 9180
2000 CLS : PRINT "SET DX7 TO ""SYS INFO AVAIL"" (FUNCTION CONTROL £8) THEN ""INT
```

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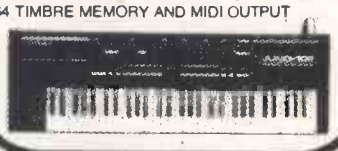
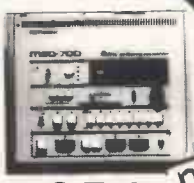
UNIQUE 6-VOICE POLYPHONIC SYNTH WITH A 64 TIMBRE MEMORY AND MIDI OUTPUT





new

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A PROGRAMMABLE POLYPHONIC SYNTH MODULE WITH MIDI. A VERY VERSATILE UNIT CAPABLE OF STORING 64 TIMBRES WHICH CAN BE MODIFIED BY THE EDIT FUNCTION. THE DUAL VCO'S PRODUCE METALLIC SOUNDS PLUS A STEREO CHORUS FOR THICK BROAD SOUNDS. CAN BE USED WITH MIDI KEYBOARDS, SEQUENCERS AND COMPUTERS!

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```
ERNAL MEMORY PROTECT  OFF"""
2010 PRINT AT 11,5;"PRESS ANY KEY TO LOAD"
2020 POKE 35071,23: POKE 35072,17
2030 IF INKEY$="" THEN  GO TO 2030
2040 BEEP 1,1: RANDOMIZE USR 35067
2050 CLS : PRINT AT 11,3;"32 VOICE LOADING COMPLETED": GO SUB 9180
3000 CLS : PRINT AT 9,0;"SET DX7 TO ""SYS INFO AVAIL"" (FUNCTION CONTROL £8)  TH
EN SELECT PATCH NO"
3010 POKE 35003,0: POKE 35004,1: POKE 35005,27: POKE 35035,156: POKE 35036,1
3020 BEEP 1,1: RANDOMIZE USR 35028
3030 CLS : PRINT AT 11,1;"SINGLE VOICE SAVING COMPLETED": GO SUB 9170
4000 CLS : PRINT "SET DX7 TO ""SYS INFO AVAIL"" (FUNCTION CONTROL £8) THEN ""INT
ERNAL MEMORY PROTECT  OFF"""
4010 PRINT AT 11,5;"PRESS ANY KEY TO LOAD"
4020 POKE 35071,162: POKE 35072,1
4030 IF INKEY$="" THEN  GO TO 4030
4040 BEEP 1,1: RANDOMIZE USR 35067
4050 CLS : PRINT AT 11,1;"SINGLE VOICE LOADING COMPLETED": GO SUB 9170
5000 CLS : IF PEEK 35204<>32 THEN  PRINT AT 11,9; FLASH 1;"NO RELEVANT DATA": PA
USE 100: GO TO 80
5010 CLS : FOR I=1 TO 16: PRINT AT I,0;I: FOR A=0 TO 9: PRINT AT I,A+3;CHR$ PEEK
 (35196+A+128*I): NEXT A: NEXT I
5020 FOR I=17 TO 32: PRINT AT I-16,17;I: FOR A=0 TO 9: PRINT AT I-16,A+20;CHR$ P
EEK (35196+A+128*I): NEXT A: NEXT I
5030 PRINT AT 19,0;"          PRESS ANY KEY                    TO RETURN TO MENU
    "
5040 IF INKEY$="" THEN  GO TO 5040
5050 GO TO 80
5500 CLS : IF PEEK 35205<>27 THEN  PRINT AT 11,9; FLASH 1;"NO RELEVANT DATA": PA
USE 100: GO TO 80
5510 CLS : FOR A=0 TO 9: PRINT AT 0,(A+11);CHR$ PEEK (35351+A): NEXT A
5520 PRINT AT 1,0;"        EG   RATES  EG  LEVELS          1  2  3  4  1  2  3
4  "
5530 FOR Y=1 TO 6: PRINT AT 2+3*Y,0;"OP";Y: NEXT Y
5540 FOR A=0 TO 7: PRINT AT 5,8+3*A;PEEK (35311+A): NEXT A
5550 FOR A=0 TO 7: PRINT AT 8,8+3*A;PEEK (35290+A): NEXT A
5560 FOR A=0 TO 7: PRINT AT 11,8+3*A;PEEK (35269+A): NEXT A
5570 FOR A=0 TO 7: PRINT AT 14,8+3*A;PEEK (35248+A): NEXT A
5580 FOR A=0 TO 7: PRINT AT 17,8+3*A;PEEK (35227+A): NEXT A
5590 FOR A=0 TO 7: PRINT AT 20,8+3*A;PEEK (35206+A): NEXT A
5600 IF INKEY$="" THEN  GO TO 5600
5610 CLS : FOR A=0 TO 9: PRINT AT 0,(A+11);CHR$ PEEK (35351+A): NEXT A
5620 PRINT AT 1,0;"    BKPT  DEPTH     CURVE  SCALE    C3=39 L   R     L    R  K
EY "
5630 FOR Y=1 TO 6: PRINT AT 2+3*Y,0;"OP";Y: NEXT Y
5640 FOR A=0 TO 5: PRINT AT 5+3*A,6;PEEK (35319-21*A): NEXT A
5650 FOR A=0 TO 5: PRINT AT 5+3*A,10;PEEK (35320-21*A): NEXT A
5660 FOR A=0 TO 5: PRINT AT 5+3*A,14;PEEK (35321-21*A): NEXT A
5665 FOR A=0 TO 5: LET CURV=PEEK (35322-21*A): GO SUB 9100
5675 PRINT AT 5+3*A,18;C$: NEXT A
5680 FOR A=0 TO 5: LET CURV=PEEK (35323-21*A): GO SUB 9100
5690 PRINT AT 5+3*A,23;C$: NEXT A
5700 FOR A=0 TO 5: PRINT AT 5+3*A,29;PEEK (35324-21*A): NEXT A
5720 IF INKEY$="" THEN  GO TO 5720
5730 CLS : FOR A=0 TO 9: PRINT AT 0,(A+11);CHR$ PEEK (35351+A): NEXT A
5740 PRINT AT 1,0;"     MOD VEL OUT FREQUENCY******     SEN KEY LEV FIX COA FIN
DET"
5750 FOR Y=1 TO 6: PRINT AT 2+3*Y,0;"OP";Y: NEXT Y
5760 FOR A=0 TO 5: PRINT AT 5+3*A,6;PEEK (35325-21*A): NEXT A
5770 FOR A=0 TO 5: PRINT AT 5+3*A,10;PEEK (35326-21*A): NEXT A
5780 FOR A=0 TO 5: PRINT AT 5+3*A,13;PEEK (35327-21*A): NEXT A
5790 FOR A=0 TO 5
5795 LET SYNC=PEEK (35328-21*A): GO SUB 9150
5800 PRINT AT 5+3*A,17;C$: NEXT A
5810 FOR A=0 TO 5: PRINT AT 5+3*A,22;PEEK (35329-21*A): NEXT A
5820 FOR A=0 TO 5: PRINT AT 5+3*A,26;PEEK (35330-21*A);"%": NEXT A
5830 FOR A=0 TO 5: PRINT AT 5+3*A,30;PEEK (35331-21*A)-7: NEXT A
5840 IF INKEY$="" THEN  GO TO 5840
5850 CLS : FOR A=0 TO 9: PRINT AT 0,(A+11);CHR$ PEEK (35351+A): NEXT A
5860 PRINT AT 1,0;"    PITCH ENVELOPE GENERATOR          RATES          LEVELS
    1   2   3   4   1   2   3   4  "
5870 FOR A=0 TO 7: PRINT AT 5,1+4*A;PEEK (35332+A): NEXT A
5880 PRINT AT 7,0;"    ALGORITHM       FEEDBACK     "
5890 PRINT AT 8,8;(PEEK 35340)+1;AT 8,24;PEEK 35341
5900 PRINT AT 11,0;"    LOW FREQUENCY OSCILLATOR     SPEED DELAY PMD AMD SYNC WA
VE  "
5910 LET SYNC=PEEK 35347: GO SUB 9150
5920 LET WAVE=PEEK 35348: GO SUB 9200
5930 PRINT AT 13,3;PEEK 35343;TAB 9;PEEK 35344;TAB 14;PEEK 35345;TAB 18;PEEK 353
46;TAB 21;C$;TAB 26;W$
5940 LET SYNC=PEEK 35342: GO SUB 9150
5950 PRINT AT 16,0;" OSCILLATOR KEY SYNC    ";C$
5960 PRINT AT 18,0;" PITCH MOD SENS         ";PEEK 35349
5970 PRINT AT 20,0;" KEY TRANSPOSE [0-48]  ";PEEK 35350
5980 IF INKEY$="" THEN  GO TO 5980
5990 GO TO 80
6000 CLS : INPUT "1 VOICE OR 32 VOICES?  ";A$
6010 IF A$<>"1" AND A$<>"32" THEN  GO TO 6010
6020 INPUT "FILE NAME? (MAX 10 LETTERS)",N$
6030 IF A$="1" THEN  SAVE N$ CODE 35200,162
6040 IF A$="32" THEN  SAVE N$ CODE 35200,4113
6050 GO TO 80
7000 INPUT "FILE NAME? (MAX 10 LETTERS)",N$
7010 CLS : PRINT AT 11,11; FLASH 1;"START TAPE"
7020 LOAD N$CODE
7030 CLS : PRINT AT 11,11; FLASH 1;"STOP TAPE"
7040 GO SUB 9180
9100 IF CURV=0 THEN  LET C$="-LIN"
9110 IF CURV=1 THEN  LET C$="-EXP"
9120 IF CURV=2 THEN  LET C$="+EXP"
9130 IF CURV=3 THEN  LET C$="+LIN"
9140 RETURN
9150 IF SYNC=0 THEN  LET C$="OFF"
9160 IF SYNC=1 THEN  LET C$="ON"
9165 RETURN
9170 FOR A=0 TO 9: PRINT AT 13,(A+11);CHR$ PEEK (35351+A): NEXT A
9180 PAUSE 150
9185 GO TO 80
9190 RETURN
9200 IF WAVE=0 THEN  LET W$="TRI"
9210 IF WAVE=1 THEN  LET W$="SWDN"
9220 IF WAVE=2 THEN  LET W$="SWUP"
9230 IF WAVE=3 THEN  LET W$="SQRE"
9240 IF WAVE=4 THEN  LET W$="SINE"
9250 IF WAVE=5 THEN  LET W$="RNDM"
9260 RETURN
```

load previously dumped files back into the Spectrum's memory.

Instructions

First type in the BASIC program and save it using SAVE 'DUMP' LINE 10, and then load the machine code by using the loader in Table 7. Note that the code in Table 8 reads down, not across! Save this after the BASIC with SAVE 'DECODE' 35000, 90, and then load the BASIC program back in. This will automatically load the machine code for you. If by any chance you should break out of the program, re-enter with RUN 80.

To store the DX7 cartridge memory onto tape, the memory first has to be dumped into internal. If you're doing this, make sure you've saved the internal memory and checked it on the patch listing, or you could lose many long hours of programming, and probably your lunch as well . . .

Should you find the thought of hours of typing this listing into your Spectrum too horrible to contemplate, a cassette containing an expanded version of this program and a short sequencing routine can be obtained from SDS, 18 Cambalt Road, London SW15 6EW, for £5.95 including postage and VAT. Finally, the author would like to thank Ken McAlpine for the idea and TX/RX routines, and Tony Saunders for his invaluable work deciphering the DX MIDI codes.

E&MM

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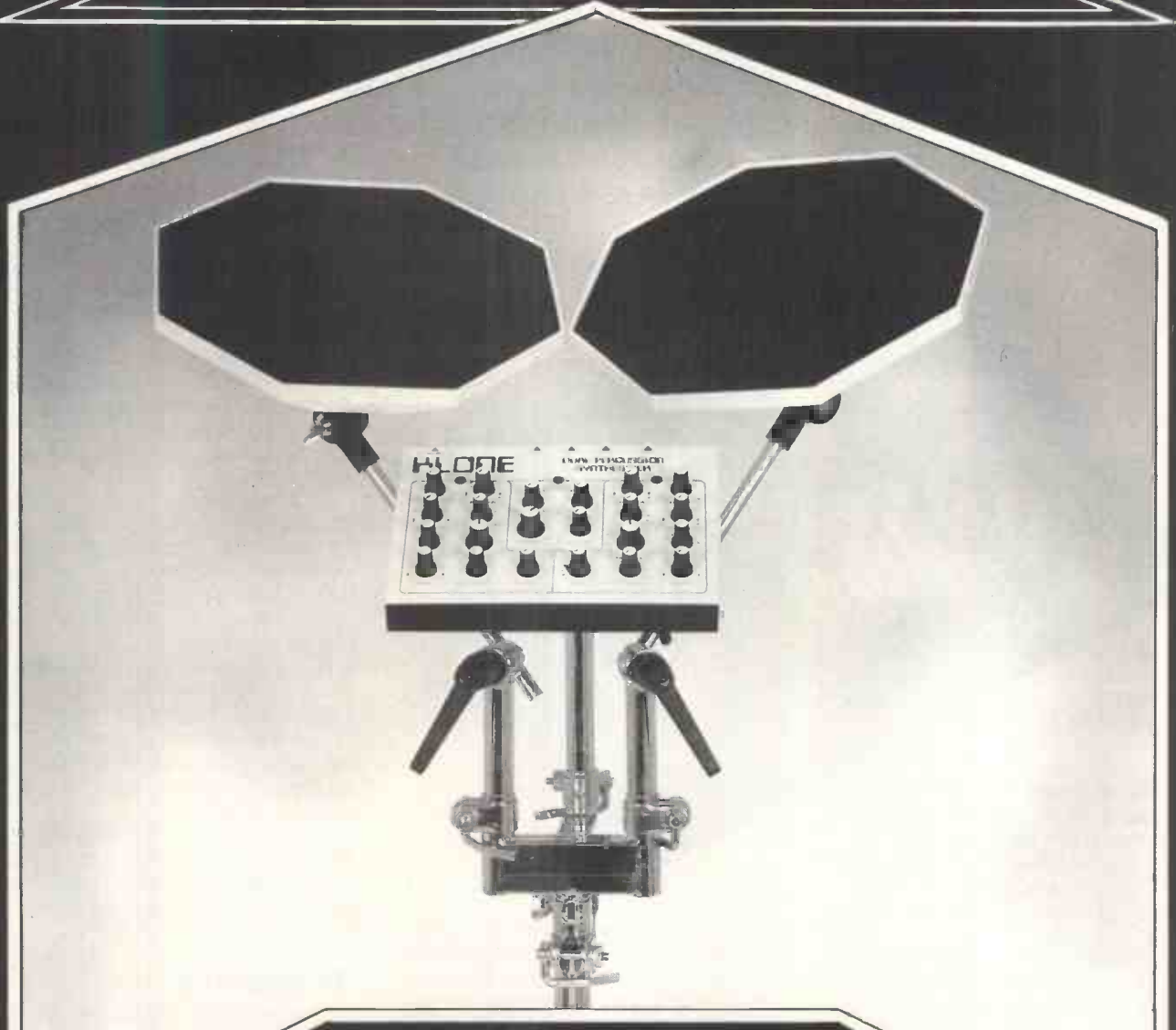

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SYNTHESIS ON A BUDGET

THE E&MM BUYERS' GUIDE FOR BEGINNERS

Searching for your first synth can be a disheartening and sometimes disillusioning experience, especially if you happen to come across rows upon rows of glistening new keyboards, equipped with the latest technology and price-tags that put them well out of your reach. But take heart. Armed with a little perseverance and this buyers' guide, you should be able to find an instrument that combines flexibility with an accessible price.

Although hi-tech instruments are capable of wonderous feats, it's still you, the musician, that has the greatest influence on the end result, and there's no point in buying a complex polyphonic synth if you only play with one finger.

Remember too that there are dozens of effects pedals available that can offer further variations on the basic sound of your synth, the most popular being chorus, flange and delay. Reverb is another effect which can greatly enhance certain synthesiser sounds and, for recording purposes, more alternative treatments such as standing the speaker in a resonant oil drum may be employed in order to impart an original quality to the basic sound.

Indeed, this kind of treatment can so alter the characteristics of an instrument that 'sampled' type sounds may be produced, although the end result is not always very predictable.

Before parting with your hard-earned money, it's a good idea to decide what you *need*, as opposed to what you want. Do you need monophonic or polyphonic operation, and do you require the synth mainly for music or for sound effects?

Presets

Then there's the question of variable or preset operation. A preset synth offers rapid selection of any available sound without the expense of programmability, but offers little or no opportunity to alter the basic sounds, which may be good, bad or indifferent, depending on the model in question.

The fully variable design, on the other hand, is capable of producing a vast range of sounds but, in a live situation, this may involve adjusting a dozen or more parameters in a very short space of time, which can be disastrous if one vital adjustment is overlooked. Many is the time that the erstwhile player has set up what he hopes to be a flute patch only to be rewarded by the sound of a liquidiser full of snails because of a simple patching mistake. Dimly-lit stage conditions can aggravate this problem further, so this potential problem area should be given due consideration before a firm decision is reached.

Parameters

To complicate matters further, there are different degrees of complexity involved in setting up different types of variable synth, and your choice will again be affected by what you intend to use the instrument for.

For example, the Moog Rogue has a very simple control layout but is capable of a wide range of useful musical voicings, while the ARP Axxe, on the other hand, has a very comprehensive patching facility that enables elaborate sound effects to be created in addition to more conventional musical voicings, but there are *a lot* of parameters that must be set accurately in order to give a satisfactory result.

Another area worthy of scrutiny is that of performance controls. Both mono and polysynths tend to have some form of performance control, the most popular being the Moog-type wheel system which allows control of pitch-bend and vibrato depth.

Some manufacturers use an extension of this system, whereby other parameters such as filter cut-off frequency may be patched to the performance wheels, whilst others go in for joystick controls, levers, or pressure-sensitive pads.

The next point of consideration is the keyboard itself: does it have enough octaves for your particular application, and if you want to play a lot of bass on it, does it have a bottom E?

Triggering

The keyboard triggering system on some older synths may not feature what is known as multiple triggering and this too can be important. On modern synths, when a second note is pressed before the first one is released, the envelope shaper will retrigger, which is as it should be, but on machines not incorporating this facility, it's necessary to release one key fully before depressing another in order to initiate a second trigger sequence which can make fast playing very difficult.

Interfacing

Having decided on which of these facilities you really need, you should then look at the question of interfacing. If you need to run your analogue synth in conjunction with a sequencer or rhythm machine, check that the appropriate trigger and control voltage sockets are provided, and that the control law is to the one-volt-per-octave standard, as this enables maximum compatibility between machines of different makes.

If there is a built-in sequencer, check that it has sufficient storage capacity for your needs and that it can be synchronised to a pulse from a drum machine.

Conclusions

There are many angles you ought to consider before parting with your money and the aspects previously mentioned don't really tell the whole story.

Buying secondhand *can* enable you to obtain more facilities for your money, but be sure that your potential purchase is working properly, especially if it is a private purchase since you have no legal comeback in the event of a breakdown. If the synth is now obsolete, do make sure that service facilities and spare parts are still available, and obtain a circuit diagram if at all possible.

To help you make up your mind, we've compiled a list of some of the more popular budget synths, both monophonic and polyphonic, and included a brief description of each one, drawing attention to any unusual features. Many of the synths in this list are no longer in production, and few if any have MIDI capabilities. However, they are all useful instruments in their own right and represent good value for the synthesist on a budget.

ARP Axxe

ARP themselves are now no longer in business but there are still many of their products available secondhand.

The Axxe is a single-oscillator monosynth featuring SRP's proportional pitch control and vibrato depth pressure pads. The internal patching is very flexible and readily lends itself to the production of sound effects as well as music, and multiple triggering is provided along with interface connections for CV, Gate and Trigger.

ARP Odyssey

This is a two-oscillator version of the Axxe, featuring a duophonic option and a ring modulator which extends the range of sound effects and musical voices available.

Interface connections are provided, and multiple triggering is standard.

ARP Omni

This is a hybrid machine having a polyphonic string/brass section, a bass section and a basic lead line monosynth.

Again obsolete, but this model can provide high quality textural sounds in spite of its limitations. The keyboard may be split for further versatility, and the polyphonic section can be fed through the synth filter to create polysynth effects.

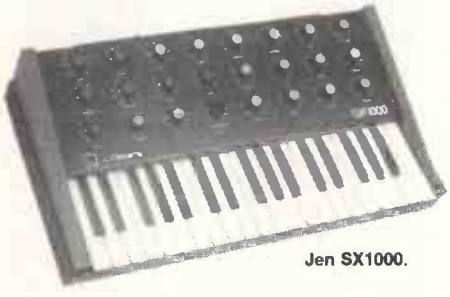
Gnat

This is a single-oscillator version of the Wasp with fewer facilities, though it is still very strong-sounding. This is only available with the touch keyboard, and its light plastic construction coupled with battery power and an internal speaker makes it entirely suitable for practising in the bath(!)

Jen Synthetone SX1000

A very basic one-oscillator monosynth featuring a three-octave, full-sized keyboard. Although cheaply constructed and extremely basic, the SX1000 does offer all the essential basics for synthesis, and has a useful range of sounds.

The very low price (sometimes under £100) of this instrument should make it accessible to even the most impoverished newcomer, whilst the techniques learnt from using it will still be valid when he or she moves to a more sophisticated synthesiser.

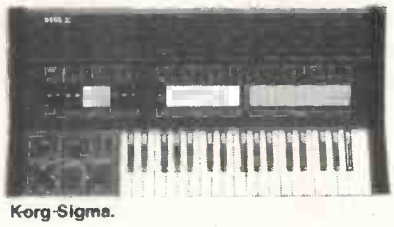


Jen SX1000.

Korg Sigma

The Sigma represents something of a departure from conventional synthesiser design, in that it utilises a bank of preset sounds that may be used singly or in combination. Each preset has one user-adjustable parameter to increase the overall flexibility, whilst performance control is *via* a joystick.

The ring modulator allows the production of metallic tones and, for the more avant garde, it is also possible to play quarter-tones on this instrument. If you're looking for a lead-line synth with 'instant' sounds of high quality, this is the one: it can be picked up surprisingly cheaply secondhand.



Korg Sigma.

Korg Delta

This synth, like the ARP Omni, is a hybrid device incorporating a polyphonic string section and a mono lead line synth.

A joystick performance control is fitted and the poly section may be routed *via* the filter of the mono section for further flexibility.

Like the Omni, the separate sections have individual outputs, enabling multi-channel amplification to be used.

Although very much a 'compromise' type of instrument, the Delta's sounds are generally good and it should be possible to buy a secondhand model at a reasonable price.

Korg MS10

This is a two-and-a-half octave monosynth with one oscillator and a modulation wheel. The design is unusual in that the individual circuit elements are brought out to a patch bay, enabling unconventional hook-ups to be implemented. The interface facilities are to the Korg standard, and so the Korg MS02 interface is required if connection to other makes of synth is envisaged.

Korg MS10.

Korg MS20

Based on the MS10, this model offers two of each basic module plus a full three-octave keyboard.

In addition, an external signal processor input is fitted, which implements a frequency-to-voltage conversion and enables other instruments to control the synth. This facility is purely monophonic and so works better on some sound sources than others.

Korg MS20.

Korg MS50

This is essentially an expander unit, ie. it does not have its own keyboard. It includes a one oscillator synth with two envelope generators, a ring modulator and a sample and hold converter, all modules being patchable for maximum flexibility. Again, it will interface only to other Korg synths unless a suitable linear/log converter is used such as the Korg MS02. Like the rest of the MS range, the 50's modular design means that it can be of great educational as well as music value.

Moog Prodigy

This was Moog's first budget synth and was designed to bring the essential features of the MiniMoog to the lower end of the synth market.

Although no longer in production, this two-oscillator synth is still very much in circulation and features the Moog performance wheels and phase syncing.

There is, however, no multiple triggering facility and early models had no Gate or CV interface connections.

When considering one of these instruments, check the tuning drift after allowing a five-minute warm-up period, as some models were particularly prone to problems in this area.

Moog Prodigy.

Moog Rogue

The Rogue is a basic two-oscillator polysynth sporting the two Moog performance control wheels and phase sync capability. CV and Gate interface connections are fitted, though the Gate input requires an S-trigger to operate. Despite the limited facilities, this synth has some excellent basic sounds and is quite easy to set up. It is an ideal beginner's instrument, and secondhand models are available at extremely reasonable prices.

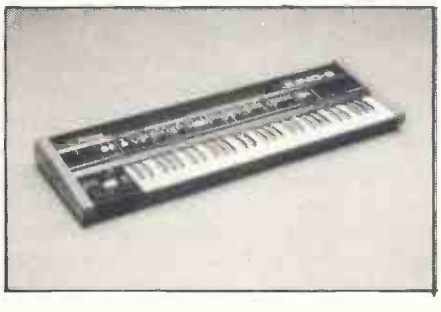
Oberheim OB1

One of the few programmable monosynths produced, the OB1 features two oscillators and dynamic phase sync capabilities. This was originally quite an upmarket synth costing over £1000, but with the advent of cheap programmable polysynths, it should be available at a realistic secondhand price.

Roland Juno 6

This was Roland's first budget polysynth and, as its name implies, it has six voices that can be played simultaneously. The oscillator circuitry is digitally controlled, allocating one oscillator to each key pressed, whilst the analogue filtering and envelope shaping controls are similar to those found on a monosynth. A chorus unit is built-in, and a pitch-bend lever is also provided.

The synth is not programmable and there are no MIDI facilities, but the internal arpeggiator may be syncronised to an external drum machine.



Roland Juno 60

Identical to the Juno 6 in all other respects, this version is programmable and can store 56 patches in its inbuilt, non-volatile memory.

Roland SH101

The ever-popular SH101 is in many ways an update of the SH09 but with a few added bonuses which included a built-in digital sequencer, battery or mains operation, an arpeggiator, and an optional modulation grip and guitar-style strap for the ultimate in portability. This single-oscillator synth provides for CV and Gate In and Outs as well as an External Clock In, which will sync the arpeggio or sequencer to another sequencer or drum machine. Even new, the 101 is by no means expensive.

Roland SH101.

Roland SH2

A dual-oscillator three-octave synth featuring a sub-oscillator on VCO1. The pitch can range from 32' to 2' with Sine, Ramp, Square and Pulse waveforms selectable on both oscillators. The SH2 also includes delayed vibrato and auto-bend, and operates on the 1V/oct standard. Shop around the secondhand shops for this versatile mono, as its sounds and facilities are still relevant to most modern musical styles.

Roland SH2.

Roland SH09

A scaled-down version of the SH2, this single-oscillator synth also features a sub-oscillator which can be mixed with VCO1 to thicken up the sound from the 2½-octave keyboard. CV and Gate interfaces are provided, and the control parameters offer the means to recreate most standard synth sounds.

Transcendent 2000

Marketed only as a kit by Powertran, this single-oscillator monosynth features a separate envelope generator for the filter section in addition to the standard complement of synth controls. Gate and CV inputs are provided and multiple keyboard triggering is standard. The basic sound is reasonable (if a little limited) and the components are all fairly common so that future servicing should not be a problem.

Wasp

A cheap but well-equipped two-oscillator synth which has a touch-sensitive keyboard and digital interface capabilities, running from batteries or a mains adaptor unit.

The Wasp Deluxe was produced later using a conventional keyboard and, although the manufacturers - Electronic Dream Plant - are no longer in business, both synths represent good secondhand buys. The pitch generation is digital, and it's possible to interface the synth directly to a microcomputer or an EDP Spider sequencer.

Wasp Deluxe.

Yamaha CS01

This synth is unusual in several respects. It's based around a small-scale keyboard and may be controlled using an optional breath controller.

Basically, the synth is a simple one-oscillator design, but the battery operation and built in speaker make it ideal for practice as well as live use.

Although it is an ideal beginner's synth, the CS01 is widely used in professional circles, largely due to the added flexibility provided by the breath controller. A CS01 Mk II has just been announced by Yamaha, with the result that old models are now being discounted to below the £100 mark.

Yamaha CS01.

Yamaha CS5

This is a basic single-oscillator monosynth which should be available secondhand at around £150.

The three-octave keyboard features multiple triggering and the filter allows a choice of high, low, or bandpass options.

An audio input is also provided with an automatic triggering facility, enabling other instruments to be fed through the filter and envelope shaper, which can be a useful treatment for a string machine.

Interfacing facilities are provided, but these are to Yamaha's own standard and so will work only in conjunction with another Yamaha machine.

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Using Sequencers

Real-time Sequencing

Having examined how to go about getting the best from step-time sequencing, Paul Wiffen **turns his hand this month to looking at recording music performance in real-time.**

Up until now we've concentrated on programming techniques that can be exercised at a leisurely pace, with the facility to go back and delete, insert or re-arrange things as desired, but real-time programming, as the name implies, requires everything to be loaded as a cohesive musical performance (albeit at a slower tempo than playback or to within certain limits). There are some people for whom 'real-time' is the *only* way to program. Clearly, they value the speed of programming and human 'feel' which results and can fully benefit from this method owing to their superior playing technique. For us lesser mortals, there are means by which real-time programming can be made more accurate and less laborious, which is just as well, because in some applications – long-drawn-out polyphonic chords (a string part, for example) or lead lines – it gives far more satisfying results than step-time recording.

Preparation

As the time in which the loading of a sequence can be accomplished is strictly limited, it's vital that when the recording actually begins, everything has been set up to get the sequence right in as few 'takes' as possible. Whilst no two real-time sequencers are identical, there are a few things you can do to aid recording which are commonly available on many such machines, if not all.

Metronomes

If you're lucky, a metronome facility will be built into your sequencer: all you have to do is set it to give the note values you want – crotchets, quavers, or whatever – and a click track will automatically be put out when you're in record mode. Be careful, however, as you will often find that the metronome governs your trigger in (for sync) and out (for controlling other sequencers/synths/drum machines), so if you plan to use this facility as well, be sure that it is fast enough for all the other things you want to happen at the same time.

If you don't have an internal metronome, don't worry: there are several other ways of obtaining a similar aural guide. Many sequencers nowadays can be controlled externally by a drum machine or another sequencer –this means that the sequencer's internal clock is overriden by the incoming one (either through the Click/Clock In, or MIDI In) and the sequence is then recorded in relation to these incoming pulses. If you are using a drum machine in this manner, then it's a relatively simple matter to set up either the final pattern you are going to be using or a rhythm which gives you the timing you need (for example, a hi-hat on 4s, 8s or 16s as required, with the first beat playing open hi-hat to give you the beginning of the bar). Then you can play along as normal and the drum machine will keep you in time on record, and in sync on playback.

Even if you don't have this drum machine sync facility, there are still other ways of obtaining a metronome. For example, it is sometimes possible to set up a step-time sequence on the sequencer you are using (to be erased when you have your first track properly recorded) or on a synced pulse time sequencer. Again, set a repeated note on the sequencer, with a higher or lower note to indicate the first beat of a bar, and use a percussive envelope on the synth. Noise as the sound source is a good thing to use if you have filter tracking, which can be used to make a difference in brightness between the two pitches.

If all else fails, use a totally separate metronome, either an old-fashioned, mechanical one or a more up-to-date device such as E&MM's Electronic Metronome (featured as a project in Jan 84). As long as you start playing (or go into 'record') at the beginning of a bar, it should give a better result than using nothing at all.

Auto-Correction

On some real-time sequencers, it's possible to set the internal clock so that it corrects your playing to the nearest note, be it 8s, 16s, 32s or some triplet form of these. If there's a feature on your sequencer labelled Correct (or similar) then use this to set it up, and if not, it may be possible to use the Frequency Control to do this. By experimenting with slow clock speed and fast playing, you should be able to deduce the clock rate (even if this is not shown on the machine) and use this to delineate your smallest time interval.

Starting Right. . .

If you don't get a good start to your recording then it doesn't matter how good the rest is – that 'take' is useless. So it makes sense to do as much as possible to facilitate the beginning of the recording. Nowadays, it's often possible to use a footswitch to start either the sequencer or the controlling drum machine, and you should use one of these wherever possible as it leaves your hands free to do the actual playing.

Some real-time sequencers actually give you the metronome in advance, or else allow the sync drum machine to run first but don't actually start recording until you press the footswitch or begin playing. All this makes your job easier and you are almost certain to end up with a better performance.

If you have none of these tricks at your disposal, you will have to rely almost entirely on your own co-ordination. One thing you can do is to try to practice hitting record' and your first note together a few times before going for the take. In general, though, the only really concrete think I can say to owners of this form of gadget-less sequencer is to wish you good luck. You're probably going to need it.

. . .and Ending Right

If you want to loop your sequence or chain several together, then stopping the recording correctly is just as important as starting it: otherwise you will find your loop or next sequence is out of time. Again, if you have a recent-model sequencer, you may find there is an auto-correct on the end as well, but if you are not so fortunate, practice hitting the 'stop' button in the right place a few times – it's not always quite as easy as it sounds.

Once you've got your sequence roughly right, what next? Well, again you may be fortunate enough to have a post-auto-correct facility, but if you have, don't just leap in and correct as most of these facilities are permanent and you may overdo the job.

In any event, you should always listen back to your sequence very carefully: you may find that the replay doesn't sound as good as you thought. This may just be a result of your native optimism or it may be that the internal clock is not correcting in the manner you require. If you find notes are clipping or appearing out of place (or even being lost altogether), you'll need to adjust your auto-correct or clock frequency to allow for shorter notes. If the sequence still sounds a bit loose, re-record it with a heavier auto-correct or a slightly faster clock frequency. If your auto-correct is retrospective, listen carefully for how far out your performance is. Use the smallest correction factor possible and build up to the minimum required (this is not only the safest way not to ruin your sequence, but also allows for a more human feel – which is half the point of real-time sequencing).

Overdubbing

Try to use whatever metronome facilities you had originally for as many subsequent overdubs as possible: this will maintain the same error factor in each track as opposed to the error accumulating with each additional performance. If you can still use your intro facilities (footswitch or drum pattern), then do so – they'll help keep the timing as good as your performance.

Above all, the secret of real-time recording is to be patient and to practice – a great deal. Don't get discouraged if your first results are not particularly flattering: real-time sequencing is a performance technique that requires considerable experience and familiarity with the equipment in question. You will find that the results of your real-time endeavours gradually become more and more satisfying and the benefits of this form of keyboard recording become more and more apparent. All your sequences should be replayed with a more human feel than is possible with step-time techniques, albeit with human mistakes as well.

Paul Wiffen **E&MM**

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MASS HYSTERIA

The Human League were one of the first bands to prove conclusively that synthesisers could be used to make hit records, but the band's new album, *Hysteria*, sees them branch out into the use of more conventional instruments. Dan Goldstein **spoke to the League's Ian Burden recently about the shift of emphasis and the reasons for *Hysteria's* late arrival.**

By anybody's standards, The Human League's success story has been a spectacular one. From being one-half of a defunct Sheffield electronic band that had amassed a reasonable cult following but achieved little else, they became the UK's most successful singles artists almost overnight, with a number one album - *Dare* - that was written, performed, and recorded almost entirely on synthesisers.

However, once *Dare* and its creators had done the rounds of most of the world's major popular music markets, The Human League's output was reduced to little more than a trickle, with just two singles - 'Mirror Man' and 'Fascination' - being released in more than a year. Ian Burden - one of the songwriters brought in to add strength to the League's compositional muscle when the original band broke-up - sums up the reasons for the delay very simply.

'We had one false start, and then a series of different engineers and producers that spun the process out a lot longer than it should have been. First of all, we started recording the second album at Genetic Sound with Martin Rushent: that was how we'd done *Dare*, so it seemed logical to do the follow-up the same way. The only trouble was Martin didn't feel altogether confident with some of the new material we were coming up with, and eventually he resigned, though I must stress there was no animosity between us. He taught us an awful lot about recording synthesisers, how to use microcomposers and that sort of thing, for which we're obviously very grateful. In the end we managed to salvage two songs from those Genetic sessions - 'Mirror Man' and 'Fascination', though the latter was re-mixed by Chris Thomas.

'One thing we weren't altogether happy about Martin's production was the way he treated vocals. There are three singers in the group and obviously the vocals are very important to us, but what Martin is mainly interested in is the use of synthesisers and computers, and listening back to *Dare* now, there's not really any emphasis on the vocals at all, because Martin treated them just like so many more machines.

'What we've wanted to do for a while now is get better vocal performances from our singers. It's especially difficult with Joanne (Catherall) and Susanne (Sulley) because more often than not they're presented with their vocal parts for the first time in the studio. When we recorded *Dare*, as soon as one of the girls had come up with a reasonable vocal performance of say, a chorus, Martin would take that performance and spread it all over the song. He succeeded in doing that very well, but it isn't really a very satisfactory way of working, when you consider that vocals that stay at the same level when a song is building up to a climax can never really sound 100% right.

'So when it came to recording *Hysteria*, we decided we'd spend longer on the vocals, so that Joanne, Susanne and Philip (Oakey) could actually sing their way through a song in one performance. We'd heard some of the records Chris Thomas had produced, and felt that the vocal performances he seemed to be capable of getting out of people - as well as the way he recorded them - were some of the best things about them. I think all he did with 'Fascination' was raise the vocals in level a little and maybe use less in the way of effects on them, but it impressed us and we hired him for six weeks to record the album at Air Studios in London'.

Air Studios

That wasn't the end of the League's production headaches, however. After a while, it became readily apparent that domestic problems were distracting Thomas from the serious business of recording, and although his efforts were much appreciated by the band, a change of producer eventually became inevitable, and after Christmas 1983, the League left Air for for the Townhouse, where they completed *Hysteria* with Hugh Padgham at the faders.

'Once we started working with Hugh, it only took us another six to eight weeks to finish the album off,' remembers Ian. 'And in total, if you don't count weekends and breaks and so forth, we only spent about six or seven months working in the studio, though that's still longer than we originally expected it to take.

Listening to *Hysteria* for the first time, it's obvious that a lot of care has been taken over how the finished product sounds, though what is also rather obvious is that, following on from *Dare*, many of the songs don't display a great deal in the way of musical development, though not unexpectedly, Burden is quick to defend this.

'It's not surprising really, when you consider that the majority of the songs were written over two years ago, when we were touring with the *Dare* material. In fact, one of the songs, 'Don't You Know I Want You', was kicking around before we went on tour, and we played it at a few gigs, though the version on the album is, not surprisingly, almost entirely different.

'What's important to us is that the album is still full of good pop songs, because although all the four of us who are involved with songwriting have

different individual music tastes, the one thing we all have in common is a love of pop music, and I think that's reflected in everything we've done together.'

Instrumentation

But if there's one area where *Hysteria* does show a marked change from its predecessor, it's in that of instumental arrangements. Whereas the band that recorded *Dare* prided itself in relying only on vocals and synthesisers, the new album contains as much guitar, bass and grand piano as it does electronic keyboards. Not for the first time, Burden has a simple explanation.

'The insistence that we use only synths was really a legacy that Philip and Adrian (Wright) had carried with them from the previous group. In a sense it was no bad thing because it meant that Jo (Callis) and I had to learn a lot about electronics and computers that we probably wouldn't have done if we hadn't joined the band, but Philip and Adrian have proved now that you can make successful pop records using just synths, so we're now at the stage where we use whatever instrument will work best. I play quite a lot of bass, and Jo's been playing almost as much guitar as he did when hewas with the Rezillos!'

Synclavier

The revolution hasn't been confined to guitars, however. The League have also made some additions to their armoury of electronic instruments, the most notable of these being a Synclavier, purchased specifically with *Hysteria* in mind.

'We bought the Synclavier essentially because we'd heard so many good things about it, and we'd been interested in getting a sampling system for a while. Martin had had a Fairlight at Genetic that we'd fiddled about with from time to time, but personally I found its sound quality never really impressed me all that much: it seemed to add its own character to every sample you made on it. We got the Synclavier on the grounds that its fidelity was greater, and I think to a large extent our experiences bear that out, though that's not to say we didn't have some trouble with it, because we did - lots of it.

'The main problem seems to be related to the fact that, whereas the Fairlight essentially has two computers - one for sampling and one for timing - the Synclavier has to make do with just the one. A lot of the time we were using a LinnDrum code transferred to tape to run the Synclavier's sequencer, but although it ran beautifully in conjunction with its own FM synthesised sounds, with our samples there would be occasions where it would lose track of itself, especially if the sequence was a very fast one.

'What was even more annoying about it was that we found ourselves spending hours on end trying to prove that the Synclavier could or couldn't do what we wanted it to, to the extent that we quite often forgot what we were setting out to achieve in the first place. There was one occasion - when we working on the track 'Love Me Again...(Six Times)' - that I remember quite clearly. We'd done a pretty good sample of real trumpets to play a brass part and loaded that part into the Synclavier, and it just couldn't replay it right - perhaps it was too funky for it, I don't know! Anyway, after hours of trying to get the thing to work, we eventually gave up and Jo played it manually with the tape slowed down: it ended up sounding fine.

'I think the concept behind the Synclavier is brilliant, and some of the technology it uses is quite mind-boggling, but in practice it isn't absolutely right yet. The thing is, I get the feeling that it won't be too long before we look on something like the Synclavier as being really primitive. When you think back to the sorts of things John Cage was using back in 1958, lots of little black boxes wired up together, and how far we've come since then, it makes you wonder what the ultimate instrument is going to be in, say, ten years' time.

'We've also just got a DX7 which I really like, especially its touch-sensitive keyboard which is such a relief after some of the keyboards you get on instruments these days. There really is an awful lot of it on the album, when you consider that we only got it two weeks before the end of the recording!

'We didn't actually get as far as programming any of our own sounds into it, though we did edit Yamaha's cartridge voices quite extensively. In

any case, it isn't really the sort of instrument where you can program sounds from nothing. I mean, can you imagine thinking of a certain sound in your head and then trying to work out which particular algorithm would be the most suitable? The only thing you can do is find a sound that's reasonably close to what you want and then alter it, and that's what we did.

'The DX was one of those instruments that just became instantly usable, and in a way it started to overshadow some of the other synths we were using like the Roland Jupiter 8 and System 100M.

'It sounds so convincing at times it can get a bit worrying. There's one song on the new album that's called 'Life On Your Own' that has what sounds like George Benson playing guitar on it. Jo has been worried ever since that people are going to wonder why he's started playing the guitar like George Benson, when in fact the whole thing is just me and Philip playing the DX7!'

Writing

So, given that the arrival of new instruments was probably a minor contribution to the new album's late arrival, I wondered if internal disruption within the band had also played its part.

'Well, obviously when there are four of you all involved with writing songs, there are always going to be arguments going on from time to time, but really there was nothing particularly devastating this time around. To be honest, writing by committee has never really bothered us, because we don't have any set formula for composing that we always stick to. The nearest we get to that rigidity is that almost everything we do starts off as being one particular person's idea, which then gets passed around to anyone who's interested for them to work on.

'In general, though, that original idea can be more or less anything: a particular melody line or chord sequence, a really good drum machine pattern, or maybe even just a synth sound that's appealing. I think that's one of the reasons why a lot of our songs sound so different to each other - it really is quite hard to pinpoint a particular song and say that is a typical Human League record, because they're written in so many different ways.

'One constant thing we are quite aware of is the need to keep things sparse. It's not a desire to make everything sound that way, but we do feel quite strongly that it's better to have one element of a song that's really good - say, a really memorable melody - than to include something that isn't as strong and end up having to record about 40 tracks' worth of overdubs to get it to sound decent.

'The same thing goes for synth sounds. I do get a bit worried if a lot of effects units and little black boxes start getting plugged in to be put on a certain sound. It makes me think that maybe the sound isn't really good enough in the first place, and if that is the case, then I'll usually try to find something better.'

In Conclusion

So, having overcome production upheavals, writing differences and computer hiccups, the band have finally succeeded in completing their recording, and *Hysteria* is in the shops. Will they be going on tour to promote it? For once, Ian Burden isn't quite sure.

'There was a time when I considered the whole business of playing live rather archaic, especially for a band like ours which really came together for the first time in the studio. When we did the tour after *Dare,* I think it was pretty evident that we'd never played together as a band before, and I felt at the time that the whole thing was a bit of a distraction from the real business of making records.

'On the other hand, I know that Joanne and Susanne get a lot out of it - in fact I'd say it's probably the thing they enjoy most - and I've even begun to change my opinion on it. We did a video for 'The Lebanon' recently at the Theatre Royal Drury Lane, where we mimed to playback in front of an invited audience. It was surprisingly exciting for us, and the audience were great, even though we weren't actually playing.

'I don't want to commit myself one way or the other though, because there are a lot of things that have still got to be finalised. Anyway, after all the things that have happened in the last year and a half, I'm a little bit wary of making too many promises!'

Dan Goldstein **E&MM**

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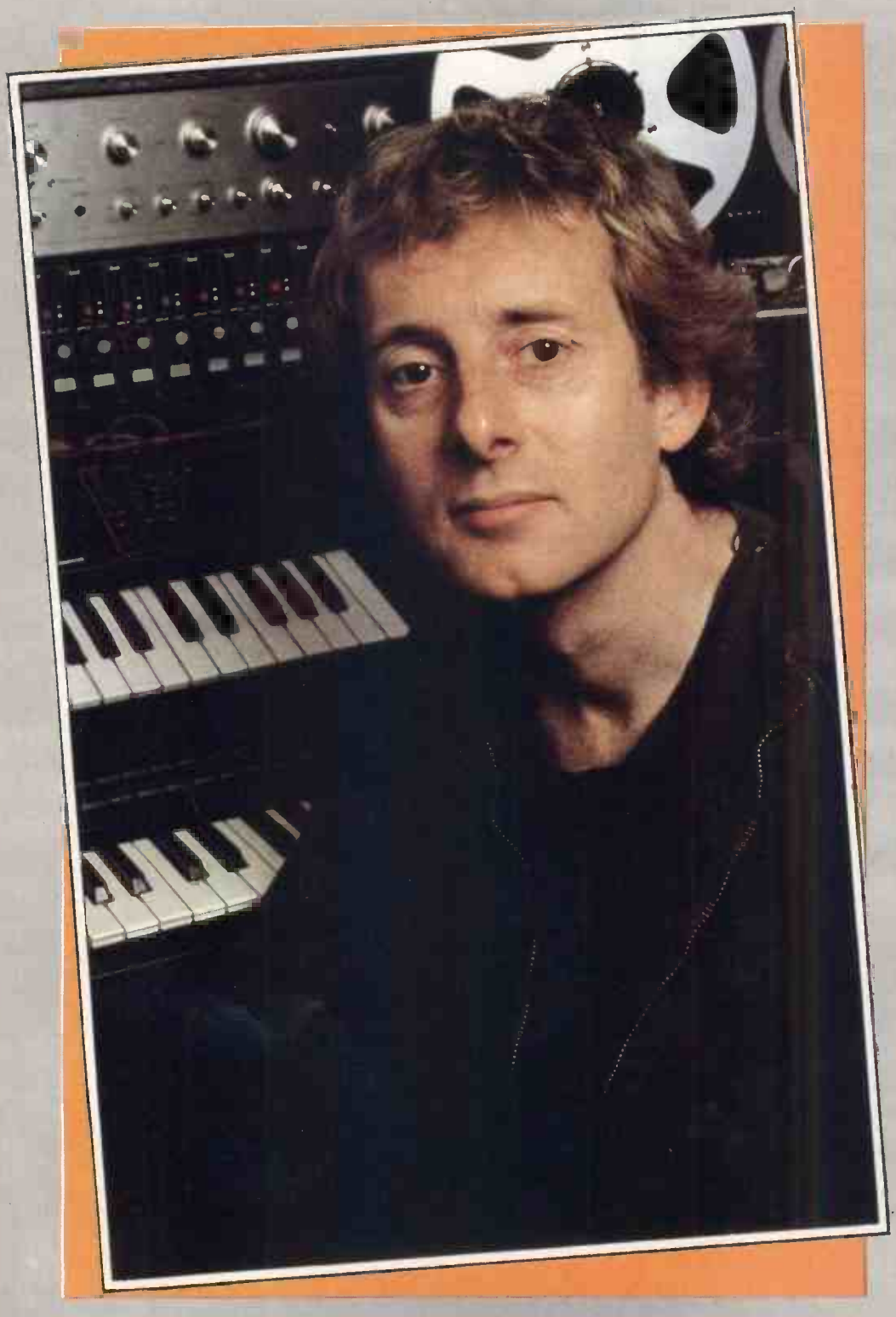
STEVE JOLLIFFE: LIFE AFTER TANGERINE DREAM

After years of being a musical gipsy, moving from one style to another without any apparent logic or planning, Steve Jolliffe re-emerged during 1983 with the release of his first solo album. *Journeys out of the Body*. Here he talks to Dan Goldstein **about before, during, and after life as one of Tangerine Dream's founder-members.**



In a quiet square just off one of London's more fashionable major thoroughfares, one of electronic music's most unpredictable characters rises every morning to the sound of birds singing and motorists cursing, and begins the day's work at his home studio.

For Steve Jolliffe, life has become worthwhile once again. Now freed from the constraints placed on him by several bands of various different musical persuasions, he is now almost totally self-sufficient, owning his own equipment, writing his own material, and recording his own albums.

It hasn't always been this way, of course. A couple of turbulent years at art school in England playing flute and saxophone led to a spell touring Europe that ended up with his unexpectedly enlisting as a student at one of Berlin's most prestigious musical academies...

'I think I was one of the few people ever to be admitted who wasn't able to read music. I can remember being examined by about six of the school's tutorial staff: they just sat there while I fumbled through some piano improvisations that were rather too reminiscent of Shostakovich. Still, they must have liked what they heard, because they gave me a place, I managed to get a grant, and I stayed there for about a year and a half, during which time I learnt almost nothing at all!

'I had one tutor for piano and one for composition, but all I was really interested in was learning how to read music, and neither of them were of much use to me. In the end I learnt how to read years later when I came back to England and started spending hours on end at the piano, picking up more and more as I went along: I'm sure it was the only way.'

TD's Early Days

Eventually, Jolliffe left the Academy, though he didn't leave Germany. Instead, he joined another band ('of sorts'), and it was while with them that he met up with Edgar Froese, co-founder of seminal German electronic music purveyors, Tangerine Dream.

'I remember going to an electronic music studio and meeting Edgar for the first time there. It was a very

Stockhausen-ish place, full of old Studer tape machines they were running at different speeds. Anyway, it was obvious that neither Edgar nor I was particularly happy being in conventional bands, so I suggested forming a three-piece consisting of just lead guitar, drums, and flute. His first reaction was 'you can't have a band without a bass', but after a while he got to quite like the idea, and we set about looking for the right drummer, who turned out to be Klaus Schulze. At first we didn't think he'd be suitable at all – to be honest he looked like a bit of a thug in those days – but we soon realised he was almost ideal because, like us, he was simply yearning to do something a bit different.

'Edgar had thought of the name Tangerine Dream some time before, so that was what we called ourselves. The music was very odd, not only because we didn't have a bass player but also because our attitudes were different. A lot of our music was improvised – sometimes we'd begin a gig without any thought whatsoever of what we might do. We did any number of concerts around Germany, but after a while I began to feel a bit of a longing for home: I suppose a lot of it was connected to my simply wanting to hear people speaking English again. Late at night after one particular gig, Klaus got out of the car we were using to tour around in and shouted out 'there's nothing on the roof – it's all blown away!' I had almost my entire worldly belongings on the roof of that car, so that was just the final straw – I had to get back to England.'

This Steve then proceeded to do. He learned to read music and play the piano better than ever before, and subsequently joined a band called Steamhammer, whose career was rather less fruitful or exciting than its name might otherwise suggest.

After an album and a couple of tours with Steamhammer, Jolliffe left to contemplate his own musical position (the period shortly after Germany had seen him revolt against electronic musical instruments, to the point where he no longer wanted anything to do with them or with any band that used them). However, not long afterwards he received a call from Edgar Froese, who was by this time (1978) desperately in search of somebody to take the place of the recently-departed Peter Baumann.

'Edgar asked me if I'd like to re-join the Dream, and since I didn't really have anything better to do, and I had mostly overcome my dread of electronics, I agreed. Edgar came over here first of all; it had been such a long time since we'd seen each other, and such a lot had happened in that time, that we talked for ages and played a lot of music together. It really was tremendous.

'Then I went to Germany with him and we recorded *Cyclone*, my only album with Tangerine Dream. For some reason I don't think it was an altogether successful exercise. I enjoyed playing on it and recording it, and to some extent I enjoyed going out on tour with the band to promote it, because that in particular was a huge success, but there were so many restrictions on what I could and couldn't do, I felt a little bit claustrophobic. I also felt that, to a degree anyway, the Dream had lost its will to experiment, or to put it another way, some of the original fire that I remembered so fondly was definitely absent.'

So, after an album that will be remembered as TD's never-to-be-repeated excursion into the world of songs, and a tour that will be remembered as the one that finally brought them acclaim in their home country, Jolliffe left the band for a second time, again feeling the desire to go solo.

Journeys

On returning to England, Steve began to experience his 'journeys out of the body' for the first time. He describes his state of being on these occasions as 'somewhere between wake and sleep', and they proved strong enough to provide inspiration for some powerful music that was entirely Jolliffe's own creation. What he wrote while recovering from various 'attacks' of half-sleep became the nucleus of his album, *Journeys out of the Body*, but initially he was composing purely for his own private consumption.

'I really had no intention of making that music available to the public, but a friend of mine persuaded me to send a demo of some of it to Dave Lawrence at Pulse Records. After I'd done that I phoned him to ask him what he thought, and although he expressed some enthusiasm, he said he didn't think he'd ever want to put it out on record. I assumed that would be the end of it but, astonishingly, I got a letter from Dave a few days later saying that he'd drastically underestimated the tape and that he'd be releasing it as soon as he could, which is about as big a change of heart as you can get!'

And so it was that *Journeys out of the Body* came to be re-mixed on eight-track by Jade Warrior's Tony Duhig (see elsewhere in this issue) and released by Pulse last autumn.

The music's mood is beautifully serene – rather different from what one might expect, given the unsettling nature of many of Jolliffe's experiences – while the diary extracts that accompany every copy serve to increase its emotional impact further. Given Jolliffe's impeccable pedigree, perhaps it's not surprising that the recording is of an exceptional standard and that the music remains consistently appealing play after play. What *is* surprising is that the entire piece was played and recorded very, very simply.

'My main instrument on *Journeys* was an SCI Pro One. I think it's an extraordinary instrument for what it costs. I like the fact that it's got no presets or memories, because that means you have to do all the work for yourself, and that way you get to know the instrument much better. I'm becoming more and more aware that a lot of people like using 'instant' synths that give you great sounds as soon as you turn them on, though I do think it would be nice if the Pro One had had memories: there are hundreds of sounds I managed to get out of it that I think I'd find impossible to recreate now, simply because I've forgotten how I went about getting them!'

Journeys sees the Pro One's synthetic tones counterbalanced by touches of piano, flute and guitar, while there's also some Emulator and Roland guitar synth, courtesy of that man Duhig.

'Most of the original tracks for the album were put down on a TEAC four-track. That might sound limiting to a lot of people but actually I enjoyed working with it very much. You really know exactly what you're doing when things are at that level, and I do feel quite strongly that it's better to have a little equipment and know it really well than it is to have stacks of it yet not really be fully aware of all its capabilities. Even my

Photos: Matthew Vosburgh

own set-up now is quite a modest one – I still don't like the idea of being absolutely surrounded by different bits of machinery whose capabilities I could never fully explore.'

Studio

After the completion of *Journeys out of the Body*, Steve set about re-equipping his studio and moving it from its previous resting place at Bruton, Somerset, to London. He's now the proud owner of a Tascam 38 eight-track tape machine and matching mixer, a Yamaha DX7, a Roland JX3P, and a Boss DE200 digital delay line. It may not be the biggest synthesiser studio the world has ever seen, but it fulfils his needs admirably.

'Moving on to the eight-track was a logical step to make, and as for the keyboards, it was almost inevitable that, sooner or later, I was going to get tired of the Pro One and aim for something bigger and better.

'As soon as I heard about the DX7 and what it was capable of doing, I knew it was what I wanted. I see it as the first electronic keyboard that's really professional in everything it does, though I will admit that programming it is a real headache. I really do think there's too much going on inside the machine for the human brain to cope with, especially as the display lets you see so little of it.

'I'm looking forward to getting a CX5 computer, because I hear Yamaha have got some software that displays all the DX parameters on screen. That's definitely something the DX series needs: a better visual representation of what's going on.

'I'd also like to see an alternative method of presenting the information, though that may be not quite so easy to achieve. I do feel that terms like Operator and Algorithm aren't really going to be understood by a lot of musicians, and my personal ideal would be to have a display that would have diagrams of different musical instruments in different corners of the screen, so that if, for instance, you wanted a sound that was a cross between a flute and a violin, you could move a cursor between the two and get hold of it that way. In general I think I'd like to see technical terms translated as far as possible into musical ones.

'Before I got the DX7, I had a brief spell with a Roland Juno 6, which I liked for much the same reason I liked the Pro One – it hasn't got any presets. I soon realised that the DX7 wasn't as good at supplying the great spreads of sound I was getting out of the Juno, so I set about looking for a synth that could not only do that but would also link up to the Yamaha using the MIDI, and that's how I got the JX3P.

'I've had no problems connecting the two together, though I have heard of some people who have; in general I think they complement each other very well. The only thing I am a bit worried about is what may happen when I get a CX5, because both my keyboards are very early examples and I'm not sure whether the MIDI specifications will be the same: if need be I'll have to get the keyboards updated to bring them into line.'

Computers

This brings us nicely on to what is rapidly becoming Steve Jolliffe's pet subject: the role of computers in modern music.

'Yes. I'm very, very excited about them. I'm looking forward to almost every

aspect of what computers can do for the musician. I like the idea of using a Music Composition Language, and I love the prospect of being able to edit sequences so precisely. I'm also keen to use computers as a sound source and to start modifying them from scratch, because there would seem to be almost no limit as to what they can do. If there is one thing I'm not quite so interested in it's sampling, which is odd because that's what almost everybody else is talking about. There are two reasons, really. First of all, most of the samples I've been exposed to have sounded a little bit impure – I think you can always tell they're not the real thing – and the second thing is that I have a feeling that in time sampling itself won't actually be necessary: you'll be able to generate virtually any sound using FM or PCM techniques, starting with electronics from scratch.

'I can see myself becoming, in the not too distant future, more a computer programmer and operator and less of a keyboard player, though obviously I don't want to drop keyboards altogether because I still enjoy the physical sensation of playing them, in just the same way that I still get a lot out of playing sax and flute. Mind you, I am very excited about the prospect of a lot of different musicians owning something like a CX5 and writing different sorts of software for it – just think of the possibilities it would open up.'

Japanese Butterflies

Moving a little more down to earth, Steve has already all but completed a new album, provisionally titled *Death of Japanese Butterflies* and due for release by Pulse sometime this coming autumn.

'I wrote it last year in absolutely idyllic surroundings down in Somerset. It has a totally different feel to it: in fact I'd say it bears very little resemblance to *Journeys out of the Body*. That's quite important I think, because one thing I'm anxious to do is make each album a completely different concept to the previous one: I don't see much point in making sequels just for the sake of them.

'Obviously the album has quite an Oriental feel to it, which is something I've never really done before, and of course the instrumentation is completely different to what I was using before. In addition to the DX7, the Juno, and JX3P, I've also been helped out by a Japanese percussion player, Joji Hirota, who plays all sorts of different things, kotos, gongs, whistles.

'Recording that percussion was actually rather more of a problem than I envisaged. For one thing, a lot of Joji's instruments have weird tuning and I found myself having to record them at different speeds in order to get them in tune with everything else, and for another, they're almost impossibly difficult to mike up properly, though fortunately I discovered the Realistic PZM, which has proved a godsend.'

Jolliffe Live

1984 also sees the return of Steve Jolliffe to the live concert arena, from which he's been absent since he left Tangerine Dream second time around.

'Well, you've guessed it. I'm very very excited about playing live again. I think what happened was that I had so little control over what went on at the Dream gigs, I lost my taste for playing live, and it's taken this long for me to get it back. The set I've devised is designed primarily to be a solo one, but it's flexible enough for me to play with Joji or with Tony Duhig on a particular occasion if I want to. I'm hoping this year's concerts will be successful, because I'd like to do some next year as well. I'm now so in love with the idea of playing live, I've started writing new material with live performance in mind, which is certainly something I've never done before.

'You see, I see myself primarily not as a composer or musician in the strictest sense but as an environment-maker – somebody who translates emotions into musical landscapes. I see live performance as being a very important part of that now, just as I see computers as playing an important part in shaping the way I create those environments in the first place...'

Dan Goldstein **E&MM**

Steve Jolliffe plays the Festival of Mind, Body and Spirit, Earls Court, London, July 6, and Westwood Festival, Bradford-on-Avon, Wiltshire, August 11.

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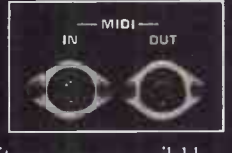

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RETURN OF THE WARRIOR

Although undeniably one of the seventies' most consistently original and inspiring purveyors of instrumental music, Jade Warrior have never quite succeeded in capturing the record-buying public's imagination, and therefore never really enjoyed the success they deserve. After a series of organisational misfortunes that threatened the band's existence, Tony Duhig and Jon Field have now returned to the limelight with a new album, *Horizen*, released this month on Pulse Records. Dan Goldstein **spoke to the duo soon after that record's completion.**

It's doubtful whether many of the electronic music fans who buy Jade Warrior's new *Horizen* album will realise that it is in fact the band's eighth in a recording career that spans no less than 13 years. For one thing, the band have rarely threatened to emerge from the media obscurity that has dogged them ever since the start of their career, and for another, the LP is as fresh, as exciting, and above all as *contemporary* as any release you're likely to come across in the rest of 1984.

Tony Duhig first met fellow-Warrior Jon Field when the two of them were working as (wait for it) fork-lift truck drivers at Lyons ice-cream factory in London. However, Tony had been playing music of his own for a little while before that, as he explains.

'I was about 18 when I sent off for a Spanish guitar I'd seen advertised in a catalogue – I think they're still marketing them today! I think the main motivation for my getting it was so that I could play the sort of thing I could hear on early Platters records, which I later realised was simply a basic three-chord progression. I supposed I played like that on my own for about three years, and it was only after I met another guitarist that I realised I'd been tuning the guitar wrong all that time!

'Then I met Jon and he introduced me to modern jazz records. They were a completely unknown quantity to me at the time, and there were sounds on them that appealed to me immediately, like the sound of piano, harp, vibes and so on. We were both in love with everything about those records: the melodies, the chords, the way the players improvised, all that sort of thing. In retrospect though, I think we probably read more into those jazz records than was actually there. We thought those musicians were absolutely superhuman, but looking back on it now, some of that music is incredibly weak, though on the other hand, a lot of those chord progressions formed the basis of the music we wrote subsequently.'

After a while, Jon and Tony joined forces with some other musicians to play R&B standards in a band called The Tomcats. However, the more 'serious' side to their musical endeavours – and the side that involved them writing and recording their own material – involved only the two of them, for reasons that Tony is keen to point out.

'In addition to the band, we also had what we used to call our 'front room

music', which involved us overdubbing on two Grundig TK24 tape machines, which was as close as we could get then to working in a studio. To begin with, a lot of our own music had strong Latin American or African influences – hence our love of different percussion sounds – and I suppose it was that stuff that eventually became Jade Warrior.

'The main reason we overdubbed everything was that we didn't actually know anybody who wanted to play our sort of music in a band situation, and there was also an empathy between us that we found difficult to replicate working with any other musicians. So we ended up overdubbing everything, and I think we were one of the few groups of people at that time who actually had the audacity to play instruments that we weren't really qualified to play.

'It could be, for instance, that we wanted the sound of a tymp on one of our recordings – neither of us had ever played one before, but that didn't stop us liking the sound of one or playing it as part of our music.'

Dance Drama

The name Jade Warrior finally came into existence when Jon and Tony were invited to write the music and scenario for a dance drama that was to be performed at a school for the performing arts in Guildford, Surrey. Based on Shakespeare's poem *The Phoenix and the Dove*, the drama was so successful that the duo were asked to produce a second, and after hitting upon a story that drew heavily on things Oriental, Jon and Tony came up with a title: Jade Warrior.

Tony then proceeded to tour Persia with a fairly ordinary rock and roll band whose bass player, Glyn Avett, heard a tape of the early dance dramas and asked Tony if he'd ever thought of playing that sort of music in a band.

'It seemed like a good idea, and I asked Glyn if he would be the band singer, because that would give our music vocals for the first time. Anyway, we formed the band and got a deal with Vertigo Records, for whom we made three albums in 1971 and '72. We used the dance dramas as the basis for much of those recordings, but in a sense I think they were diluted a little by the way we added vocals and turned them into songs.'

Nevertheless, all three of those albums, *Jade Warrior, Released,* and *Last Autumn's Dream,* were generally well received by critics and musicians alike, and Jon and Tony had already showed themselves to be innovators, particularly when it came to recording.

Jon: 'I know it's very easy to say now, but I think we actually 'invented' a lot of techniques long before anybody else turned them into something more successful. For instance, we recorded our first Vertigo album on eight-track at Philips in London. We wanted the sound of a choir on one particular song, but obviously we didn't have the access to one, so we recorded our own voices on tape and then looped them so that they would sound continuously. As far as I know, that was the first time that had been done on record: the next time I heard it was on 10cc's 'I'm Not In Love', at least four years later!

'I think it's indicative of the way Tony and I approach equipment that we've been able to do that sort of thing successfully. In general, we manage to get new gear working for us almost immediately. We couldn't get the sound of a real choir so we said to ourselves 'let's multitrack one', and that's exactly what we did. We've always tended to get equipment to work for us very quickly, and that's because we're never tentative or over-cautious when we approach a piece of equipment for the first time.'

America

After the release of *Last Autumn's Dream,* Jade Warrior left Vertigo and set

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off for a tour of America. Tony takes up the story.

'The tour was very badly organised: we didn't get to play nearly as often as we'd have liked to, though when we did play, we were very well received. I'm not quite sure exactly how much that means, because I've since realised that when Americans go to a gig, they're so determined to enjoy themselves that you've more or less got to throw missiles at them in order not to go down well...'

Yet no matter how successful the venture was, it couldn't stop the 'band' version of Jade Warrior splitting up, and it seemed for a while as if that would be the last the world would see of them. However, the tale then took a rapid and rather unexpected turn for the better: Tony was sitting at home one day minding his own business, when Chris Blackwell, millionaire boss of Island Records, telephoned to say that Steve Winwood had heard one of the Vertigo albums and told him to sign JW up.

'I tried to explain to Chris that we didn't have a vocalist any more,' Tony recalls. 'But he didn't seem to mind. If anything, I'd say he preferred the idea of a purely instrumental Jade Warrior.'

And so it was that Jon and Tony recorded four LPs for Island, *Floating World, Waves, Kites,* and *Way of the Sun,* though the last – recorded in 1978 – was destined never to be released in the UK.

However, although Chris Blackwell gave JW a generous budget and complete artistic freedom, the promotional push afforded the band was almost nil. Shortly after signing the band, Blackwell moved to America to set up his US operation, and subsequently ventured out into the West Indies to build a studio there, so that, as Tony puts it, 'although his heart was in the right place, his body rarely was.'

Each of the four Island albums demonstrates different sets of influences, but one theme that remained consistent throughout was Jon and Tony's *penchant* for Japanese culture and philosophy.

Tony again: 'We became very enthusiastic about certain aspects of ancient Japanese culture, but in general I don't think their music played a very big part in shaping what we were doing. Unlike the court music of China, which has a lot of note structures, bending and so on that really aren't all that far removed from some Western things like the blues, the Japanese court music is almost totally inaccessible to most of the population of this planet. What we were trying to do was put music to certain images we had in our heads, and those images were often of Japanese buildings, paintings and things like that, so the music occasionally had an Oriental feel. I suppose you could sum it up by saying that a lot of our music then was a soundtrack to a set of Oriental images, translated into music by the minds of Europeans.'

Instrumentation

Yet although the concepts behind Jade Warrior's Island albums were more often than not on a grand scale, the band's instrumentation remained for the most part fairly simple, with Tony – as ever – on guitar and Jon on flute and congas, though as in the 'front room music' days, neither of them were afraid to try their hands at playing piano, harp, or 'whatever a particular studio had that sounded good.'

Despite their lack of commercial success – a fact that was aggravated by the collapse of several promising-looking concert tours before they even had a chance to get off the ground – both Jon and Tony look back on the Island records with some pride, feeling that their original ideas had come to greater fruition than previously. However, if there was one problem they were becoming more and more acutely aware of, it was the limitations imposed by the recording equipment they were using, as Tony explains.

'With each album that's passed, we've got more and more frustrated with the limitations of the equipment we've been using. It seems to me that while people are going gaga over the latest digital recording technology or what have you, we're still an awful long way off in real terms. The biggest problem we have is dynamic range, because a lot of our music has a dynamic range far greater than is actually possible to capture on tape. It works both ways, too: often you can't go as loud as you'd like to, but just as frequently we've found we can't go quiet enough either, not without getting mic noise, mixer noise, outside noises – even in the best recording studios.

'If we'd done concerts then I think we would have been able to get that sort of range across. The records are more a sample of tone colours than a real representation of our music...

'I think you can use a simple test to show how far we are away from perfect recording quality. Just sit in your living room with your eyes closed and put on a record of some chamber music, and ask yourself 'is there really a cello in this room?' In the final analysis the answer has to be no. Of course things are better now than they used to be, but my feeling is still 'g od effort, 8 out of 10.'

Nevertheless, the absence of perfect recording hasn't prevented Jade Warrior from coming up with some pretty dynamic recordings. *Floating World,* for instance, contains 'zaps' of sound that are enough to make even the best-prepared listener jump from out of his seat, though Jon is at pains to point out that nothing JW has ever put onto record has got there simply because it was a useful mechanical device.

'We recorded *Floating World* at a 16-track at Marble Arch called Nova Sound. We were the first people in the UK to use dbx noise reduction, I think, and we also started using noise gates which were also quite a novelty at the time. Anyway, those things enabled us to get quite a big dynamic range, and we got this idea of 'zaps' of sound. We recorded the introductory music at a very low level so that the listener would think the whole record was that quiet – then of course he'd turn up his hi-fi and pow! These zaps would hit him round the ears ... They weren't just a mechanical thing, though. They were an integral part of a lot of the music we'd been listening to, like the Oriental stuff, and it was something we'd been wanting to incorporate into our own music for a while.'

New Horizens

After their fourth album for Island, Jon and Tony became disillusioned with the whole set-up and left. There followed a couple of 'wilderness' years in which they played little music together, and both of them resorted to occasional session work in order to pay the bills. Then, as unexpectedly as Chris Blackwell's call eight years previously, Tony received a missive from Pulse Records' Dave Lawrence, asking if Jade Warrior could be re-formed for another album release.

'I knew Jon wasn't going to be available to do any recording, and so originally I planned to record an epic piece I'd written for a choir of 400 voices. In the end it proved too difficult to organise, and since I had a lot of other ideas knocking about at the same time, I decided to put together a Jade Warrior album that was more of a logical follow-on from what had gone before.'

But although the new album, *Horizen,* is compositionally quite a logical step-forward from the Island days, in terms of musical and recording hardware it represents an entirely new direction. On the one hand, Tony's recording budget meant that much of the album was recorded on his own recently-acquired Fostex A8, while on the other, the onset of new technology manifested itself in the use of two main instruments that were both virgin territory for JW – the Emulator and the Roland GR300 guitar synth. Some of the tracks on *Horizen* contain overdubs made at Bark Studios, a modest 16-track in North London, but the recording quality throughout is superb.

Tony: 'Our mastering engineer, Melvin Abrahams, was astonished to hear that a lot of the album was recorded on the Fostex, and I must say I'm knocked out by the quality you can get from it if you use it properly. I only wish everybody was issued with one by the Government, because the sooner everyone has an Emulator and an A8, the sooner we'll be getting back to music, and not just who has the best gear.

'The Emulator was very useful, but it does have its shortcomings. The fact that some of the factory samples aren't particularly well executed is a real pain. On the violins, for example, you can hear the decay time cutting off very abruptly, and it's even more annoying because in a lot of cases, you've got no access to the samples so you can't edit them. The two-second sampling on the Mark One is alright for some things, but with the strings you have to use a volume pedal and a lot of reverb to make them sound really good.

'I did quite a lot of my own sampling with the Emulator. One example is on the track 'Long Wait at Mount Li', which has

an Oriental-type sound that's actually a sample of me playing an octave on the guitar, though it ended up sounding nothing like that! I also sampled some strings off a record, but I did find that making loops so that the samples would sustain is a devil of a job. I can't remember how many times I tried to get a loop of that particular sample that didn't have a glitch at the edit point, and I think there are some samples that just won't loop properly at all.

'I don't want to sound too scathing about the Emulator though because there are some things I love about it, like the facility to replay sounds backwards, just at the touch of a button. There's a backwards gaelic harp on 'Grey Lake, Red Mountain' and that sounds superb.

'I think that, in my case anyway, not being a trained keyboard player is an advantage, because although it means I have to stick pieces of paper to some of the keys so that I can remember what notes I'm playing, I approach the instrument in a totally different way to a keyboard player, and that results in music that has a different feel to it. Music that doesn't *sound* like keyboard music, if you see what I mean.'

This determination to prevent Jade Warrior's music from sounding synthesised or electronic is amplified by Tony's insistence that there will always be a place for acoustic instruments in JW's sound.

'Technology has allowed us to get quite close to the sounds of acoustic instruments, either by sampling them and storing them in a computer's memory or by synthesising them electronically on something like a DX7, but although you can take a spectrum analyser and stick it on the output of both a violin and its electronic equivalent and the two may *look* identical, the actual physical presence of a bow going across a set of strings, and the acoustic disturbance that creates, can't be recaptured, at least not yet. It may be possible in the future, but I think I'd still rather get an acoustic instrument in and use that if that was the sound I wanted. Synths are good at providing approximations of sounds, and sounds that simply don't exist outside the electronic world, and that's the sort of thing we like to use them for – they can be very, very beautiful.

'What's important to remember is that if you hear a synth preset that's called cello and it sounds nothing like one, you shouldn't just dismiss it as being unusable: you've got to realise that the only reason it's called cello in the first place is that the designers have got to give their presets reference points that people will recognise as being a sound that exists in the acoustic world. A sound can be good in its own right, without having to sound like an acoustic instrument.'

The Future

Fortunately for Jade Warrior, there has always been a hard core of fans ready to give their music a fair hearing, regardless of what instruments the band have used. Now the future looks as bright as it ever has done, due in part to the fact that, as an instrumental band, their music hasn't dated as easily as that of some of their contemporaries.

Jon Field is now back in the Jade Warrior fold, and the duo are set to undertake a couple of live concert appearances in the near future. Meanwhile, Tony's epic for 400 voices may soon be recorded live using the latest ambisonic technology (assuming he can get all the required singers in the same place at the same time), and on the hardware front, his just-acquired Yamaha DX7 may soon be complemented by two further items of MIDI gear, a Mark Two Emulator and a Roland GR700 guitar synth...

'I sold my original Emulator, mainly because I was convinced that any day the Japanese were going to come up with something equally as good but at about a fifth of the price. Mind you, that hasn't happened yet and so I'm interested in getting a Mark Two, especially seeing that its maximum sampling time is a lot higher now, which should make sustained samples an awful lot easier to achieve.

'Also, of course, there's the MIDI, which should enable me to play my own samples from the new Roland guitar synth. That's something I'm looking forward to because it'll mean I'll be able to play my own samples using a guitar, which I'm quite proficient at, instead of on keyboards, which I'm not!'

Dan Goldstein **E&MM**

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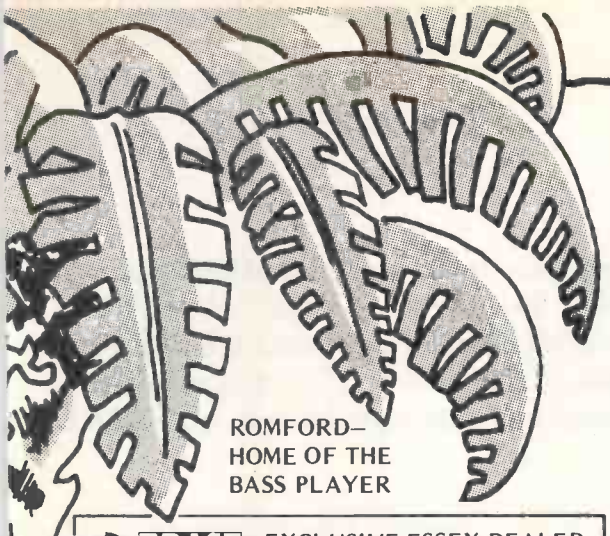

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BeeBMIDI 2

Last month we published preliminary details on the construction of 'BeeBMIDI', a MIDI interface for the BBC Model B home computer, designed by Jay Chapman **and** Dave Eagle. **BeeBMIDI 2 continues where that piece left off, with a full parts list and some MIDI software routines that should get your interface working even if you've only minimum of BASIC programming experience.**

Last month's article certainly seemed to provoke a good deal of interest from readers, perhaps not surprisingly so in view of the fact that the BBC is one of this country's most popular home micros and that, at this stage anyway, there's only one other company producing MIDI software and hardware for said computer.

To clear up a couple of points that might have caused a little uncertainty among interested readers in the weeks ensuing last month's feature's appearance, you may have noticed that there are a number of decoupling capacitors drawn in on the PCB layout illustration that aren't included in the circuit diagram. This is normal practice and all the capacitors are in fact detailed in the parts list printed here. In addition, a gremlin in the E&MM artistry department resulted in a minor detail being omitted from the BeeBMIDI circuit diagram as printed in the June issue: the other end of R4 should be connected to the five-volt supply instead of floating around in mid-air.

Incidentally, BeeBMIDI PCBs are now available direct from E&MM, price £4.95. Cheques/postal orders should be made payable to Glidecastle Publishing Ltd., and you should allow 28 days for delivery.

BASIC Routines

More and more people are discovering, and wanting to take advantage of, the potential that MIDI offers. No doubt many E&MM readers will be building the BeeBMIDI microcomputer-to-MIDI interface described in the magazine, only to connect all the hardware together and find it will do nothing without some software!

Well, E&MM intends to be very active in this field and will in fact be marketing a comprehensive MIDI software package in a couple of months' time, as well as running a series of articles on how to write software for MIDI.

What we're going to do now is describe a few routines written in BASIC which will allow you to get something out of your MIDI set-up straight away, without diving into the complexities of assembler programming, interrupt handling, keyboard scanning and other such deep mysteries. At the end of the article some modifications, possible in BASIC, are also suggested.

Although the routines are written in BBC BASIC they can be translated to other BASICs without too many problems. The program has been tested on a Yamaha DX7 and a Roland JX3P, and should work with most other MIDI-equipped instruments.

Routine Details

The PROCinitialise routine relates to the 6850 Asynchronous Communications Interface Adaptor (ACIA) in the BeeBMIDI interface used to connect the BBC Microcomputer, *via* its 1MHz bus, to MIDI synths. The ACIA is responsible for converting the parallel bytes handled by the micro into serial bit streams over the MIDI connections and was described in detail in last month's MIDI supplement.

First, some names are set up for the ACIA register addresses and control codes. The ACIA is sent a Master Reset code in line 1330. The BBC BASIC syntax used in this line, '?address=value', corresponds to 'POKE address, value' in some other BASICs. Finally the ACIA is configured to receive and send one start, eight data and one stop bits and to divide its external receive and transmit clock frequencies by 16. Since the two frequencies input to the ACIA are both 500KHz, this gives the correct MIDI serial bit time clocking of 31·25kBaud.

This routine, or its assembly level equivalent, is required in every piece of MIDI control software using this ACIA.

The byte passed as a parameter to the

```
>
 1000 REM ------------------------------
 1010 REM ---- BASIC MIDI Routines ----
 1020 REM ----                      ----
 1030 REM ----    J D G Chapman     ----
 1040 REM ------------------------------
 1050
 1060 PROCinitialise
 1070
 1080 REPEAT
 1090   INPUT "Voice ",voice%
 1100   UNTIL voice%>=1 AND voice%<=32
 1110 PROCselect_voice(voice%)
 1120
 1130 PROCplay_data
 1140
 1150 STOP
 1160
 1170 REM ------------------------------
 1180
 1190 DEF PROCinitialise
 1200
 1210 REM Sets up symbols - initialises
 1220 REM MIDI Interface's 6850 ACIA.
 1230
 1240 control_reg%  =&FCFC
 1250 status_reg%   =&FCFC
 1260 transmit_reg% =&FCFD
 1270 receive_reg%  =&FCFD
 1280 master_reset% =&0003
 1290 set_control%  =&0015
 1300
 1310 REM Master Reset the ACIA.
 1320
 1330 ?control_reg%=master_reset%
 1340
 1350 REM Configure the ACIA.
 1360
 1370 ?control_reg%=set_control%
 1380
 1390 ENDPROC
 1400
 1410 REM ------------------------------
 1420
 1430 DEF PROCsend_midi(byte%)
 1440
 1450 REM wait until last Tx gone.
 1460 REPEAT
 1470   UNTIL ?status_reg% AND &02
 1480
 1490 ?transmit_reg%=byte%
 1500
 1510 ENDPROC
 1520
 1530 REM ------------------------------
 1540
 1550 DEF PROCselect_voice(voice%)
 1560
 1570 PROCsend_midi(192)
 1580 PROCsend_midi(voice%-1)
 1590
 1600 ENDPROC
 1610
 1620 REM ------------------------------
 1630
 1640 DEF PROCplay_data
```

```
1650
1660 REM Plays the MIDI information
1670 REM stored AS DATA. Sends bytes
1680 REM until a -1 is found and then
1690 REM waits a set time. Finishes
1700 REM when a -2 is found.
1710
1720 REPEAT
1730
1740   READ byte%
1750
1760   IF byte%=-1 THEN FOR wait=0 TO 300:NEXT wait
1770
1780   IF byte%>=0 THEN PROCsend_midi(byte%)
1790
1800   UNTIL byte%=-2
1810
1820 ENDPROC
1830
1840 REM ------------------------------
1850
1860 DATA &90 : REM KEY ON - SET UP RUNNING STATUS
1870 DATA 64,64,-1,-1
1880 DATA 64,0
1890 DATA 69,64,-1,-1
1900 DATA 69,0
1910 DATA 69,64,-1,-1
1920 DATA 69,0
1930 DATA 71,64,-1,-1
1940 DATA 71,0
1950 DATA 71,64,-1,-1
1960 DATA 71,0
1970 DATA 72,64,-1,-1
1980 DATA 72,0
1990 DATA 72,74,-1,-1
2000 DATA 72,0
2010 DATA 74,64,-1,-1
2020 DATA 74,0
2030 DATA 72,64,-1,-1,-1,-1,-1,-1,-1
2040 DATA 72,0
2050 DATA 64,64,-1,-1
2060 DATA 64,0
2070 DATA 69,64,-1,-1
2080 DATA 69,0
2090 DATA 69,64,-1,-1
2100 DATA 69,0
2110 DATA 71,64,-1,-1
2120 DATA 71,0
2130 DATA 71,64,-1,-1
2140 DATA 71,0
2150 DATA 72,64,-1,-1
2160 DATA 72,0
2170 DATA 72,74,-1,-1
2180 DATA 72,0
2190 DATA 74,64,-1,-1
2200 DATA 74,0
2210 DATA 72,64,-1,-1,-1,-1
2220 DATA 72,0
2230 DATA 71,64,-1,-1
2240 DATA 71,0
2250 DATA 69,64,-1,-1,-1,-1
2260 DATA 69,0
2270 DATA -2
2280 END
```

```
          60  61  62  63  64  65  66  67  68  69  70  71  72  73  74

(middle)  C   C#  D   D#  E   F   F#  G   G#  A   A#  B   C   C#  D
```

Figure 1.

PROCsend_midi(byte%) routine is transmitted over MIDI Out *via* the ACIA. As the ACIA's registers are 'memory mapped' – that is, they appear as normal locations in the BBC Micro's 6502 CPU memory – all we have to do is poke the byte to be transmitted into the ACIA Transmit Register (line 1490). Before doing so, we have to check that the last byte transmitted has actually gone. This is done by the REPEAT UNTIL loop (lines 1460 and 1470) from which the program exits when the expression '?status_reg% AND &02' becomes non-zero.

BBC BASIC is again unusual in that '?status_reg%' is the equivalent syntax to 'PEEK(status_reg%)' in MICROSOFT type BASICs. The 'AND&02' ('&' indicates that a hexadecimal value follows) causes all the bits in the expression result to be zero except the bit corresponding to the 1 in the binary version of &02, ie. '00000010'. Thus the only bit we actually see the value of in the result of '?status_reg% AND &02' is the 'Transmit Register Empty' bit. If the expression result is non-zero then this bit is on and the register is empty, so we can transmit.

Now that we have a routine to send a byte *via* MIDI Out, we can make the instrument(s) on the other end actually do something!

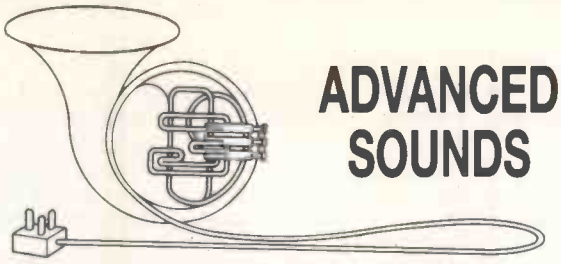
The PROCselect_voice(voice%) routine is passed a voice number in the parameter voice%, and simply sends the correct MIDI status byte (line 1570) followed by the voice number (line 1580). Note that the voice number has 1 subtracted from it. This sort of 'correction' will occur quite often when you're sending such data over MIDI, because the digital hardware implementing the MIDI control starts counting with 0, whereas you or I usually start with 1. Another example of this is the MIDI Channel Numbers, which are referred to as 1 to 16 but are coded internally as 0 to 15.

Lines 1080 to 1110 call this routine after asking the user which voice number he would like. These lines check that the voice number given is in the range 1 to 32, the possible voice numbers on the DX7 (when 'corrected' to 0 to 31). The JX3P is slightly more complex to deal with because you need to take in the bank as well as the voice number. Bank B, voices 1 to 16 are coded internally as voice numbers 16 to 31 (after 'correction'), bank C's 16 voices as 32 to 47 and bank D's as 48 to 63, so it's not too difficult to expand lines 1080 to 1110 to cope, viz:

```
1080 REPEAT
1090 INPUT "Bank, Voice", bank$,
  voice%
1100 UNTIL bank$ >="A" AND bank$
          <="D" AND
     voice% >=1 AND voice% <=16
1110 PROCselect_voice ((ASC(banks$)
- ACS("A")) * 16 + voice%)
```

PROCplay_data is a very simple routine to get something musical sent over MIDI. The tune played should at least be recognisable, though it is played a little woodenly, I have to admit.

The method used here is to split time up into fixed length intervals. Data is read and transmitted over MIDI from the start of each interval until a marker value



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of −1 is read: the routine then delays for the fixed interval. This means that the read and transmission time is added to the fixed interval but this should not be noticeable. When a −2 marker value is found, the routine exits.

This routine's code should not be too difficult to understand. If you want to change the tempo you can alter the 300 in line 1760: a larger number will give you a slower tempo and vice versa.

Data

The data actually sent over MIDI needs a little explanation.

The first byte sent (DATA on line 1860) is &90 (decimal 144), which is a status byte saying that data for 'key on' events follows. Each event needs two data bytes – the first gives the number of the key pressed and the second the key velocity. Because MIDI allows 'running status' – that is, the status byte need not be sent on every event provided status is not to be changed – we don't need to send another status byte. Of course, we need to say when keys are released, but we are allowed to use a 'key on' event with a velocity of zero to say 'key off'.

The next two bytes sent are both 64. The first byte is the key number of the E above middle C: the key numbers increase or decrease by 1 for each semitone pitch change – middle C is key number 60. The second byte, the key velocity, is also 64. We've used a velocity of 64 for all 'key on' events as this is the centre value of the velocity data value range – it's also the value that would be sent by a non-touch-sensitive keyboard.

After waiting for two time intervals (forced by the two markers at the end of line 1870), with the E above middle C playing the program, send the data on line 1880. The note number is again 64 but the velocity value is zero, so this causes the E above middle C to stop playing. You should now be able to work out what the rest of the data does. The note numbers, with their pitches, are shown in Figure 1.

Modifications

Perhaps the most obvious modification is to replace line 1800 with:

1800 UNTIL FALSE

and insert the line:

1785 IF byte%=−2 THEN RESTORE

The effect of these two edits is that PROCplay_data now plays the data repeatedly – so we have a very simple sequencing facility.

You could easily make this sequencing more useful by transposing the sequence each time through. To do this you could have the amount to transpose by on each repeat held in an array. At each RESTORE, you increment an index into the array so that a new value will be used the next time around. For example, if you wanted to play the sequence once as written, transpose up by an octave and then down by a 5th, your array values would be 0, +12, −7. Line 1780 would therefore change to something like:

1780 IF byte%>=0 THEN PROCsend_midi (byte%+pitch_offset%(index%))

where pitch_offset% is the array and index% is the variable being incremented at each RESTORE.

There's nothing to stop you sending MIDI codes for events other than 'key on's, of course. You might like to try experimenting with the pitch-bend and modulation controllers, but don't forget that if you insert bytes to effect this sort of control between the 'key on' message bytes, you have to follow the MIDI rules – insert new bytes after the velocity data byte of a 'key on' event and insert another &90 'key on' status byte after the new bytes, otherwise the following 'key on' data bytes will be assumed to be pitch (or whatever) controller data!

Try changing line 2030 to:

2030 DATA 72,64,−1,−1,&E0,0,66,0,68,0,70,−1,0,68,0,66,0,64,−1,−1,&90

I know it sounds like a cat in pain, but you get the general idea.

The &EO is the 'Pitch Wheel Change' status byte and is followed by pairs of bytes representing the wheel's position. The pairs are sent with the low order byte first – in the example above I didn't actually use the resolution offered by the low order byte, which I set to zero. The wheel's centre position is represented by the byte pair 0, 64 (&00, &40) giving the combined hexadecimal value of &4000.

Another possible modification would be to send chords rather than the simple monophonic tune given in the program. All you have to do is turn more notes on at a time – and then turn them off some time later. For example the following sequence of bytes will play a C6th cord.

&90,60,64,64,64,67,64,69,0,−1,−1,−1,−1,60,0,64,0,67,0,69,0,−2

If your synth is capable of touch-sensitive operation, you might like to try varying the velocity values associated with each 'key on'. Using something like 'CLAV 2' on the DX7, you should be able to get a nice 'funky' sound going.

Finally, if you're rich enough to have two MIDI synths (sorry – that should read 'if you *were* rich enough. . .') why not set them onto different channels and send different control information to each of them? Chords to one and the melody to the other, for example. Incidentally, don't buy two JX3Ps if you want to do this – I don't think you can change their channel number, so both would be on channel 1 . . .

Anyway, what you need to do is send a status byte, incorporating the correct channel number in its least significant nibble (4 bits) followed by control information for the synth on that channel, and then send another status byte incorporating the second synth's channel number, followed by its data.

By way of an example, assume that a JX3P is on channel 1 (since it can't be on any other channel!) and a DX7 is on channel 2. Don't forget that the channel numbers need 'correcting' from the range 1 to 16 into the range 0 to 15, so a 'key on' status byte for channel 1 looks like &90 whereas for channel 2 it looks like &91.

The following sequence of bytes will cause PROCplay_data to play middle C on the JX3P and G above middle C on the DX7 simultaneously.

1885 DATA &90,60,64,&91,67,64,−1,−1,−1,−1,&90,60,0,&91,67,0,−2

Note that a byte could have been saved if we take advantage of 'running status' and code the MIDI bytes up as follows (think about it. . .)

1885 DATA &90,60,64,&91,67,64,−1,−1,−1,−1,67,0,&90,60,0,−2

In later articles we'll see how techniques based on this idea can give split keyboard effects where both halves (or thirds, or quarters. . . in fact, up to 16ths!) can be transposed into sensible ranges.

Well, I hope you'll have a lot of fun 'doodling' with these routines and that your interest will be aroused enough for you to follow some of the more technical programming articles that E&MM will be publishing in the future. And if it all seems like too much hard work, you can always buy the 'MIDI Control Software' Package that E&MM will be marketing soon.

Jay Chapman **E&MM**

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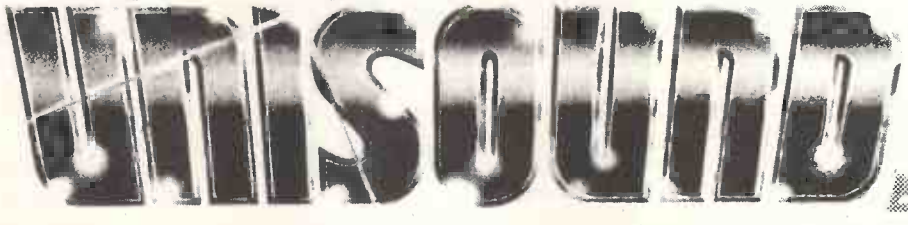

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MODULAR SYNTHESIS
Vocal Effects

Steve Howell **takes a look at how to synthesise what is the perhaps the most complex acoustic sound of all – that of the human voice itself.**

It could be argued that if there is one sound that is almost impossible to synthesise accurately using analogue techniques, it is the human voice. This is because, although the mouth is nothing more than an elaborate lowpass filter and envelope shaper, it can be manipulated in many sophisticated ways that a synthesiser's VCF just cannot come close to in terms of versatility. Apart from this, the mouth can switch instantly from being an oscillator to a noise generator; combine with these the resonance of the nasal cavities and the incredible control we have over all these parameters, and the analogue synthesiser appears somewhat humble by comparison. Synthesised speech is often almost entirely unintelligible, even when vocoders are used, and sampling (at the moment) can only really handle one small element of the vast range offered by the voice.

What an analogue synthesiser can do, however, is to recreate the effect of vocal sounds, and these effects can be employed in many styles of music.

The most simple vocal sound to synthesise is that of the solo female soprano. The patch is given in Figure 1 and, as you can see, it could be patched up on even the simplest of monosynths. It utilises a pulse wave with a mark/space ratio (pulse width) of about 25/75. This is fed into a standard VCLPF whose cutoff frequency is set at about two thirds and whose resonance is set so that it is a tweak away from oscillating – in other words, high. The EG controls are set as required, but I would recommend a slowish attack with full sustain and a release of about 1½ seconds for the legato effect this sound normally requires. Vibrato can be delayed or left on permanently as you wish, while portamento is essential to create the 'wailing' effect, though it shouldn't be excessive. Add to this copious quantities of echo and/or reverb and you have an ethereal vocal effect that should be quite atmospheric. Adjustment of the cutoff frequency will give you the whole range of 'ooohs' and 'aaahs', depending on where it is set. Keyboard track must be on, and should you find the sound too 'shrieky' at the top end of the keyboard, backing this control off should remedy the problem as fewer harmonics will be passed through.

For a more 'choral' sound, two or more VCOs detuned as necessary should fit the bill. I suggest you use a sawtooth wave as the other waveform and you could, if your synthesiser allows simultaneous waveform output, mix in a pulse wave whose pulse width is being swept by the sine or triangle output of an LFO. Chorusing, a mild flange or a harmoniser will also thicken the sound, especially if run in stereo. So, not a particularly difficult sound to set up, but it may require some delicate tweaking to get *exactly* the sound and effect you require.

Male Vocals

Male voices are, likewise, fairly easy and require only a change in pitch, a decrease in resonance, adjustment of the cutoff frequency to suit and slight modification of the EG controls, You can add a touch of EG modulation of the VCF using the second EG. If you do decide to do this, the controls of the second EG should be set to give attack, decay and release times of about 500ms and the sustain set to about two-thirds – this will give a slight 'wow' effect which can be quite useful. You could also use the second EG (or yet another EG if you still have one to spare!) to sweep the pulse width very slightly. As with the soprano sound, be prepared to fiddle a bit to get the sound you want as it won't come instantly. Choral sounds can be obtained in the same way as before by using detuned VCOs and/or chorus, harmoniser, etc.

Those, then, are two sounds which can be obtained with a fairly modest synthesiser. If you have more in the way of hardware more possibilities are open to you.

For instance, if you listen to almost any singer, be he (or she) of the rock, pop or operatic persuasion, you will notice that there is usually a slur up to each note, and this can easily be obtained by using the output of an EG routed to the CV input of the VCO. The attack should be set to around 100ms so that there is a slight 'swoop' upwards. You can either set the sustain full up so that the pitch will stay constant after the attack cycle, or you can back it off a bit so that the pitch slides down. In the latter case, the decay control should also be set to 100ms or so. In either event, you'll have to retune the VCO using a combination of the VCO frequency control, EG sustain level and EG modulation level. For an extreme slur the pitch has to be set fairly high, but if you only want a hint of sweep then, naturally, the EG modulation level needs to be set quite low – either way, be prepared to jiggle with the respective controls for the optimum effect. Release of the pitch sweep EG should be set longer than that of the amplitude shaping EGs, so that you don't end up with a 'clunk' at the end of the note as the pitch drops abruptly before the sound has died away (unless, of course that's precisely what you want!)

If you opt to use more than one VCO for a more choral efect, you could try sweeping only the one VCO and keeping the other 'straight'. Depending on how you balance the two VCOs level-wise, you can create a variety of commonly encountered vocal sounds, from the comic to the menacing. An extension of this is to use three VCOs, with two of them being swept and the other left untouched. You can then tune the two swept VCOs apart and bring them to unison using a combination of modulation levels and sustain amount – yet again, experimentation will yield the best results. In both these examples, the VCF and amplitude shaping EG can be adjusted to taste.

Vocal Articulation

Probably the most outstanding feature of the human voice is its ability to change its tonal characteristics, often quite drastically, for each new note, and whilst we can't get synthesisers to actually come up with words, we can use the VCF for some fairly drastic tonal changes. Perhaps the most famous example of this is the comic male voice so beloved of Japanese synthesist Tomita. This sound is actually quite easy to create, but you *will* need at least a sequencer or a sample and hold that can be stepped through with an external trigger pulse. The patch is shown in Figure 4 and the method is as follows.

Set the basic vocal sound up as you require (in this case, the male voice patch). Next, program some voltages into your sequencer, setting each one about a volt apart. If you're using an analogue sequencer you can simply tune the controls, but if you've gone digital, you'll have to connect the keyboard to your sequencer and play, say, a C and another C an octave up. Now connect the sequencer's CV output to the CV input of the VCF, and connect the gate output of the keyboard either to the 'step' or the 'external clock' input of the sequencer. Whenever you play a note, the sequencer will step through the two voltages you have programmed into it and will open and close the filter accordingly. By varying the level of modulation at the filter and by adjusting the cutoff frequency and resonance, you should be able to create a whole host of vocal sounds that would probably make Tomita proud! You can, of course, also modulate the VCF with an EG for a touch of 'wow', and if you find the jumps in voltages too abrupt you can rectify this by routing the CV output of the sequencer *via* a lag time integrator which will smooth the changes out.

If you don't have access to a sequencer, you can use a sample and hold circuit in its place just as effectively, except that in this instance the tonal changes will be random instead of preset. If, however, you have an old ARP analogue sequencer, you have the best

of both worlds in that you can preset the voltages and then, by switching it to the 'random' position, step through those preset voltages so that they are picked out at random.

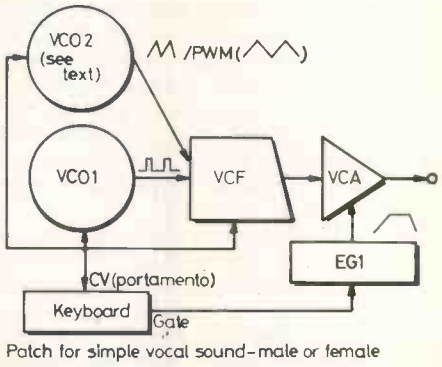
If you want to, of course, you can program many more voltages into your sequencer to give the sound more variation, and you could also use more than one VCO, sweeping it with another EG as outlined above.

Performance

Points to watch for when playing these sounds are basically the same as those for any sound that is an imitation of one that requires breathing in that, for total realism, you have to phrase the music properly, allowing plenty of time for 'breaths'. Of course, the beauty of synthesised vocal sounds is that you don't have to worry about such things, but if realism is your aim then it's a detail you've more or less got to bear in mind.

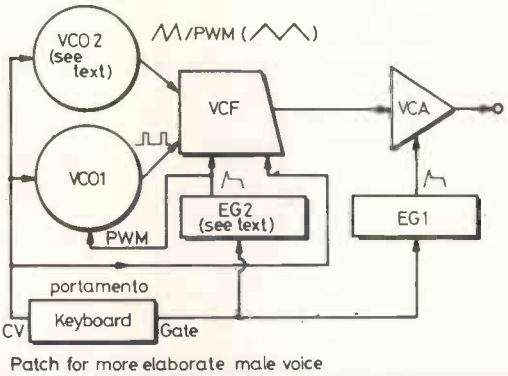
Because of the very high resonance of some synthesised vocal effects, in particular the female soprano, you could well run into problems during recording, whereby on certain notes the level is boosted incredibly high and wraps the needles round the end stops of your poor VU meters! If this does happen, the use of a compressor/limiter will help – even if it's only a little footpedal type – otherwise you'll just have to watch your recording levels closely. These sounds are also fairly pure, and you may therefore experience some problems getting them to cut through a mix: again, if you can use a compressor/limiter it will certainly help.

Figure 1.



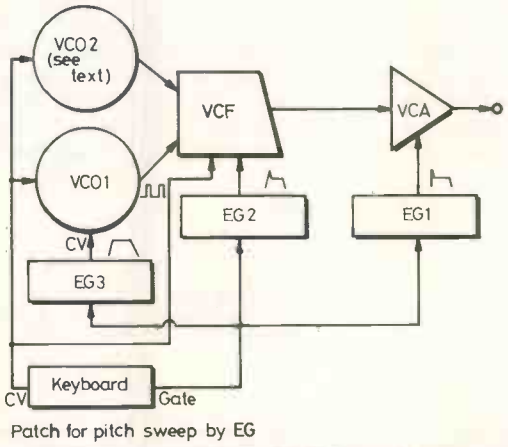
Patch for simple vocal sound-male or female

Figure 2.

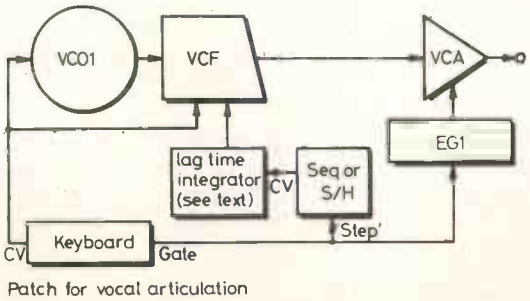


Patch for more elaborate male voice

Figure 3.



Patch for pitch sweep by EG



Patch for vocal articulation

Figure 4.

Filtering

You can, of course, experiment with other types of filters such as high or bandpass and you could also try routing the sound through a graphic or parametric equaliser, boosting the mid frequencies in particular. Most modern-day mixers have reasonably versatile quasi-parametric EQ sections and such a facility will usually suffice if you don't have access to larger units. If your mixer's EQ is a bit limited, however, a simple six-band graphic EQ pedal will do and, since they could always come in useful for other sounds as well, it might be well worth investing £50 or so in a suitable model. . .

Reverb and echo can be added in whatever quantity you wish – I prefer to use quite a bit and usually add it to the sound as I record. This not only helps me to play the sound in the first place but also enables me to set up a unique acoustic environment for that sound, which in turn helps it stand out in the mix.

Different echo speeds can produce startlingly different effects: long echoes on the female voice should make it particularly ethereal and heavenly whilst a short slap-back echo on the male variant can give an almost 'computer' feel to the sound. Likewise, a chorus unit and harmoniser, as mentioned before, will agument a choral sound, especially if run in stereo.

Meanwhile, vibrato can be added to any of the sounds as you wish, and if you find the cyclic effect of a low frequency sine or triangle too repetitive you could always inject a shade of 'human error' into the process by using the random vibrato technique explained last month, whereby the output of the sample and hold is routed *via* a lag time integrator to create a smooth but random pitch modulation.

Summing up

In conclusion, I think of all the 'acoustic' sounds available to the modern synthesist, vocal effects are the ones most likely to make an audience sit up and take notice. There's something about a synthesised vocal passage that people find quite fascinating – I well remember my own reaction when I heard Tomita's version of Debussy's *Golliwog's Cakewalk* for the first time – so it's worth experimenting with vocal effects and trying to make them as interesting as possible.

If done well, they can turn a mediocre piece of music into a reasonable one, and a good one into something rather special.

Steve Howell **E&MM**

Understanding the DX7

Having completed his analysis of what goes into Yamaha's factory preset DX voices, Jay Chapman **moves on this month to programming some basic sounds from scratch.**

It would seem that, after an exhaustive survey of DX series preset voices, the time has come to start programming a couple of voices of our own. Both the following voices have been kept simple so that we can build on what we talked about in the earlier articles in this series. DX9 owners will be pleased to hear that they will be able to program the same voices on their instruments by 'interpreting' the instructions given below (unfortunately, I don't have a DX9 so I can't tell you exactly which keypads to press!).

Only two Operators are used to create the voices. They are combined in the 'modulator/carrier' configuration already explored in previous issues. In this way simplicity is assured but, as you can imagine, the voices are not exactly going to shine in terms of quality and depth. More complex programming will follow in later articles – it's best to learn to walk before you can run. . .

There are in fact two ways of programming your own voices on the DX series – either you modify an existing voice or you start from scratch. Both the voices discussed below were programmed from scratch, so the first thing you have to do in each case is a 'VOICE INIT'. Press the brown FUNCTION keypad then the green VOICE INIT keypad and finally the green YES keypad twice. You now have the DX7 in about as basic a state as it can be. Only Operator 1 is contributing to the sound you hear, producing a sine wave whose pitch is governed by the keyboard. In terms of envelope shape, we're presented with the simple 'gate' effect of key down is on, key up is off, as on an electric organ.

Cheap Synth

The first voice to come under discussion is actually the first piece of DX7 programming I attempted, having devoured the manual and tried some of the experiments talked about in earlier articles. This may sound a bit silly to you, but I thought it very important to be sure that I had understood enough to make my new DX7 sound like the cheap, tatty, monophonic, kit-built, one-oscillator analogue excuse for a synthesiser that it was replacing.

Before we actually get to work on the DX7, let's have a look at what we are trying to do. Figure 1 shows the state of affairs that I wanted to imitate – some of you may even be able to work out which cheap synth I had. The idea of this patch is that a harmonically rich waveform for the oscillator (a sawtooth, perhaps) is fed through a Voltage Controlled Filter (VCF) and a Voltage Controlled Amplifier (VCA). The ADSR-type Envelope Generator controlling the VCA is set to give practically any envelope you like, though I tend to set a long release time to try and make up for my having slow fingers!

The essential character of the voice is given by setting the AD Envelope Generator controlling the VCF frequency to give moderately slow attack and decay times. This opens and then closes the filter, and provided the resonance control is set suitably you can obtain a 'wah' effect as the higher frequencies come in and then fade away. I'm fairly confident you will have heard sounds very like this one on quite a few keyboard albums in the past.

The first component I needed to create was the 'harmonically rich waveform'. Having tried the 'modulator/carrier' experiments I knew that I could produce some sort of complex waveform by messing about with the modulating Operator's frequency and output level. This I proceeded to do (without a great deal of scientific method) until the sound produced seemed to fit the bill. To follow in my somewhat inglorious footsteps you should continue on from the VOICE INIT by turning off Operators 3 through 6 and then press the green OUTPUT LEVEL keypad and select Operator 2 if it is not already selected. Your display should look like:

```
ALG 1 110000 OP2
OUTPUT LEVEL = 0
```

We are now in a position to mess about with the modulation. The difficulty here is that it's preferable to alter both the output level and the frequency of the modulating Operator at the same time, since it's the interaction of these two parameters that determines the overall modulation effect. As we have only a one-dimensional data entry control rather than something like a joystick (which is 'two-dimensional' and can therefore handle two parameters at once) we have to keep leaping between the output level and the various FREQUENCY keypads (stick to FREQUENCY COARSE for the

fig. 1
The 'cheap synth' sound on the cheap synth.

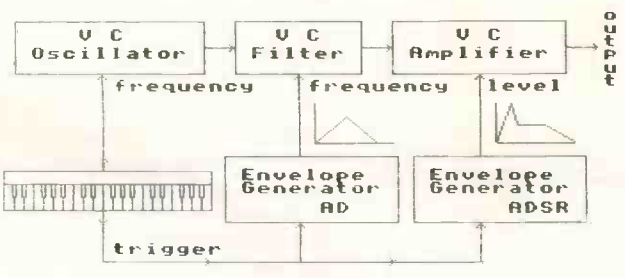
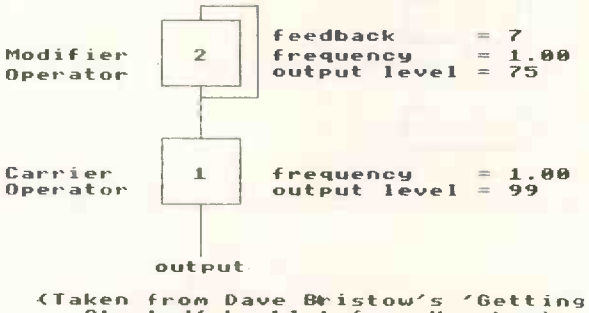


fig. 2
Sawtooth Wave



(Taken from Dave Bristow's 'Getting Started' booklet from Yamaha.)

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moment), changing the parameter values a little at a time and listening to the results.

As an example, I found that if Operator 2's FREQUENCY COARSE was set to 4.00 and its output level was set to 75, the result sounded quite reasonable. Getting to this point was a somewhat hit and miss affair, I must admit: some information that could be of use at this point is to be found in Dave Bristow's *Getting Started* booklet which I understand is now supplied with all DXs. On page 23 you'll find a number of Operator configuration diagrams (ie. partial algorithms) which relate to the production of waveforms you may recognise from your pre-FM days. In particular, the diagram reproduced in Figure 2 will give a 'sawtooth' output wave. You might like to try the sawtooth wave instead of the sound we've arrived at so far. You could select algorithm 9, for example, and set the parameters for Operators 1 and 2 as specified in Figure 2. At least then you'll know exactly where you're starting from. . .

Figure 3 shows the connections made for the sawtooth wave (ignore the pitch 'EG' part which relates to the 'Syndrum' voice to be described later). Note the feedback loop from the output of Operator 2 going back to its input. The feedback parameter controls how much of the output is fed back to the input and thus acts in much the same way as the output level parameter of a modulating Operator. Of course, the more output you feed back the more complex the output becomes, which means that the fed back signal is also more complex, which in turn means that the self-modulation is more complex, which again means that the output is more complex, which . . . fun isn't it?! We'll consider this subject in more detail in a later article: in the meantime you might well be able to see why such feedback is used to create a noise source on the DX (consider the definition of white noise).

So far all we have is the equivalent of a VCO producing a sawtooth waveform. The 'wah' effect – due to the VCF and its AD EG shown in Figure 1 – can be produced by setting the parameters of the EG in the modulating Operator, to give the required slowish attack/decay curve. It's important to realise that the envelope should not start from and descend to a level of zero as it does in the AD envelope in Figure 1. If it did we would only have the more complex harmonic content of the sawtooth during the 'wah' and we would be left with the simple unmodulated sine wave of the carrier operator for the rest of the time!

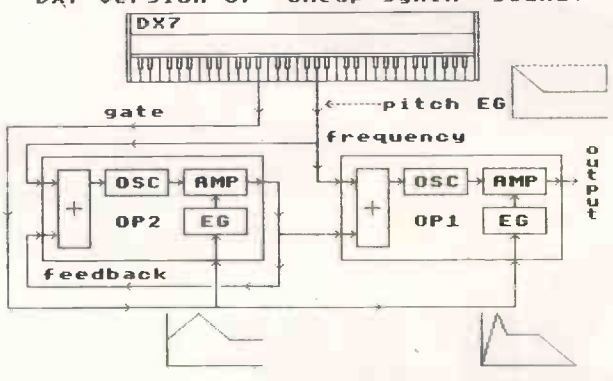
To obtain an envelope for the modulating Operator (number 2) as shown in Figure 3, I came up with the following parameters for Operator 2's envelope generator:

Operator 2	**1**	**2**	**3**	**4**
RATE	40	40	99	99
LEVEL	99	60	60	60

I'll leave you to set up your own amplitude EG ADSR curve, which will mean you deciding on and setting up the parameters for Operator 1's EG, of course.

While the voice we've just produced is not going to win any prizes (understatement of the year!) it shows a very important principle of FM synthesis in action. It's not too difficult to see that with several Operators connected in a fancy algorithm with various modulations (possibly of modulations!) going on, we can produce very complex timbres. However, of far greater importance is the timbral movement we have created in programming the 'wah' in this 'cheap synth' voice.

fig. 3
DX7 version of 'cheap synth' sound.



Why?

Because at each point of modulation in our fancy algorithm we could set about forcing such timbral movement. Also worth considering is the fact that at each such point we can apply not just the simple AD envelope, but rather the eight-parameter envelope available in *each* Operator on the DX series. This is one of the facilities that allows DX synthesisers to imitate accoustic instruments so well, since the change in the relative levels of fundamental and several other harmonics during the sounding of a note can be synthesised accurately.

Syndrum

The second voice is, I admit, a pretty weak attempt at a syndrum. Again, the simple approach – with just two Operators being used – means that the quality of the imitation is fairly poor. Things will improve in later articles, rest assured.

As with the 'cheap synth', the two Operators are used in modulator/carrier configuration. The sound I wanted here was something bordering on the metallic, and this was obtained easily using the same method (I think 'mucking about' would be a suitable technical term!) as that described for the cheap synth voice. This time feedback was not required. The values I used for Operator 2's frequency coarse and output level were 2.00 and 70 respectively. Operator 1 is already set up sensibly after the VOICE INIT, of course.

To get the characteristic pitch rise or fall associated with a syndrum the pitch envelope generator is brought into use. The pitch information fed to the Operators is a combination of the keyboard pitch and the pitch EG envelope (this combination takes place logically at the point indicated by the dotted arrow in Figure 3). As you can see, the pitch envelope starts high and settles to a medium value (actually 50): this will give a falling pitch.

When the pitch EG is not in use, all of its level parameters are set to 50, which corresponds to the keyboard playing at the pitch it thinks it is tuned to – if you take my meaning. The pitch EG has the same parameters as the EGs in the Operators.

Since we want to start high we must set level 4 high. Note that the envelope starts *and* finishes at level 4 – the pitch EG diagram in Figure 3 shows the return to level 4, represented by the dotted line across the top of the envelope diagram at its extreme right. We don't actually hear this pitch change because it occurs only after key release, when the carrier's (amplitude) EG curve is at zero anyway.

The fall in pitch must take some time so we need to set up a suitable rate parameter. Since the pitch change occurs from level 4 to level 1, it's rate 1 that needs altering. You can see this easily if you look at the EG diagram on the front panel of your synth. The pitch EG parameter values that I settled on are as follows:

Pitch EG	**1**	**2**	**3**	**4**
RATE	70	99	99	99
LEVEL	50	50	50	90

The last component we have to set up is the amplitude envelope of the syndrum. This involves choosing suitable parameters for the carrier Operator's EG. The sound should have a fairly percussive start and then fade away over about half a second. Envelope generation on the DX instruments is essentially no different from that on any other synthesiser, so I don't see this side of things causing too many problems.

The percussive start to the envelope is obtained by setting both rate 1 and rate 2 to high (ie. fast) values. Level 1 is left full on at 99, which should always be the case for the main (or only!) carrier Operator, in order to avoid unnecessary loss of level. Rate 3 is then set fairly slow, to give the half-second fade out. Rate 4 is left alone since effects after key release are ignored for simplicity's sake. Note that I rarely look at the parameter values changing in the display when I'm setting up envelopes – instead, I tend to experiment by moving the data slider about until it sounds right. Not very scientific, but it works.

I found the following values effective for Operator 1's EG:

Operator 1 EG	**1**	**2**	**3**	**4**
RATE	96	91	49	99
LEVEL	99	92	0	0

So there you have it – 16 syndrums at the same time over 5 octaves. Will wonders never cease?

Jay Chapman **E&MM**

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ON RECORD

Summer might be here but more vinyl seems to be finding its way into E&MM's offices than ever before. Dan Goldstein **takes a look at some of the most notable releases.**

Blancmange Mange Tout

London SH8554

Any band making music that can be neatly classified as 'pop' runs the risk of becoming one-hit (or at best, one-album) wonders, but Blancmange seem to have avoided that possibility rather neatly on the evidence of this, their second LP release in as many years.

In many respects, *Mange Tout* isn't far removed from its predecessor, *Happy Families*. The jolly, throwaway melodies are still there, as are the Indian percussion breaks, the 'let's put as many synth lines on this as we can' production and the none-too-serious lyrics.

There is evidence that Arthur and Luscombe are branching out, however. 'See The Train' is the most obvious break from tradition, being a vaguely tongue-in-cheek acapella that succeeds surprisingly well, and in addition 'Time Became The Tide' (soulful vocals accompanied by nicely-arranged string section), 'All Things Are Nice' (Blancmange go *My Life in the Bush of Ghosts*) and 'Murder' (splendidly anarchic follow-up to the first album's 'Feel Me') all display a desire to break free from the musical shackles imposed by the 'pop' classification, even if their creators' meanderings have no definite direction or purpose.

Finally, a magnificent cover version of Abba's 'The Day Before You Came' sums up the album's hope and diversity. A steady drum machine beat is gradually swamped by melody lines played on instruments both acoustic and electronic, while Neil Arthur sings forcefully and with just the right degree of irony for the track to be successful.

It's my view that, of all the 'electropop' duos that sprang from nothing at the beginning of the decade, Blancmange would seem to have the brightest future. *Mange Tout* is a record that'll please their fans, earn them a lot of praise and silence their critics. If only all second albums were as good as this!

Human League Hysteria

Virgin V2315

Having already received the inside story behind the making of this album 'from the horse's mouth' (see the Ian Burden interview elsewhere this issue), I was expecting a record that displayed more technical than musical progress from the League, and in the main that's what I got.

The production job on *Hysteria* is superb, far better than it ever was in the Rushent days (though whether greater audio fidelity will be as commercially successful remains to be seen), while the greater range of instruments used has resulted in a record whose tonal colours are more varied and whose material wears better after a number of listens.

The only problem is that these technical improvements have not been matched by any form of musical progression that I can discern. The basic League pop formula of simple, hummable synth melodies, carefully matched chord sequences and vaguely memorable vocal lines remains pretty much as it was two years ago, though in the last instance, the lyrics seem to be delivered with a little more conviction than was previously the case.

This compositional stagnation is hardly surprising, taking *Hysteria*'s lengthy gestation period into account, but I do get the feeling that the Human League may be content to remain in this particular musical vein for quite some while to come.

What makes this all more infuriating is that *Hysteria* is really quite a good album. 'The Lebanon' is a track of considerable power both lyrically and musically (almost a throwback to the *Travelogue* days), 'Rock Me Again ... (Six Times)' is a thoroughly competent cover version of a song I didn't at first think was ideally League material, while both 'Louise' and 'Life On Your Own' are sensitive, thoughtful love songs of greater delicacy than the band were previously capable of achieving.

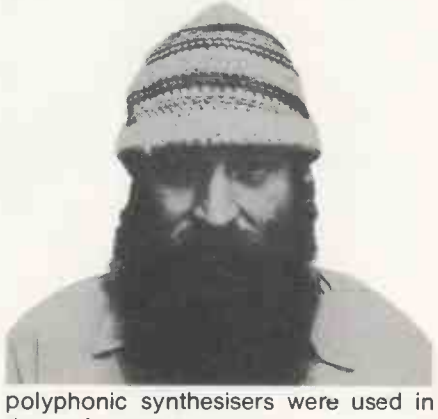
Buy *Hysteria* for those songs alone, and enjoy it for what it is, clever studio pop music with the merest hint of soul. But whatever you do, don't try to think what the Human League's future might hold...

Terry Riley Songs for the Ten Voices of the Two Prophets

Kuckuck 067

The name Terry Riley should already be familiar to fans of Philip Glass, Steve Reich, and other US systems music composers with whom he is seemingly almost always associated. If the name doesn't ring a bell, then perhaps the titles *A Rainbow in Curved Air*, and *In C* will: they're just two of his most celebrated works, the former being played entirely on organ and synthesiser (linked up to a tape recorder for looping, of course).

Songs is his first album release for a while, and it consists of three new pieces recorded in concert at the Amerika-Haus in Munich during 1982. The LP's title actually gives some clue to the album's content, since it relates to the fact that ten voices on each of two SCI Prophet 5



polyphonic synthesisers were used in the performance.

'Embroidery' and 'Chorale of the Blessed Day' both feature extensive Oriental chanting on the part of Riley (though fortunately the lyrics are in English and fully intelligible), but although these work well, it's the quieter track, 'Eastern Man', that makes the biggest impression, with some of the Prophet voices being almost ethereal in quality.

Generally speaking, *Songs* is quite a bit less repetitious in structure (and more varied in composition) than some of Riley's previous efforts, so even if you've never been particularly taken by what he's produced in the past, give this one a fair hearing.

Recording quality is superb, though I assume the two Prophets were DI'd to tape because the record contains no evidence whatsoever of audience noise. If you have difficulty tracking it down, contact the UK distributors, Making Waves, on 01-481 9917.

Dan Goldstein

Guitarist

80p

Volume 1 Number 2 July 1984

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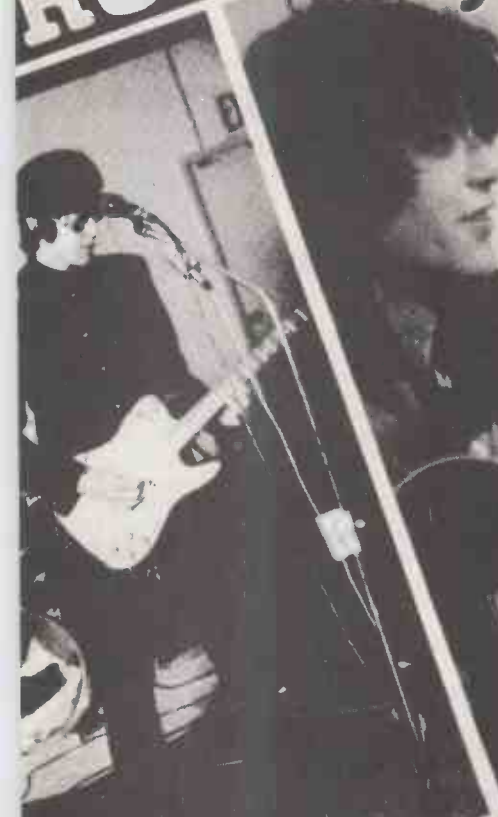

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AUGUST PA Signal Processor ★ Powercomp ★ Hexadrum ★ Matinée ★ Resynator/Casio VL-Tone reviews ★ Irmin Schmidt

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

1982

JANUARY The New Tangerine Dream ★ Japan Music Fair ★ Fact File ★ Guitar Workshop ★ Reviews: Casiotone 701, Telsco 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

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 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.

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 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, Mllab 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 G[illegible]de ★ Prophet T8 in focus ★ [illegible]nith's Collect Stu[illegible]erheim DX Drum[illegible] Pro-FX 500 Rickenba[illegible]0/12 String Guitar Rickenbacker TR75GT Amplifier ★ Projects: Synclap, Amdek Tuning Amp Kit

SOLD OUT!

OCTOBER John Miles ★ Andrew Powell ★ Yamaha DX1 ★ ICA Vancouver ★ Guitar Month ★ New Pickups ★ Mains Distribution Board ★

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
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

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

APRIL Fad Gadget • Vic Emerson • Brian Chatton on the Poly 800 • Reviews: Klone Dual Percussion Synth • Vox Venue PA • Simmons SDS7 & SDS8 • Vox White Shadow Bass • Ibanez UE400 & 405 • Yamaha PS Keyboards • Crumar Composer • Roland Jupiter 6 • Roland TR909 & MSQ700 • Features: Understanding the DX7 • CM: The Gentle Art of Transcription Pt1 • Digital Design • Projects: The Syndrom Pt1 • Bass Pedal Synth

MAY Wang Chung ★ Reviews: PPG Wave 2.3 & Waveterm ★ Roland Juno 106 ★ Roland JSQ60 ★ Casio CT310 ★ M&A Electronic Drums ★ MPC Sync Track ★ Dynacord PDD14 Delay ★ Feature: Understanding the DX7 Pt2 ★ Projects: PDSG Pt1 ★ String Damper ★ MIDI SUPPLEMENT Pt1: MIDI Specification, MIDI Theory & Practice, MIDI Product Guide, MIDI By Numbers (Steve Levine)

JUNE OMD • Reviews: Roland GR700/G707 • SynthAxe • Boss DD2 Delay Pedal • Jen Musipack 1.0 • MFB 512 Digital Drum Machine • Siel Expander • SCI Model 64 Sequencer • Features: Independent Labels • Understanding the DX7 Pt3 • Editing on the Model 64 • CM: Gentle Art of Transcription Pt2 • PDSG Pt2 • Projects: Syndrom Pt2 • Multi-waveform LFO • MIDI SUPPLEMENT Pt2: Inside MIDI • MIDI & The Micro • BeeBMIDI Interface

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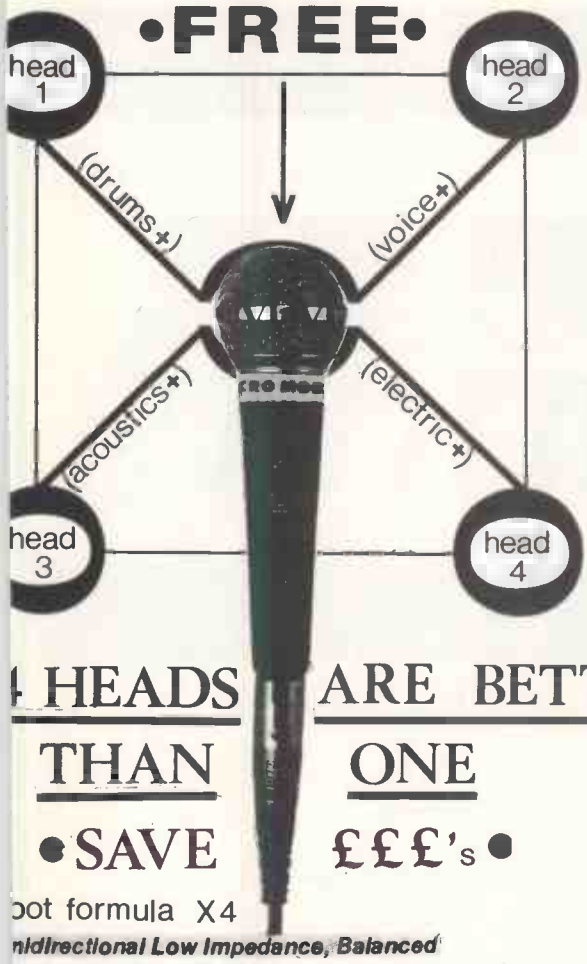

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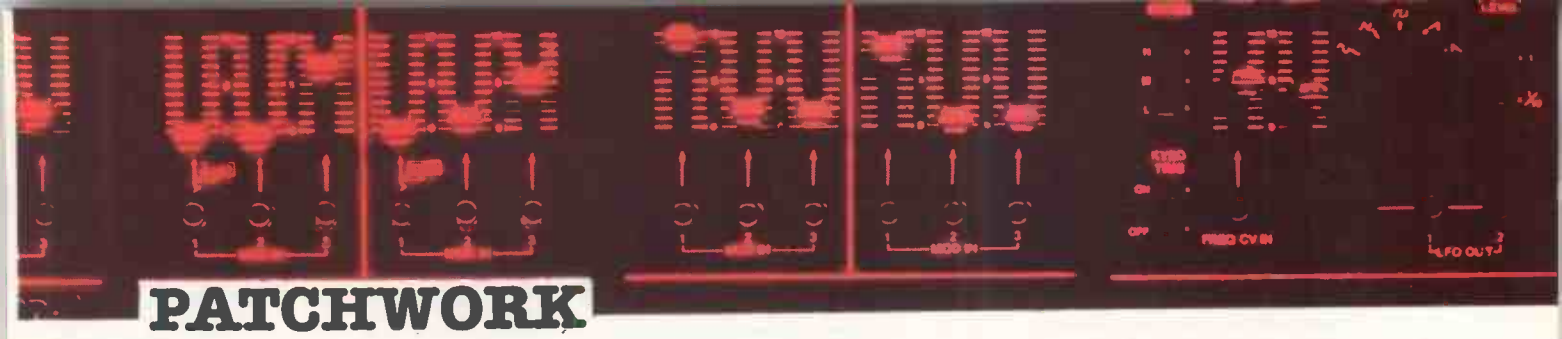


PATCHWORK

This is where the professional musicians retire into the background and E&MM readers get a chance to put a favourite synth sound of their own devising into print. If you've got a patch you'd like to share with readers, send it (preferably on an owner's manual patch chart including a blank one for artwork purposes) to: *Patchwork*, E&MM, Alexander House, 1 Milton Road, Cambridge CB4 1UY.

MOOG SOURCE — 'Solo Source' — Darren Short-Pullman, Surrey

The Source, Moog's excellent monophonic and the first synth to feature an Incrementor and touch panel, is a welcome newcomer to *Patchwork*. Darren says his patch was inspired by the keyboard solo sound in 'Rock With You' by Michael Jackson. See if you agree. . .

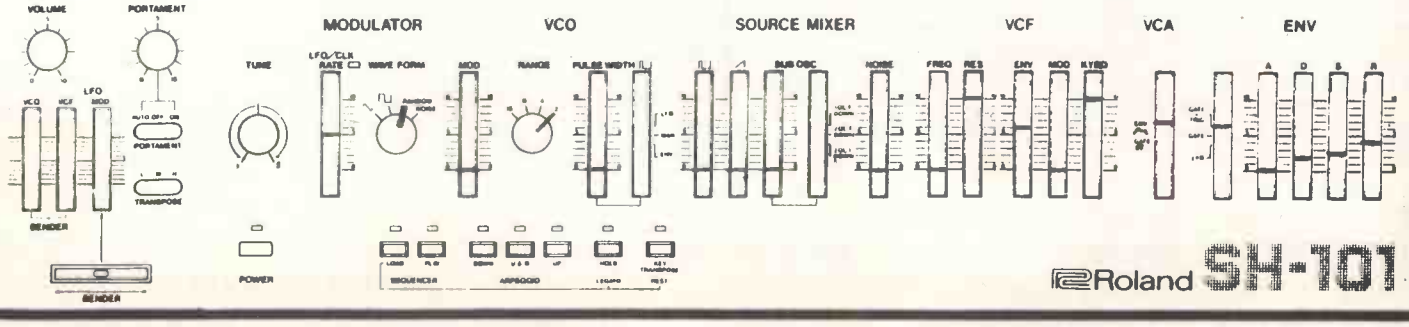
Keyboard Glide	0
Multitrigger	On
LFO Rate	46
Shape	
To Osc	Off
To Filter	On
Osc 1 Footage	8′
Waveshape	PWM-50
Osc 2 Footage	8′
Waveshape	PWM-50

Sync	Off
Interval	0
Mixer	
Osc 1	77
Noise	0
Osc 2	68
Voltage Controlled Filter	
KB Track	½
Cutoff	18
Emphasis	10
EG Amount	54

Filter Envelope	
Attack	21
Decay	25
Sustain	22
Release	99
VCA Envelope	
Attack	0
Decay	60
Sustain	0
Release	60

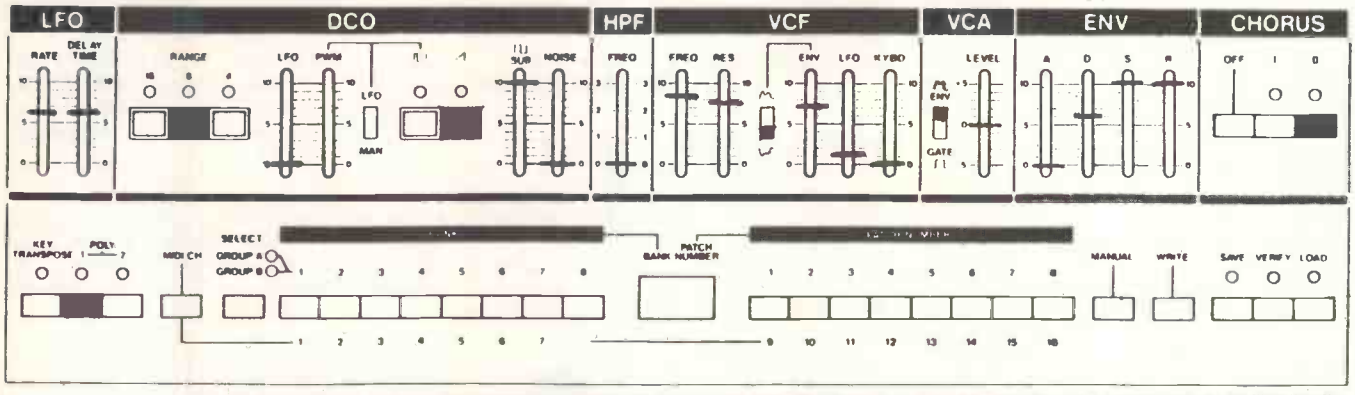
ROLAND SH101 — 'Synth Kit' — Bill Coopland, Sheffield

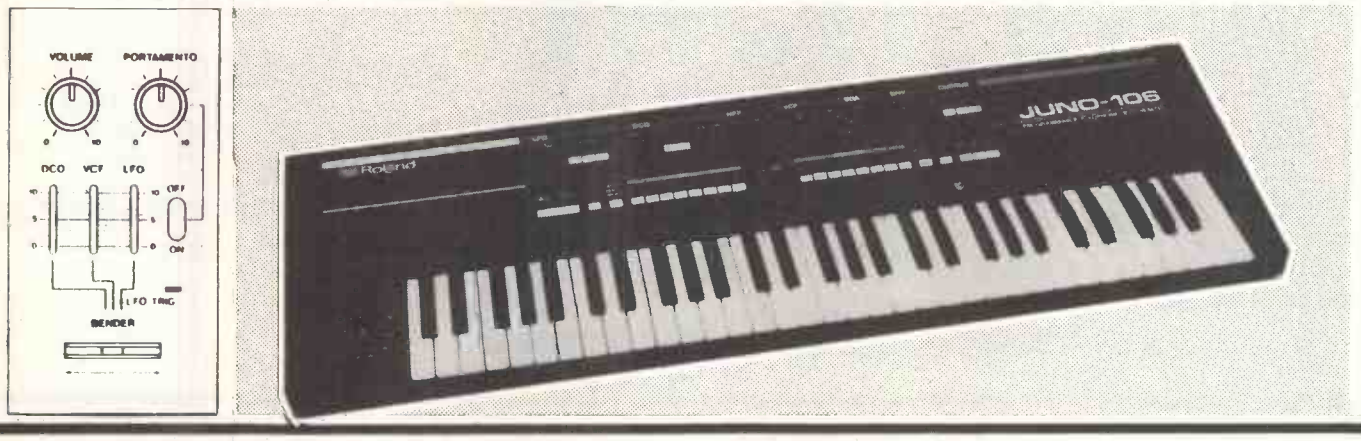
The quality of the tom sounds from this patch came as quite a surprise to us, and proved yet again the versatility of this inexpensive mono. The lower keys produce a reasonable bass drum thump while those higher up provide tom sounds that can be varied from low 'dull' toms (VCF ENV at 4) to high syn-drum effects (VCV ENV at 7).



ROLAND JUNO 106 — 'Space Frontier' — Christer Lorichs, Sweden

Nice to see our overseas readers contributing to *Patchwork*! Christer submitted this 'slow-growing space synth' patch for the new Juno 106, and comments the keys should be struck in a random order, letting the sound grow slowly. He adds that it sounds better in stereo mode and that it's well worth experimenting with the LFO. For our part, we reckon it's bound to go where no synth patch has gone before. . .





YAMAHA DX7 — 'Split-Keyboard' — Tony Wride, DX Owners' Club

In amongst the multitude of DX7 patches comes this one from the organiser of the DX Owners' Club – how could we resist it? Tony comments that 'by use of keyboard level scaling, two separate sounds are put at either end of the keyboard. Each sound has a two-octave range with the centre octave of the keyboard being the crossover area. It is also worth experimenting with different sounds'.

YAMAHA DX7 VOICE DATA LIST

ALGORITHM	FEEDBACK	LFO WAVE	LFO SPEED	LFO DELAY	LFO PMD	LFO AMD	LFO SYNC	MOD. SENSITIVITY PITCH	MOD. SENSITIVITY AMPLITUDE
12	7	SINE	28	46	30	29	OFF	1	

	POLY/MONO	PITCH BEND RANGE	PITCH BEND STEP	PORTAMENTO MODE	PORTAMENTO GLISSANDO	PORTAMENTO TIME
	POLY					

OP			FREQ. COARSE	FREQ. FINE	DETUNE	EG RATE 1	EG RATE 2	EG RATE 3	EG RATE 4	EG LEVEL 1	EG LEVEL 2	EG LEVEL 3	EG LEVEL 4	BREAK POINT	L CURVE	R CURVE	L DEPTH	R DEPTH	K.BOARD RATE SCALING	OUTPUT LEVEL	VELOCITY SENS.	PITCH EG RATE 1	PITCH EG RATE 2	PITCH EG RATE 3	PITCH EG RATE 4	PITCH EG LEVEL 1	PITCH EG LEVEL 2	PITCH EG LEVEL 3	PITCH EG LEVEL 4	KEY TRANSPOSE	VOICE NAME
6	R	ON	0	50	0	99	24	19	54	99	99	99	0	D4	-L	-	99	-	1	66	2									C3	SPLIT KEYBOARD
5	R		6	00	+1	28	24	19	54	99	99	99	0	D4	-L	-	99	-	1	71	3										
4	R		0	50	-1	99	29	28	27	99	0	0	0	D4	-L	-	99	-	1	89	2										
3	R		1	00	+3	98	29	28	51	99	0	0	0	D4	-L	-	99	-	1	90	2										
2	R		2	00	+2	99	71	35	51	82	92	87	0	C3	-	-L	-	99	0	85	2										
1	R		2	00	-2	52	30	25	23	99	92	90	0	C3	-	-L	-	99	0	99	1										

MODULATION WHEEL RANGE	MODULATION WHEEL PITCH	MODULATION WHEEL AMPLITUDE	MODULATION WHEEL EG BIAS	FOOT CONTROL RANGE	FOOT CONTROL PITCH	FOOT CONTROL AMPLITUDE	FOOT CONTROL EG BIAS	BREATH CONTROL RANGE	BREATH CONTROL PITCH	BREATH CONTROL AMPLITUDE	BREATH CONTROL EG BIAS	AFTER TOUCH RANGE	AFTER TOUCH PITCH	AFTER TOUCH AMPLITUDE	AFTER TOUCH EG BIAS

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COMPUTER MUSICIAN

The Four Digital Commandments:
Thou shalt not commit adultery with other people's software.
Thou shalt not covet thy American neighbour's machine code routines.
Thou shalt not bear false witness to copyright details.
Thou shalt not raise false effigies in place of the real McCoy.

So, just where does CM stand with regard to the vexed question of piracy on the micro seas? In the past, I've made no bones of my support for the cheap Apple lookalikes that occasionally make it through Apple UK's picket line, but that surely makes me something of a hypocrite if I do the about turn and tear a company that's ripping off software to shreds. Well, yes and no. The point about the Apple II is that its age hasn't mellowed its price or Apple's stance on licensing their software, and that's a little galling when you consider that Apple went on to bigger and better micros many moons ago.

Bearing in mind that the Apple II is now obsolete (replaced, as far as Apple are concerned, by the IIe), but still enjoying the largest amount of software for any home computer, the time is ripe for making cheap versions of the most popular micro ever. Unfortunately, Apple Inc. don't see it that way. That's a touch ironical because, in this case, imitation is the sincerest form of flattery, and these lookalikes are bought for the simple reason that they're Apples in all but name.

There's no pretence here about producing a machine that's new and original – these are copies and everyone knows it. And if people get on with these machines, then that's to Apple's benefit in the long term, because the same people will doubtless be inclined to look fairly favourably on Apple's products in the future and purchase vast amounts of software that ultimately puts yet more dollars back in Apple's Cuppertino coffers.

The problem with software is that it's a lot easier to disguise the original parentage of the routines required for getting Hobbits into holes than it is to put an Apple lookalike motherboard in a 100 % convincing disguise. As a result, a state of paranoia over copy protection now exists in the software industry, such that some companies are attempting to limit what you can do with software in the privacy of your own home.

My own stand on the software that I write and sell is to sell it for as little as is commercially feasible and leave off copy protection if I possibly can. The argument for this approach is much akin to that being voiced in the record industry: make the items cheap enough and people will be quite happy to forego illicit copying for the sake of having an original that can always be sold in the future.

Unfortunately, aside from a very small number of companies both here and in the States, the general attitude is 'copy-protection or bust', so that companies are wasting vast amounts of time and money on developing dongle devices, and individuals are being obliged to fork out for the latest and best copying programs.

What makes a right mockery of all this is that Acorn wax lyrical in their manual for the BBC Micro 2nd Processor about how the extra RAM can be used like sideways RAM for copying programs from ROM to disk. A question of the leg not knowing quite what the arm's doing, I'd say.

Curiously, admist all this software copyright hoohah, there's still one rather small area that's remained untouched: the question of what happens to copyright when you encode a musical score into a digital format. As things stand, neither the Mechanical Copyright Protection Society (MCPS) nor the Performing Rights Society (PRS) know quite what to do here. Putting the data through a digital-to-analogue converter certainly wouldn't re-create the sound of the score, so this definitely doesn't fit into the territory occupied by compact discs *et al.* On the other hand, encoding a score *could* be classed as an act of arrangement or re-composition, so it's hardly clear who's going to benefit in this direction, either.

What all this boils down to is that there's nothing to stop any Tom, Dick, or Harry from making arrangements of any tune, in or out of copyright, encoding all the pitch and duration bytes onto disk or cassette, and then flogging them to any other Tom, Dick, or Harry to play on his MIDI-equipped micro and synthesiser set-up.

That's what you call food for thought!

David Ellis

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RUMBLINGS

The IBM Personal Computer hasn't exactly been blessed with musical goodies in the couple of years since it appeared in the States. Octave-Plateau's IBM PC software for their Voyetra synth is meant to be quite something, but it's also quite expensive and still in the process of debugging from what I hear.

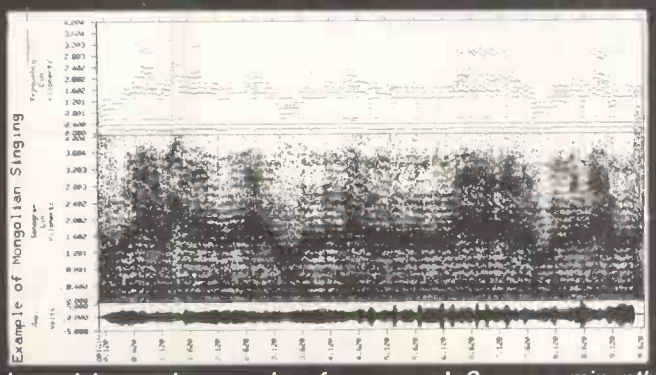
Casheab, the first company to produce a music add-on specifically for the IBM, are also one of the grand-daddies of the music hardware side of things, and their SYN10/CTR10 32-channel Digital Synthesiser boards have been doing the rounds of the S100 bus for almost five years now.

Casheab's product recently made it into the big time, courtesy of Utopia's keyboard player, Roger Powell, who coupled it up with a Z80 micro, some of his own software, and a keyboard, turning it into what he called the 'Databoy'. (Ghastly name – sounds a little too like those Grundig trannies of late sixties vintage.)

Little is known about the IBM PC reincarnation of Casheab's product, but it's expected to have decent size waveform tables (considerably greater than the 256-byte norm) with better than average resolution (12 bits seems likely) and lots of channels to play around with. The synthesiser board is expected to sell for just short of $800 and is likely to appear later this summer. Casheab have moved to San Francisco, but mail should still reach them if you use their old address of 5737 Avenida Sanchez, San Diego, CA 92124, USA.

Synclavier Sonography

The latest additions to the growing arsenal of Synclavier software include both Resynthesis software and a Sonograph option. The raison d'etre behind the Resynthesis software (standard with every new Synclavier II) could hardly be more clear-cut. You want to capture the time-varying harmonic spectra of your favourite instruments, but you're not interested in the rather banal approach of using vast amounts of RAM to store all those changes. So, what do you do? Well, the answer is to analyse a sound byte-to-byte and then resynthesise it using the Synclavier's palette of partial timbres. As someone else said, 'no mess, no waste, just



honest-to-goodness value for money.' Seems eminently sensible, really.

The other side of Synclavier's latest synthetic coin is their Sonograph option. This works in conjunction with the Sample-to-Disk system (very expensive) and enables the user to examine in minutia all that's going on in a long and/or complex sample. Just what you've always wanted, eh? As New England Digital say with inimitable perception, 'acousticians, ethnomusicologists, speech and perception researchers may now tailor their analysis to achieve individual research goals.'

Right on, NED! Personally, I'm never going to be overimpressed with software that's unlikely to be of much use to the average musician, but no doubt University studios will be queuing up to avail themselves of its printouts.

For more info on NED's products, contact Turnkey, Brent View Road, London NW9 7EL (Tel: 01-202 4366) or NED themselves at Box 546, White River Junction, VT 05001, USA. Tel: 802-295-5800.

Sliding SID

Just in case you're still under the impression that Commodore's SID is the be all and end all of micro music, have a look at this 'technote' from the UK side of the Commodore empire:

'Because of the variations in SID chips, it is not advisable to include the filter in the sound of commercial software. Doing so may result in sounds that are unexpected or not audible on some 64s. There is, of course, no problem in setting the filter in software one writes to one's own computer.'

Well, isn't it nice of them to let us know. . . . I hope owners rake Commodore over the coals for that. So, bow down, SID – make way for people like Yamaha who really know what they're doing with custom sound chips!

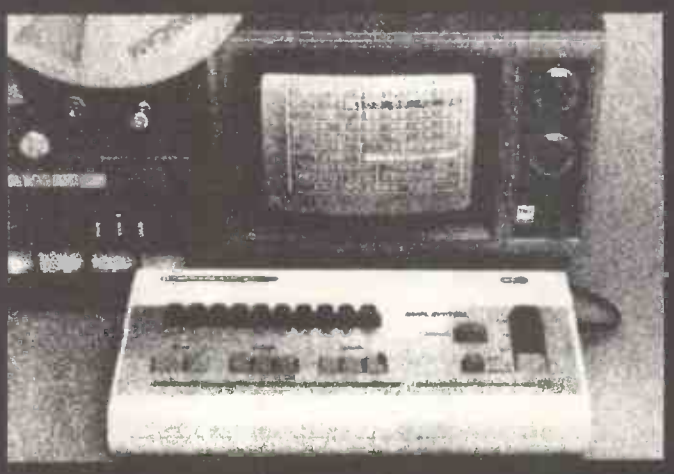
Synchronous SMPL

The third American company in this month's line-up, Synchronous Technologies, have just announced what they call the SMPL System, a 'low cost computer-based automation system designed specifically for the smaller recording studio.' What this does is to provide in one package a SMPTE Time Code generator, a SMPTE Time Code reader, an Autolocator, an automatic record in/out insert editing system, a Time Code-derived metronome, a 24 pulse/beat drum and synth sync, and a recorder remote control. Pretty impressive, all in all.

The unit plugs intc the normal remote control jack of any reel-to-reel multitrack or Portastudio-type machine, and then does its ingenious thing for your greater temporal edification. From the photo, it's pretty obvious that Synchronous Technologies have taken a VIC 20 as the basis of the unit and then added a new keyboard and escutcheon to customise it. What a dastardly cunning move.

The SMPL System is priced at $995 and is available direct from Synchronous Technologies, PO Box 14467, Oklahoma City, OK 73113, USA. Tel: 405-842-0680.

Come to think of it, Oklahoma City is also the hometown of PAiA Electronics (who seem to have gone to (digital) ground these last few years) and Craig Anderton (he of 'Home



Recording for Musicians' fame). Come to think of it a second time, Craig's very much into his 'Synchro-Sonics' binge at the moment, so I wonder whether Synchronous Technologies isn't just PAiA under a different guise with Craig at the helm. Intriguing. . .

David Ellis CM

Jellinghaus Music Systems

MIDI Computer Interface and Software

In the first of what we hope will be a good many such reviews, David Ellis **takes an in-depth look at a new MIDI interface and accompanying software for the Sinclair Spectrum and Commodore 64, now available in the UK through Rosetti.**

JMS hardware and software with accompanying MIDI keyboards and home computers.

The approach taken by Jellinghaus Music Systems to MIDI software is about as different to Sequential Circuits and their 64 Sequencer as chalk is to cheese. Rather than electing for the ROM cartridge approach taken by SCI, this German company make do with the convention of cassette loading and dumping of programs. That's good when it comes to updating software, or using alternative programs with the MIDI hardware, but tedious when you're faced with a recalcitrant cassette machine that's throwing a tantrum over mismatched signal levels.

JMS produce a wide variety of MIDI software and two different varieties of micro interfacing hardware, but finished versions are only just beginning to come into the UK, courtesy of Rosetti. This review reflects what we've been able to get hold of in the way of pre-production items from Germany and a quick glance over some of the finished UK versions.

MIDI Interface

JMS have designed this 'big' interface (their description, not ours) as a general purpose unit for getting virtually any sort of micro conversing with MIDI. By this, they mean any computer based on Z80, 6502, or 6510 processors (ie. Sinclair Spectrum, Commodore 64, Apple II, to name but a few). They also produce a cut-down ('mini') version of the interface (just MIDI In and MIDI Out) specifically for the Commodore 64 (DM99 or £29.95).

The asking price of DM330 (£89.95) for the more advanced member of the species is just about par for the course for this sort of hardware, and the current version of the interface reflects a licensing agreement between Siel and JMS, whereby the latter makes the former's interface and both sell them for use with their own software. The effect of this is that the interface is actually a good deal neater, more compact, and generally less problematic than the one I had a chance to play with after the Frankfurt Musik Messe.

One highly dubious side of the early version of the interface concerned the connector to the micro. Admittedly, the Spectrum isn't the easiest micro when it comes to finding ready-made edge connectors (there aren't any), but JMS' answer of a ribbon cable that went directly from the interface PCB to the Spectrum connector was a disaster and a half, because of the complete lack of any sort of cable restraint and the tendency for the ribbon cable wires to commit *hari kari* with wild abandon.

Fortunately, this has been corrected on the English version of the interface, and the connector should now stand up to a reasonable amount of wear and tear. One sensible addition to the basic construction of the unit is a 'bivalent' connector that allows the interface to be used with either a Spectrum or a Commodore 64.

Constructional points aside, the interface provides three MIDI Outs to the one MIDI In, a single MIDI Thru, and also includes an external clock five-pin DIN socket on the back panel. In fact, this socket has a slight identity crisis on the pre-production interface, as the legend below it said 'ext. clock' and the legend

above it 'foodswitch'. Serial transmission of liverwurst, perhaps? If music be the food of love, and all that. . .

Spectrum Multitrack Composer

Like every Spectrum program, the JMS Multitrack Composer (CMP1.1) comes on cassette (well copy-protected), and takes around a minute a load. Once that's done, you're greeted by the display shown in Figure 1. This informs you of the defaults adopted by the software, namely composing channel or track ('*kanal*'), actual MIDI channel ('*ch*'), MIDI mode ('*pom*'), and notes assigned to each channel ('*notenbelegung*'). At this point, you realise that it's time to dig out your German dictionary to help with elucidation of the display and the seven photocopied sheets that comprise the manual. Unfortunately, my dictionary had gone into hiding, so I was left to battle armed solely with my very rusty 'O' level German.

However, the software is so easy to get on with that it doesn't really matter whether or not you fully understand the lingo. To start entering notes, it helps if you get the *'notenbelegung'* column in order, as this determines how many events can be assigned to each track (or *kanal*). So, on booting up, the default is 1000 notes or steps for each of the eight tracks. It's unlikely that you'd want to continue with this state of equivalence, so keying '3' allows you to change the track allocation. All this means that each track has its own set of pages of memory, and the number of events going onto one track can't be more than what has been allocated at the start.

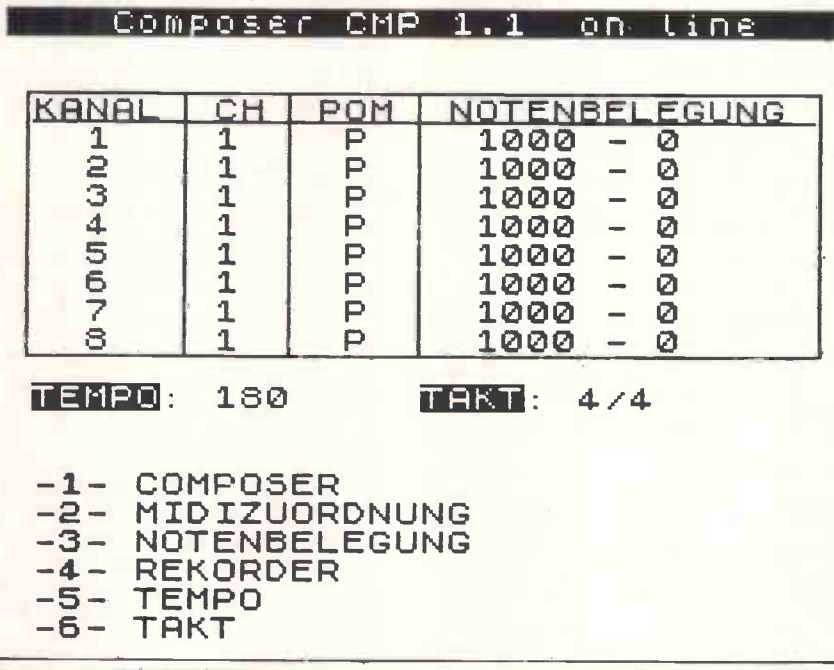
Recording

Having set the *notenbelegung* for whatever track you're about to record on, you're then obliged to choose a time signature out of 3/4 4/4, 5/4, and 7/8 (or just stay with the 4/4 default) before actually getting down to some work. Pressing '1' primes the system for accepting a monophonic line of notes on the chosen track. When that's been done and 'space' pressed to indicate the end of the sequence, keying 'R' allows you to see the entered notes in a tabular format (Figure 2).

Going from left to right, there's a column for each event number, the octave and note name (note the German convention of H for B natural), then the duration for each note, followed by the gate time (defaulted to 50%) and velocity (all 5 in this instance). Gate times can be from 10–90%, giving a useful range from *staccato* to *legato*, and the velocity can go from 0 to 9. In fact, 'real time' is something of a misnomer in this case as all notes are entered initially as quavers.

Having entered one line, you could, in theory, go on to enter another line on another track, but since you can't actually hear the first track whilst putting in a second, it's not exactly the most meaningful operation since the Creation. This

Figure 1.



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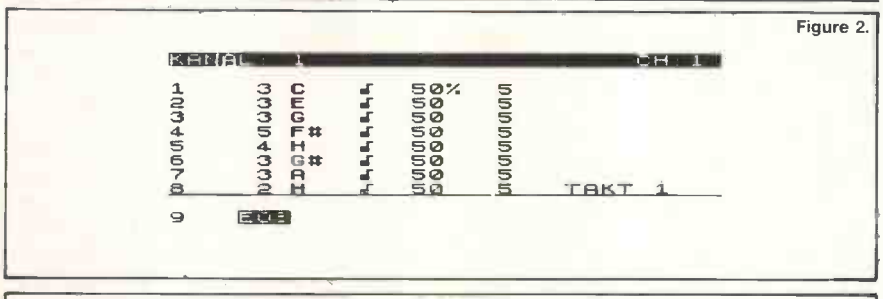

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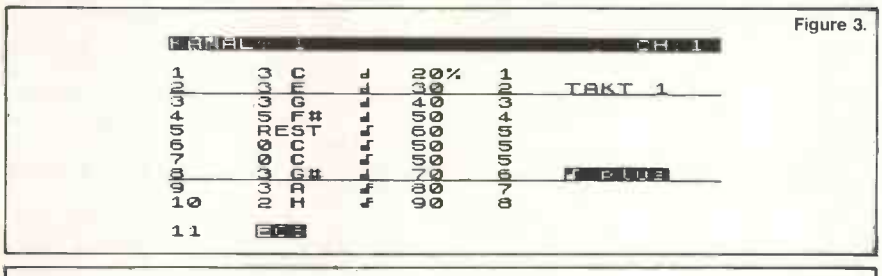
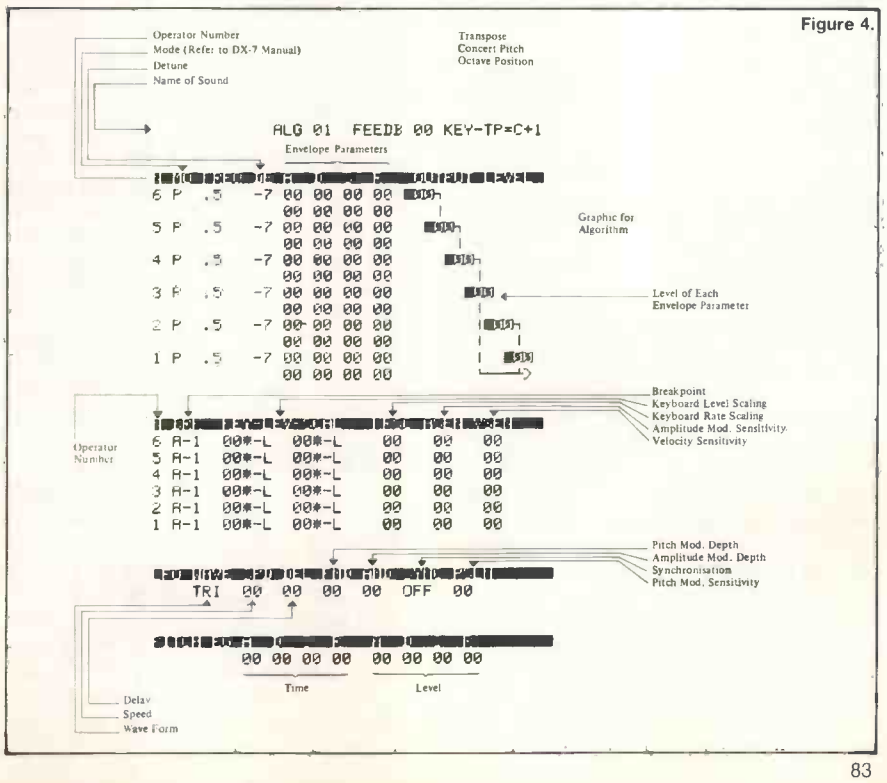


Figure 4.



is where the editing facilities come in to construct new parts out of old. One curious thing is that there doesn't seem to be any provision for instantly erasing either an individual track or the whole lot. It's certainly feasible to opt for starting recording all over again from Bar 1, but the old notes don't always seem to know that they're not wanted. In fact, the only way of being 100% sure of clearing the deck is to switch off and start all over again. Tedious.

Editing

Fortunately, the editing facilities make up for most of the problems on the recording side of the program. Once a section of a track has been entered on the keyboard, this can be copied to somewhere else on the same track, replicated on a different track, and transposed over a wide range, while any parameter can be changed, deleted, or inserted. In this way, you can turn the original real-time sequence of Figure 2 into the rather more finished variety in Figure 3, complete with rests, rhythm, phrasing, and dynamics.

These facilities work extremely well, but a few problems showed up in practice. First, the fact that the software is looking for note events that fit within the limited rhythmic sphere of the four suggested time signatures means that a difference of opinion between you and the micro when entering a sequence is a fairly frequent occurrence. In this situation, the software basically just gives up trying to allocate bar numbers, with the result that you end up with a stream of numbered notes out of house, home and bar. Now, this wouldn't be a problem if the software was totally event-oriented, but because both the record and play functions work on the basis of going from a particular bar, life can get rather difficult if the software has given up on your feeble attempts at being metronomic.

Playback

Playback is accomplished by deciding which bar you want to go from, and whether this should be just one track on its own or the whole multitrack piece. An overall looping function is also selectable, but this is as far as you can go in the way of repeat options with the present software. For some curious reason (and this is where a better understanding of the manual might have helped), the *'pom'* option seemed resolutely stuck in the Poly mode. Whilst this would have made sense if each track was polyphonic, it seems strange that a multi(monophonic)track sequencer doesn't have the option of sending all the software tracks in the Mono mode.

On the other hand, given that both of the MIDI synths (Roland JX3P and Yamaha DX7) that I successfully tried out with the software are of the sort that only operate in Poly or Omni modes, nothing would have been gained by going into Mono mode anyway. As far as I can work out, the point of the *'ch'* column is to group together tracks into particular MIDI channels. So, for instance, you could group together tracks 1, 2 and 3, and send these off down MIDI channel 1 in Poly mode to one keyboard, send tracks 4 and 5 down channel 2 to a second keyboard, and the rest *via* channel 3 to a third. That, of course, is where those three MIDI Outs really come in useful.

Other Products

The Commodore 64 equivalent to the Spectrum Multitrack Composer (the RMS20C in Rosetti terminology) offers 9000-note storage on six software tracks. This time, though, all the note input takes place in step time. The software is provided on disk rather than cassette, though given the slowness of the Commodore 1541 disk drive, that's something of a mixed blessing. On loading up the program, you can choose between internal or external sync (though only the 'big' interface allows you to use the latter facility), and then a main menu gives the options of note entry/ playback, MIDI assignment, and disk operations. Like the Spectrum program, MIDI control allows you to choose between the three MIDI modes for the six channels, and then to send the channel data to individual keyboards with their own receiving channel IDs or to group them together in duos, trios, or whatever.

Note entry with this software is much like any other step time sequencer, with columns for channel (1–6), step (1–1500), note (eg. C4), duration (1–240), and gate time. Velocity can then be programmed in after the (note) event by assigning values other than the default (64) to whichever steps and channels you're interested in. Editing facilities also allow sequences of steps to be copied or transferred from one channel to another, notes to be inserted, and any of the channels deleted.

All in all, a very flexible and usable piece of software.

Finally in this round-up of JMS' offerings, there's the DX7/9 Sound Editor program (RMS21C) for the Commodore 64 and Spectrum (DM185 or £49.95). The basic idea behind the Sound Editor is to enable the user to change and display all the DX's FM parameters in a way that's more manageable than with the small LCD display on the keyboard. This it certainly does, but it doesn't make understanding the nature of FM sound, or what changes are needed to elicit what effect, any easier to fathom out (Figure 4, for instance) than when using the keyboard alone. JMS also offer a DX Sound Library for both micros (again, £49.95) that enables 100 new sounds to be loaded into the keyboard from tape (Spectrum) or disk (Commodore 64).

Conclusions

The good thing about JMS' MIDI Computer Interface is that it has three MIDI Outs. Because most interface-producing companies seem to have a predilection for just a single MIDI Out, and because many keyboards, drum computers, and so on are being produced without MIDI Thrus, this is undoubtedly a major point in its favour.

The unit also goes a good way in the direction of becoming an 'ideal' MIDI computer interface by virtue of the bivalent connector for both the Sinclair Spectrum and Commodore 64, though it could go further if JMS provided a socket on the back of the unit and a range of different cables for connecting the interface with different micros. Overall, then, I'd say that this interface is probably one of the better bets on the market if you have a Spectrum or Commodore 64 and want to use it in conjunction with MIDI-equipped musical hardware.

The Spectrum Multitrack Composer software also seems to work very well, despite the misunderstandings that occurred between me, the manual, some MIDI commands, and the occasional bug or two. The version on sale by Rosetti Music Systems (RMS12S, price £49.95) translates the displays into English (which helps), but provides only the bare bones of the story with a rather feeble attempt at a manual that's considerably inferior to the German original. Curiously (and infuriatingly), the German-to-English translation of the software leaves the H for B natural. Very silly. . .

I was quite impressed by the program's editing facilities, but they need to be pretty special if you're to stand any chance of ordering together eight monophonic lines into a meaningful whole. What I don't understand is why the program doesn't go the whole step time hog and allow you to key in note events without playing the keyboard. It's all very well if you're only recording a short riff-based sequence (where assembling the piece is mostly a question of copying notes from one track to another with the odd transposition here and there), but for anything more complex, with rather more in the way of individualistic parts, such an approach is going to be pretty limited, I feel.

At the moment, the Spectrum Multitrack Composer seems rather stuck in between the real time and step time camps, having neither the provisions of a live, overdubbable polyphonic sequencer or an MCL suitable for putting together long, complex pieces. Still, you have to remember that such limitations are only those of a £49.95 program, not of a hard-wired unit that you're stuck with for life. But given that the major point of attaching a micro like the Spectrum to MIDI is to provide a flexible programming medium, the program could do with a few revisions to bring it more in line with that intention.

The Commodore Composer program, on the other hand, comes a good bit closer to being the real McCoy, and I look forward to the time when there are MIDI keyboards around that are capable of doing its Mono mode potential justice. Against this, the DX Sound Editor program seems expensive and rather unimaginative – a golden opportunity missed, I'd say.

David Ellis **CM**

Availability: all the above items are distributed by Rosetti, under the banner of Rosetti Music Systems. For info on stockists, contact Rosetti at 138–140 Old Street, London EC1V 9BL. Tel: 01-253 7294. Prices are given in the text.

STAGEFRIGHT

It's probably true to say that if electronic music suffers from one major promotional failing, it is the relative scarcity of live performances. Most electronic musicians who've made successful recordings fear of venturing out on the road because of the technical complexity involved, but respected EM composer Ian Boddy **has managed to shake off such anxieties and now has no fewer than 25 live performances under his belt. Here he gives some friendly advice on how to make the transition from front-room to concert hall as painlessly as possible, while next month's issue will see a detailed run-down of his own equipment line-up and how it's used live.**

The author in concert.

Electronic music concerts are in general few and far between, a situation that's more often than not engendered by the sheer technical complexity of staging such an event. However, if you can keep a realistic sense of proportion, such a concert can be well within the capabilities of many musicians whose output is normally confined to home, and I hope this article will give you the necessary impetus to try your hand at a gig or two.

Please remember though that what I'm going to talk about should not be regarded as a set of hard and fast rules. Rather, these are comments based on my own experiences from the 25 or so concerts that I've played over the last four years. Furthermore, there are many different styles encompassed within the general term 'electronic music', ranging from *musique concrète* and classical performance right through to electropop, and obviously each field has its own individual problems and solutions. Since my own particular style falls into the instrumental category inhabited by Tangerine Dream, Klaus Schulze, Jean-Michel Jarre, *et al*, I'll be concentrating for the most part on the problems of performing that sort of music, though at the same time, there's no reason why some of the lessons I've learned shouldn't be of value to performers of a slightly different creative bent.

Simplicity

The first myth I want to shatter is that to put on a concert of electronic music that's going to be taken seriously, you have to invest in vast quantities of keyboards, sequencers, outboard units, and so on. OK, we've all seen pictures of Tangerine Dream & Co surrounded by mountains of equipment, but is all that gear really necessary? Well, yes and no. Without a doubt, the sort of artists mentioned above do succeed in making a very professional sound and are able to perform complex pieces of almost studio quality in a live situation, and this is often a direct result of their having a large

number of instruments from which to choose – they've also got the money to pay for them! However, there's no reason why we mere mortals shouldn't set our sights a little lower.

The simplest concert set-up I ever used was at a poetry reading where I played two ten-minute improvisations using a Moog Opus 3 string synth and a Roland RE501 chorus/echo machine. I used the sound-on-sound facility on the 501 which effectively gives a delay of just under two seconds – sufficiently long for me to be able to play over the top of repeated melodies, producing some pretty impressive canon-like sequences. Make some rapid changes in synth settings and this delay can also give the illusion of two or more different sounds occurring simultaneously, and the effect can then be used to build up chordal layers even if all you have is a monophonic synth.

This technique lends itself very well to the 'ambient' style of music popularised by Brian Eno and his contemporaries, which is itself particularly well suited to musical performances at art galleries, poetry readings and so on.

The Next Step

The above set-up is very simple – one synth and an echo machine – but what do you do if you want to perform music of a more complex nature? As I see it there are three options, all of which have their own set of advantages and disadvantages.

Backing Tapes

This is probably the easiest solution, but even in the current technological climate, there are still some people who regard this as 'cheating', so it's wise to justify in your own mind from the outset if and when this can be regarded as legitimate practice in the context of your music. Some of the situations in which I use backing tapes are as follows. First, recreating a complex studio piece which I am unable to perform on my own; second, for sounds which cannot be performed in real time (eg. slowed down or reversed tape effects), and third, to provide areas of sound texture during which I can alter synth settings.

I feel these are all perfectly acceptable uses of backing tapes, but there is one form of 'cheating' that I could never sanction, and that is miming. Whatever you do, don't try and delude your audience: they'll probably realise what's going on a few minutes into the concert, and all you'll have achieved will be a cheapening of your performance. So, if you haven't really managed to convince yourself that backing tapes are artistically ethical. don't resort to just playing along to a pre-recorded album.

Of course, backing tape unbelievers can always resort to the use of sequencers and/or drum machines, but let's face it, some of the newer designs in this area have such huge memory capacities that if you're against backing tapes, you've got to be against using these machines as well, or else risk being accused of gross hypocrisy.

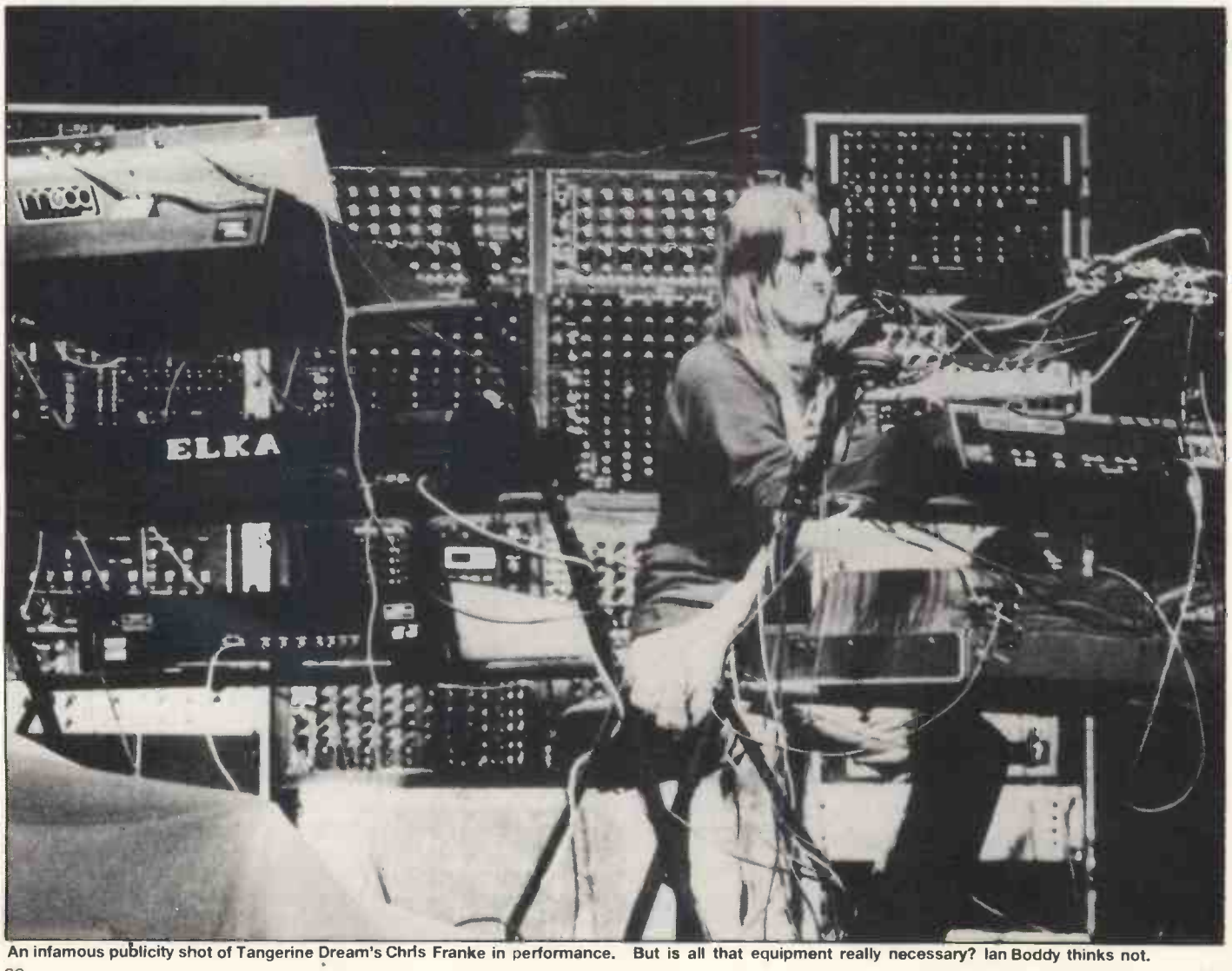
Well, that's my view anyway. If it seems as if I'm going on about this subject at rather too great a length, I apologise. But I do feel that the excessive use of backing tapes has caused many people to gain a vague impression of electronic music as being dull, monotonous and repetitious, lacking in human invention. And that impression, is, of course, misguided.

Of course, your tapes can be anything from two-track stereo cassette to multi-track reel-to-reel. I think it goes without saying that you should try and go for the best tape format you have access to: always remember that at a gig, your backing tape is replayed at a fairly high level, and that any recording inadequacies are going to show up rather more clearly than they would do at home, especially tape hiss.

Further Instrumentation

The second possibility of simply acquiring more musical hardware is one that almost all musicians contemplate at some stage or another in their career, but it's something that needs a great deal of careful consideration if you're not to make a lot of rather expensive mistakes.

Assuming you're not a millionaire, you're going to want gear that gives you maximum flexibility for minimum cost. Inevitably, this involves a degree of



An infamous publicity shot of Tangerine Dream's Chris Franke in performance. But is all that equipment really necessary? Ian Boddy thinks not.

compromise, but assuming you're performing solo, the following is a general list of the sort of equipment line-up you might need to make your concerts interesting and varied soundwise.

First up is polyphonic synth, and preferably a programmable one because having preset buttons is such an enormous help in a live situation: once you've used them you never want to be without them. You'll probably want a monosynth as well, since one of these can be controlled by a sequencer or drum machine, as well as acting as a lead instrument in its own right. It goes without saying that you've got to be sure your intended equipment is readily interfaceable otherwise you might as well halve the amount of gear you include in a performance; make sure your system works before you part with any hard-earned cash.

A third – often overlooked – possibility on the keyboard front is that of getting a modular system. Although these systems have never been exactly thick on the ground, they can in fact be picked up surprisingly cheaply secondhand, and have the advantage of being able to carry out various functions at once.

In addition to equipment that's directly involved with sound generation you're also more than likely going to want to invest in some outboard effects such as reverb and echo units, which can usefully be employed in helping to counteract the adverse effects of concert hall acoustics.

Now, obviously we've come quite a long way from the very simple set-up I discussed earlier, but it's still nothing extraordinary, and in fact bears more than a passing resemblance to my current live equipment line-up, to be discussed in more detail in part two of this article. As a system it's both compact and flexible, but don't worry if you can't afford to go out and buy an equipment array like it all in one go: it's taken me the best part of four years to amass this line-up . . .

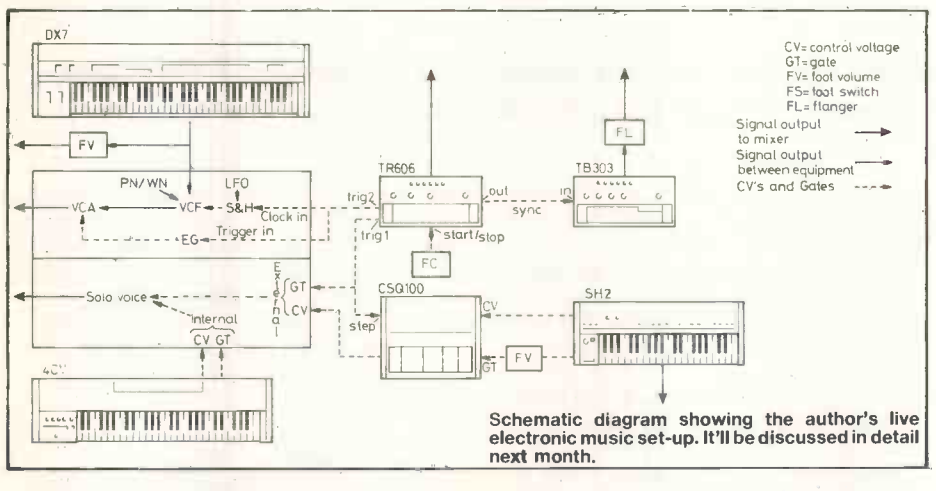
If you find yourself without any real hope of ever acquiring such a set-up, there's bound to be a temptation to gain access to better equipment by hiring or borrowing it, but beware. Make absolutely sure you're conversant with the functions and controls of any instrument you borrow before you take to the stage, otherwise you could find yourself in the middle of an inspired solo when it suddenly becomes apparent you can't remember how to turn off the drum machine you've got on loan!

Group Performance

Performing electronic music as a band is something you see very rarely indeed, largely because the number of musicians able or willing to undertake such work is extremely limited, for reasons we've already discussed.

Whether or not playing as a group is a viable proposition for you will depend to a large extent on your own personal and musical circumstances. All I can say is that no matter how closely the members of a group work together, there is always a degree of compromise involved in the end product that simply doesn't exist if you're playing on your own and thereby retaining complete artistic control. And that's always assuming you can find people that are suitable in the first place . . .

In the past I've performed several concerts with other people – usually as duos – but nowadays almost every gig I play is solo, simply because I prefer working that way and because arranging rehearsals is no problem. It's well worth bearing the latter point in mind, because if you're using a lot of gear, you're more than likely going to run into problems of logistics when it comes to getting several people to transport their equipment to, and set it up at, a suitable rehearsal venue.



Schematic diagram showing the author's live electronic music set-up. It'll be discussed in detail next month.

Concert Arrangement

Once you've established a more complex performance set-up by use of one of the methods discussed above (or possibly through a combination of all three!), it's now almost inevitable that you're going to face any number of further problems before you finally mount a really successful electronic music concert. There follows a list of the sorts of questions you might be asking yourself at this stage. Where do I play? How do I advertise the gig? How do I get my equipment transported? Do I get paid? If so, how much? Is a decent PA provided? And so on *ad infinitum*.

Frankly I don't think it's worth dwelling on too many of these problems in detail here, as a lot of them are common to almost every sort of modern music event, not just performances of electronic music. However, I will just make a brief mention of choice of venue, because unlike pop or rock music, electronic concerts can acquit themselves very well to environments other than traditional gig venues. Try various arts centres, universities, art colleges, galleries and so on, or maybe even a festival such as the annual UK Electronica.

The question concerning PA equipment also deserves more than a passing mention. The sort of music under discussion here simply cannot be treated in the same way as conventional rock music when it comes to amplifying the sound so that the audience can hear it. For one thing, in the case of electronic music sound quality is often more important than sheer volume, so if a PA is being provided at the venue, try and have a chat beforehand to the person responsible for its well-being, just in case he's expecting the usual rock band and its accompanying sonic demands.

For smaller venues, it may be quite feasible for you to provide your own PA, which is almost always preferable as you will at least be familiar with the characteristics of the equipment you're using. A mixer, a power amp and a pair of largeish monitor speakers may be all that's required.

Mixing your own sound can be a real advantage, not only because it gives you complete control over your sound balance, but also because that control enables you to use the mixer as an extension of your instrumental armoury, so that changes in sound level become as much a part of the performance as playing the instruments themselves. Such control is also essential if your music contains instrumental passages, since it simply isn't feasible to communicate complete changes of mix to someone on the other side of a hall.

The disadvantage of doing your own mixing is that you're rapidly going to run out of hands. If you're playing two keyboards at once you can't very well reach over to the mixer to change a couple of levels. Still, I manage to get around this to an extent by using volume pedals and making extensive use of the rotary level pots on the instruments themselves – they're certainly a lot closer to hand than the mixer will ever be!

The last point I want to make is perhaps so obvious that it may well be overlooked by the budding performer; know your instruments *inside out*.

Assuming your keyboard technique is up to the standard required to play the compositions in your running order, you should also be fully in command of the different pieces of equipment in your possession, which means knowing everything from how to turn a drum machine off (as mentioned earlier) to what each module of a synthesiser is used for so that, if things start going disastrously wrong, you can modify a sound without too much trouble.

If you're using a lot of hardware, it's inevitable that at some time or other at least one item of equipment will go wrong, so don't get hung up about it before every gig. Just make sure you've got some sort of back-up you can drag in if need be: this can take the form of either a back-up instrument or additional material that isn't dependent on particular instruments being available. In essence, don't panic!

Ian Boddy **E&MM**

E&MM Digital Music

The Programmable Digital Sound Generator

Part 3: The Detailed Program Interface

Designer Alan Boothman **takes a look at the interface section of this new add-on music system for home computers, paying particular attention to address locations.**

In order to control the PDSG, a single page of address locations is required within the memory map of the host computer. The board is configured to match the extended page concept of the BBC Model B computer, and is initialised by writing &70 (112 in decimal) to address &FCFF, which sets a latch until a Reset operation occurs. All further addressing is then carried out using page &FD, ie. locations &FDOO to FDFF. Details are given later on how to disable this part of the system to interface with other computers.

Within the chosen page, addresses 0-127 are reused four times in order to allow Music Load (0-127), Waveform Load (0-127), Low Auxiliary (Keyboard) Read (0-31), and High Auxiliary Read or Write (0-15). Addresses above 127 are reserved to set the Control Register mode, which defines which of the above is active, and includes on/off control of sound and interrupt operation. Addresses 129-255 are not normally used.

The Control Register is set up by writing to address 128 using the data shown in Figure 1. On powering-up, or after a computer Reset, the register is set to zero, thus disabling the sound output and interrupt generator. One or both of these may then be enabled, together with one of the four PDSG functions, by writing the sum of the required activities to address 128. Only one PDSG function should be selected at a particular time: the others are automatically deactivated by the zeros in their bit positions.

Music loading involves the writing of data to the registers shown in Figure 2, which cover Level, Waveform, Channel, and Frequency as required for each logical oscillator. In order to change an oscillator parameter during normal operation, when both sound and interrupt are required, writing 7 to address 128 sets the Control Register, after which data corresponding to the new value is written to the relevant address (0-127) from Figure 2. The Control Register will remain set in Music Load mode until a further write operation takes place to address 128.

Level data is a number between 0 and 255, which gives a linear increase in amplitude. Waveform and Channel are combined into a single number. For the normal configuration of two 2K×8 memories, the 128 Byte tables in memory 1 have base numbers of 0-15 (31), and 32-47 (63) in memory 2. The figures in brackets indicate the corresponding numbers if 4K×8 EPROMs are used in either position.

The channel positions are defined as Left 64, Right 128, and Centre 192. Consequently, in order to select the first waveform in memory 2 and the right-hand sound channel, a value of 160 (32+128) is written to the address of the required oscillator. Figure 3 sumarises the relevant data to obtain this information for the required combination. Two bytes are required to define frequency and a suitable formula will be given later.

Waveforms are loaded in 128 byte single-table streams. The Control Register is first set to Low Auxiliary by writing 8 (9, 10 or 11) to address 128, and the waveform table base number is then written to address zero. The Control Register is next set to waveform transfer by writing 32 (33, 34 or 35) to address 128. The stream of table data is then written to address 0 to 127 in the PDSG. A routine can be used to load a waveform set by repeating all the above steps for each table.

The Auxiliary Bus

For programming, the bus is split into two parts, and although the Low Auxiliary Control position was used in the write mode to direct waveform table transfer, the Low Auxiliary bus is actually read only. 32 addresses (0-31) are available on the eight-bit bus, which allows reading of up to 256 switches with suitable decoding. The 61-note keyboard adopted has two pole switches, using bit 4 of the address to define which pole is being scanned. Addresses 0 to 7 therefore scan the up position of the eight blocks of keys, with the top key (number 61 on the keyboard) being treated as number 63 in the scan, and the footswitches as numbers 1 and 2; addresses 16 to 23 scan the corresponding down position of the key blocks. Addresses 8 to 15 and 24 to 31 may be used for additional input devices, but in hardware terms, it should be noted that bit 4 is actually inverted. To scan the keyboard the Control Register is set to Low Auxiliary by writing 8 (9, 10 or 11) to address 128 and then reading from the required address between 0 and 31.

Unless High Auxiliary is selected in the

Control Register, bit 5 of the bus remains at level 0 and is used as a device select level, ie. high for peripheral devices (other than the keyboard) which may be connected to the bus. In High Auxiliary mode, bit 4 should always be fed with zero from the software, and in the bus it will appear as a negative Write Enable pulse. The High Auxiliary bus is operated by writing 16 (17, 18 or 19) to address 128 and then reading or writing addresses 0-15.

Alan Boothman **CM**

Figure 1. Control Register and Function Summary.

Control Register

Waveform Transfer	32
Auxiliary Bus High	16
Auxiliary Bus Low	8
Load Music Registers	4
Enable Interrupt	2
Enable Sound Output	1

Write to Address 128

Disable PDSG	0
Music Load	4–7
Wave Number	8–11
Wave Transfer	32–35
Keyboard Read	8–11
High Auxiliary	16–19

Figure 3. Data to give Waveform and Channel. See text for amendments if 4K×8 EPROMs are used.

Memory 1	0–15
Memory 2	32–47
Left	64
Right	128
Centre	192

Figure 2. Music Registers.

Music Registers

Oscillator	Level Register	Waveform & Channel	Frequency Low	Frequency High
0	0	63	126	127
1	2	1	64	65
2	4	3	66	67
3	6	5	68	69
4	8	7	70	71
5	10	9	72	73
6	12	11	74	75
7	14	13	76	77
8	16	15	78	79
9	18	17	80	81
10	20	19	82	83
11	22	21	84	85
12	24	23	86	87
13	26	25	88	89
14	28	27	90	91
15	30	29	92	93
16	32	31	94	95
17	34	33	96	97
18	36	35	98	99
19	38	37	100	101
20	40	39	102	103
21	42	41	104	105
22	44	43	106	107
23	46	45	108	109
24	48	47	110	111
25	50	49	112	113
26	52	51	114	115
27	54	53	116	117
28	56	55	118	119
29	58	57	120	121
30	60	59	122	123
31	62	61	124	125

DO-IT-YOURSELF
The RackPack

Build this inexpensive, rack-mounted power supply unit, capable of delivering 12 volts at up to one amp and suitable for powering many rack-mounting projects, including the Syndrom. Design and description by Paul White.

Most audio signal processors make extensive use of operational amplifiers which, thankfully, have fairly standard power supply requirements. The RackPack provides a split rail, regulated supply of ±12 volts and features several power outlet sockets so that more than one processor may be powered simultaneously, the maximum available current being one amp. The Syndrom project, although specified as requiring a nine volt supply, will run happily from the RackPack, and it should be possible to run up to six Syndroms from a single unit.

Circuitry

The output from the transformer is full wave rectified and smoothed, giving an unregulated voltage of roughly ±18 volts ($12 \times \sqrt{2}$) which provides sufficient headroom for the regulators to operate reliably. A toroidal transformer was chosen for its low stray electromagnetic field but, as it takes a high switch on current, an anti-surge mains fuse is required.

The regulation is performed by the industry standard 78 and 79 series monolithic regulator ICs and, as can be seen from the circuit diagram, this facilitates a simple design which enables the component count to be kept to an absolute minimum. Two LEDs are incorporated which monitor the output voltage so that an overloaded or shorted power rail is instantly evident.

Construction

If the rack case design is to be used, drill the metalwork first (Figure 2) and then paint the front and rear panels. The dimensions given are those used on the prototype, but positioning of switches and sockets may be altered if required and more than four output sockets may be fitted if needed. It is also possible to fit two PCBs into the box and in this case, a larger transformer will be required (see parts list). the transformer is fitted by means of a central bolt and a set of mounting washers is provided as part of the mounting kit (Figure 3). Wire up the DIN sockets as shown in Figure 1 and insulate all exposed mains connections with rubber sleeving or PVC tape.

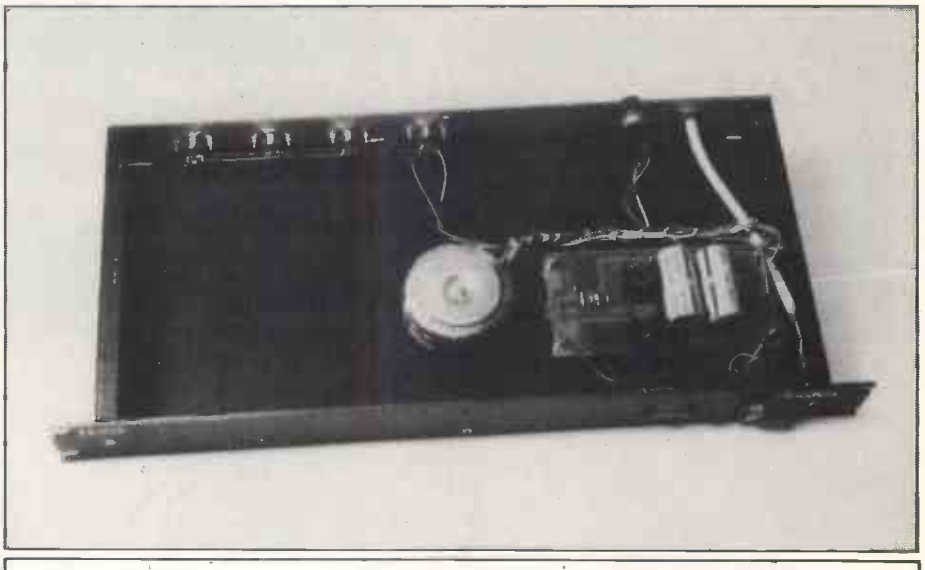
The PCB presents no assembly problems (Figure 4), but as always, check the polarity of electrolytic capacitors and semiconductors before applying power. As the regulators are capable of supplying up to one amp, heatsinks must be fitted to RG1 and RG2. It's necessary to mount the PCB on spacers, and short lengths of ballpoint pen serve well in this capacity, four Ba bolts being used to secure the PCB to the case. Internally, the wiring layout is not critical and the photograph should give you a general idea.

Testing

No sandbags are required for this one. Simply turn on the mains with a long stick and see if the LEDs come on. If not, put the fuse in and try again! Check that the polarity of the output sockets matches the device(s) that you're going to run from the RackPack; even a momentary reversal of polarity can have serious consequences.

There should be few or no problems encountered in building the RackPack, and it should work as a useful power supply for some years to come.

Paul White **E&MM**



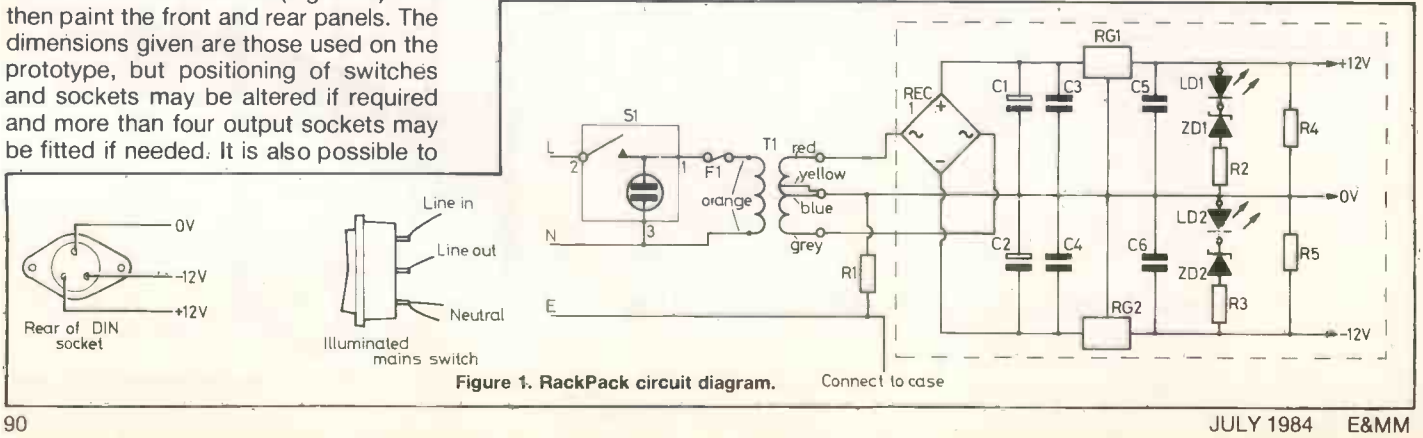


Figure 1. RackPack circuit diagram.

RackPack Parts List

Resistors
(All ½W metal film)

R1, R2, R3	100R
R4, R5	4K7

Capacitors

C1, C2	2200uF 63v
C3, C4, C5, C6	0.1uF

Semiconductors

Rec 1 (W01)	1.5A bridge 100v p.i.v. (QL38R)
RG1	7812
RG2	7912
LD1, LD2	Standard LEDs with mounting ferrules
ZD1, ZD2	10v zener diode

Miscellaneous

Heatsinks – 2 required (FL58N)
Transformer 12-0-12 (YK10L) or (YK15R) to run two PCBs
DIN sockets (3-pin 180°)
Mains switch
Fuseholder
2A slo blo fuse
4Ba nuts, bolts and washers
PCB (available direct from E&MM price £3.95, cheques/POs payable to Glidecastle Publishing Ltd. Please allow 28 days for delivery.)

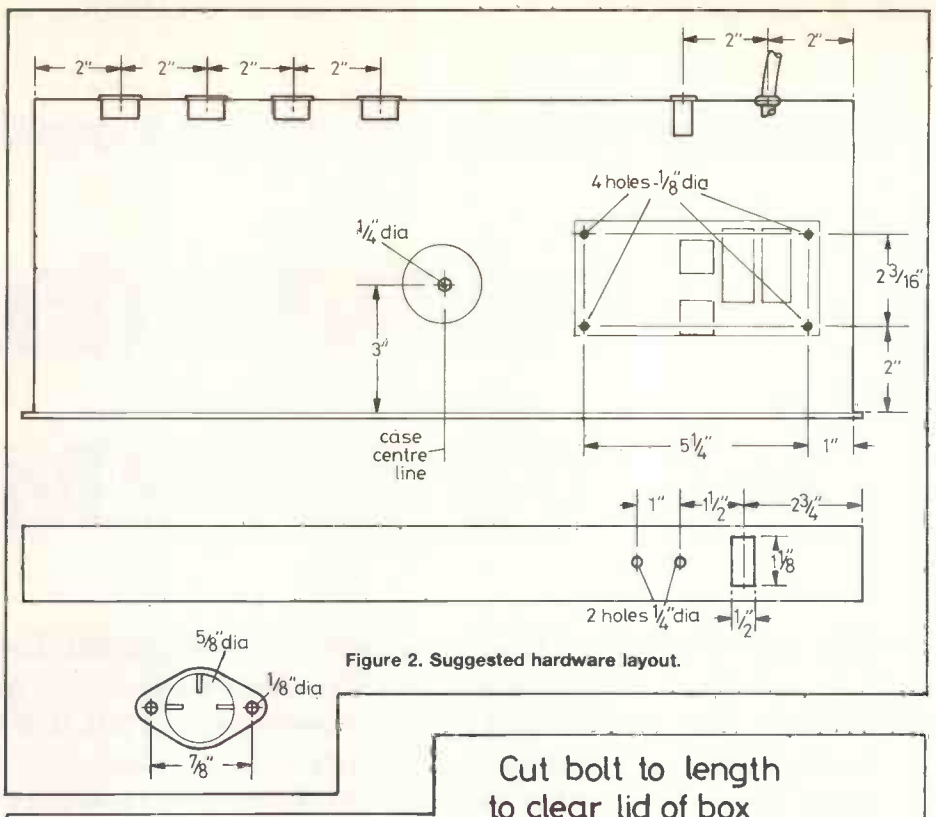


Figure 2. Suggested hardware layout.

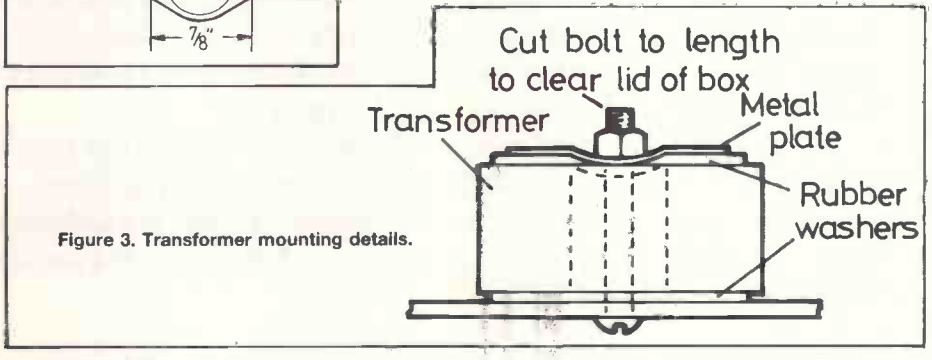


Figure 3. Transformer mounting details.

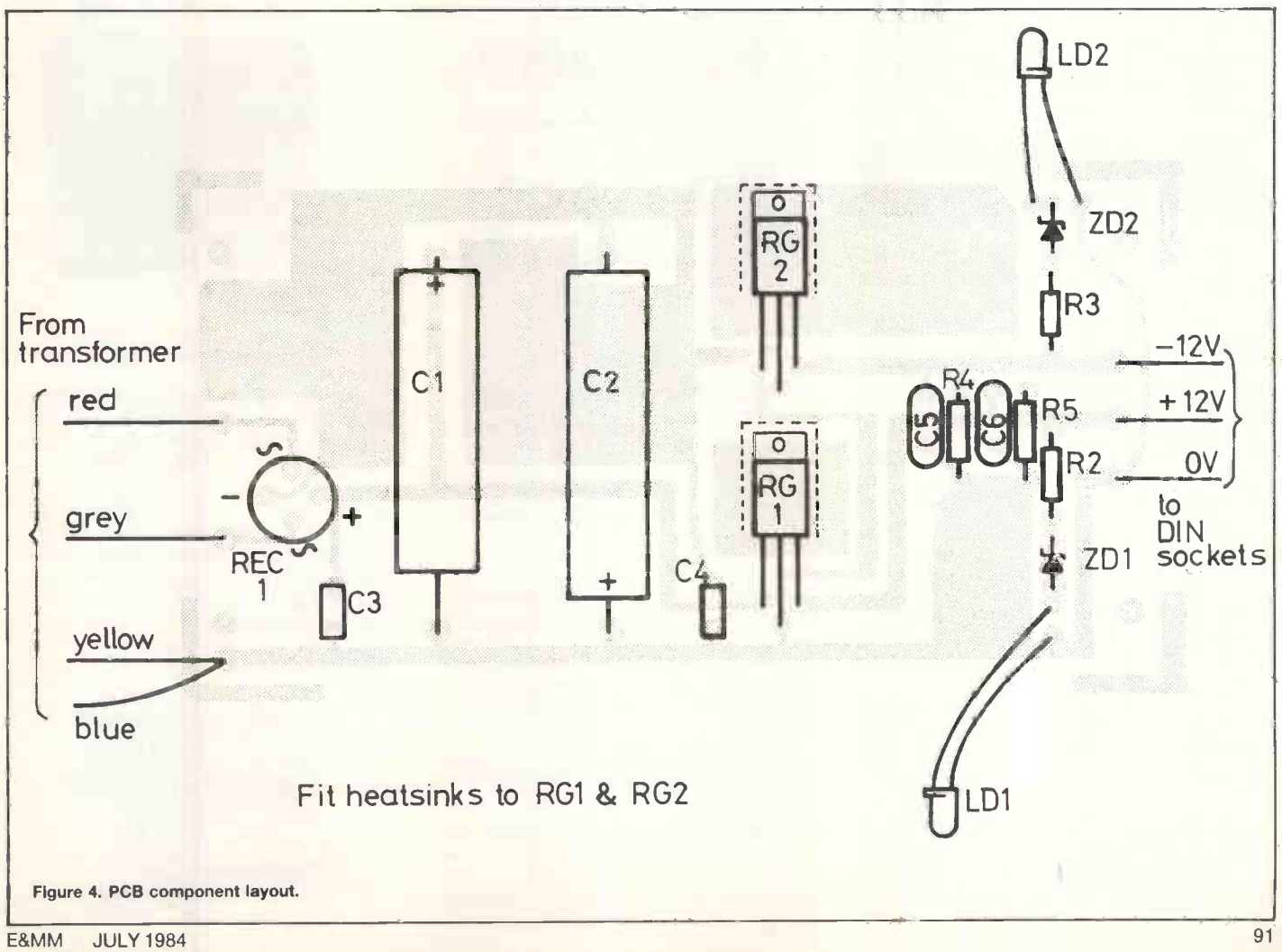


Figure 4. PCB component layout.

PROJECTED DEVELOPMENTS

The self-build electronic music projects published in E&MM over the years have gained a reputation for simplicity of construction and effectiveness of design. The following guide summarises all the E&MM projects for which complete kits or printed circuit boards are still available: readers should note however that a number of these are in short supply and may therefore not be available for much longer.

All prices quoted are inclusive of VAT and postage and packing – please allow 28 days for delivery. Send your order, with payment in sterling cheque, postal order or bankers' draft payable to Glidecastle Publishing Ltd., to Mail Order Department, E&MM, Alexander House, 1 Milton Road, Cambridge CB4 1UY.

8201 Line Mixer **August '82**

A 19" rack-mounting 8-into-2 line mixer, the 8201 has eight input channels, each with Level and Pan controls, complete with Foldback output. Ten identical PCBs

are used in a modular design, one for each of the eight channels and two for the final mix stages.

The unit is ideal for keyboard or drum machine sub-mixing and foldback applications, and the set of 10 PCBs for the project is available from E&MM at £11.50.

An aluminium panel (4mm thick, 19" wide, 2U high) is available from West Hyde Developments Ltd, Unit 9, Park Street Industrial Estate, Aylesbury, Bucks HP20 1ET. Order Code W19402A, price £3.45.

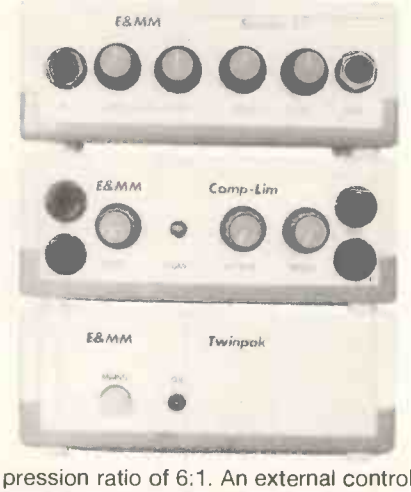
Twinpak **September '82**

A self-contained power supply designed to power and complement audio processing units such as the Comp-Lim, Sweep EQ and Shaper. Regulated ±15V rails are provided at 120ma.

A complete kit of parts, including the case and hardware, is available from E&MM at £24.95. The PCB is also available separately at £2.25.

Comp-Lim **September '82**

A useful two-channel unit which can be used to compress and limit unpredictable audio signals. The circuitry has ganged Attack and Decay controls and a compression ratio of 6:1. An external control input is provided for special effects.



A complete kit of parts, including case and hardware, is available from E&MM at £29.95. The PCB is also available separately at £2.99.

Sweep EQ **November '82**

This audio processor provides two variable equalisation stages, each with 30dB boost or cut. The low frequency selection operates from 50Hz to 700Hz, while the high frequency region covers the 700Hz to 9kHz range.

A complete kit of parts, including case and hardware, is available from E&MM at £28.95.

Synblo **January '83**

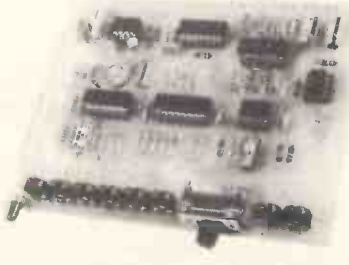
This unit allows breath control to be provided for guitar, keyboards or any other electronic instrument. Dynamic expression can, therefore, be added to a static sound using only the player's breath.

Controls on the front panel allow adjustment of breath control over the internal filter and amplifier, and the PCB is available from E&MM at £2.45.

Synbal **February '83**

Complex metallic percussion sounds can be generated by this versatile module. The circuit can be triggered from drum pads using mic pickups, or from a drum machine or computer.

Provision has been made on the PCB to allow preset or rotary controls to be



used. A stereo output is also provided to allow a bank of modules to be connected together and panned individually.

The PCB is available from E&MM at £3.25.

Shaper **March '83**

An exciting envelope shaper that offers control over Attack and Decay of guitar, keyboard and even drum sounds. Other controls include Threshold and Punch (for really percussive sounds): the PCB is available from E&MM at £3.25.

Syntom II **April '83**

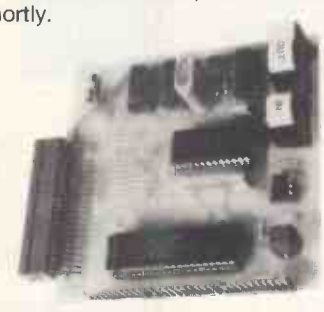
A percussion module that can be varied to provide Bass Drum, Snare or Tom sounds and offering a wide range of controls, including Decay, Noise Pitch, Tone Pitch, Noise/Tone Mix, Bend, Roll Rate, and Volume. The circuit can be triggered from drum pads using mic pickups, or from a drum machine or computer, and features dynamic response and an optional stereo output.

The PCB is available from E&MM at £3.25.

MicroMIDI **May '83**

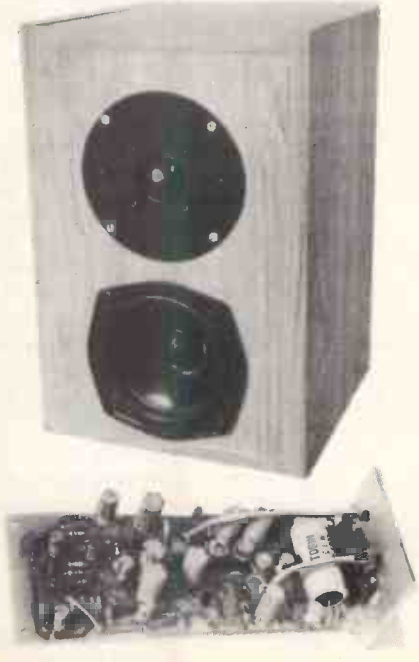
A single-board serial interface that will link a MIDI synth to the Sinclair Spectrum microcomputer. Features include three parallel I/O ports, crystal controlled data transfer, and opto-coupled input.

The PCB is available from E&MM at £4.25, while a PCB for MicroMIDI II (see elsewhere this issue) will be available shortly.



Active Speaker **May '83**

A 30W speaker featuring independent power amplifier and built-in power supply at a reasonable cost. The low-frequency



cutoff is 70Hz, but if matched with the Woofer (described in E&MM March '81) a full scale active stereo system can be formed which responds from 30Hz–20kHz within the −3dB points. The PCBs are available from E&MM at £3.75 each.

OMDAC **June '83**

The Omdac, when used in conjunction with a Z80-based microprocessor, will provide eight sets of gate, trigger and

control voltages compatible with most one-volt-per-octave synthesisers.

The August '84 issue of E&MM will feature update information for this popular and versatile project, and meanwhile the PCB is available from E&MM at £5.95.

Synclap **September '83**

Another percussion module which simulates handclaps and can be added to both the Syntom and Synbal modules to provide a complete range of electronic percussion. The Synclap can be triggered

via pads, mic or switch and controls include: Threshold, Spacing, Frequency, Resonance and Ambience.

The PCB is available from E&MM at £3.25.

Mains Distribution Board **October '83**

Provide AC power for your equipment safely and easily with this mains transient protection distribution unit. A complete kit of parts is available from E&MM at £17.50. Please note that the supplied sockets (five) are Euro type, without plug section.

Valve Driver **December '83**

An effects pedal designed to simulate the 'valve sound' as well as providing a wide range of distortion effects. The unit can be powered from an external 9V supply or battery operated, and controls include Intensity, Even/Odd Harmonics, and status LED. Frequency response is 8Hz–22kHz (−3dB). A complete kit of parts is available from E&MM at £23.95.

Bass Pedal Synth **April '84**

A pedalboard that will interface easily with any one-volt-per-octave synth with CV and gate sockets, featuring first-note priority and multiple triggering. The PCB is available from E&MM at £5.95.

String Damper **May '84**

The String Damper provides the guitarist with automatic damped string effects, as well as a range of envelope and gate processing, housed in a neat footswitch

case. Powered by battery or external 9V DC supply.

A complete kit of parts is available from E&MM at £23.95.

Syndrom **April & June '84**

The Syndrom is a circuit built on a single PCB which enables digitally sampled sounds to be read out from a pre-programmed EPROM.

Sounds may be triggered by means of a crystal microphone or by positive trigger pulses, and the pitch of the stored sound may be varied over a wide range.

A Syndrom demo cassette is available from E&MM for £1.00, the PCB is £4.95, while a complete kit of parts is £24.95 (exclusive of the sound EPROM), or you can buy it ready-built for £29.95.

The sound EPROM of your choice is available from Silicon Sound, 20 Bolton Street, Swanwick, Derbyshire, DE55 1BU, at £6.75 for a 3K 2716, or £7.75 for a 4K 2732.

BeeBMIDI **June & July '84**

A MIDI interface for the BBC Model B microcomputer, BeeBMIDI will be complemented shortly with an E&MM software package that'll enable the interface to be used as a fully-polyphonic, eight-channel MIDI sequencer.

See this issue for details on BASIC software writing.

The PCB is available from E&MM at £4.95.

Multi-waveform LFO **June '84**

This rack-mounted project is designed to provide a modulation source compatible with any digital delay unit having a voltage-controlled modulation input. The oscillator produces four different waveforms with variable amplitude, and a DC offset is provided so that the delay time may be modulated.

The PCB is available from E&MM at £2.95.

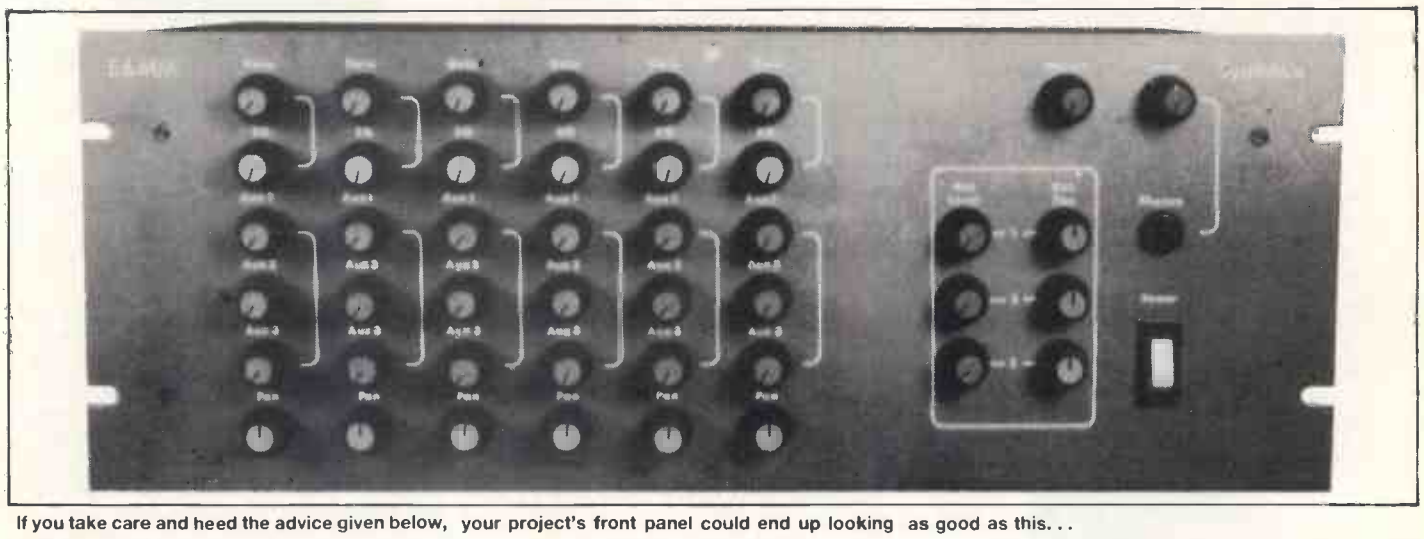
RackPack **July '84**

A rack-mounting power supply capable of supplying ±12V at one amp. Suitable for powering many rack-mountable Projects, including the Syndrom and the Multi-waveform LFO.

The PCB is available from E&MM at £3.95.

Putting on the Style

Many projects are let down, or worse still not built at all, due to the constructor's inability to produce professional-looking front panels. Paul White **proffers a few useful tips.**



If you take care and heed the advice given below, your project's front panel could end up looking as good as this. . .

Buying ready-made 19" rack panels can be prohibitively expensive, so the best approach is to visit your local industrial estate and track down a sheet metal firm (Yellow pages is an invaluable guide at this point). Ideally your panels should be one eighth of an inch thick or so, but if the project is small, a thinner gauge will suffice. If you are not too fussy about gauge, the firm will probably find a suitable offcut for little or no cost and will invariably guillotine it to size in seconds for about the price of a pint!

Well, that's the first part done already and so far you haven't even picked up a tool; the other approach is to buy a ready-built case from your local component shop. . .

Drilling

Drilling metal frightens a lot of people off but it really is quite straightforward.

First, lay strips of masking tape over the surface to be drilled and mark out the centres of the holes. Next, using a centre punch (only 70p from Woolies, so no excuses), punch the centre of each hole so that the drill won't slide all over your nice panel and spoil it. Having done this, support the panel on a block of wood and drill a small hole (about one-eighth-of-an inch diameter) through each punch mark.

If an electric drill is used, set it to the slowest speed and make sure the panel is secure, otherwise you may find it spinning on the end of the drill in a most unamusing fashion. Finally, drill the holes the required size, again resting the panel firmly on a piece of wood. Remove any burrs with a sharp knife and the panel is ready for the next step.

Painting

Thoroughly clean and polish the panel with a Brillo pad or similar and then wash it in hot water and washing-up liquid to remove all traces of grease. Warm up the panel with a fan heater or hairdryer and then, placing it on a piece of newspaper, spray on a fine coat of car primer.

When this is dry, spray on several thin coats of the desired (car) colour and don't worry if the surface looks powdery or uneven; just concentrate on not getting any runs.

Lettering

Letraset (or similar) is the best medium for producing panel lettering, and special sheets containing lines, radii and dial markings are obtainable from most large stationery or art suppliers.

The main problem is getting the lettering level. I use a strip of paper taped against the panel in the appropriate position so that there is a straight edge to work to. Work out which letter is going to be at the centre of each word and position this first so that the word will be symmetrical about the required position. When planning this, make sure that the knobs will not obscure the lettering and, when all is well, place the backing sheet over the finished lettering and rub the lettering down with a soft pencil.

Mistakes or unwanted lettering can easily be rectified or removed by dabbing the offending area with a piece of masking tape which effectively sticks to the letters and removes them.

Finishing

Also available from the art shop is a matt, quick-drying varnish spray which will protect the lettering and leave an even, stylish matt finish to the whole panel. A couple of light coats are all that are needed – don't overdo it or it'll run!

Well, that really is all there is to it; last month's LFO project – and this month's Rack Pack – were made in this way and the finished results look pretty good. (*Modesty, modesty. . .* Music Ed). Next month sees the third of our rack-mounted projects (we hope to develop a whole series of them for construction by readers) and I hope this article has provided some insight into how you can make home-built modules look as well-finished as professional units.

Paul White **E&MM**

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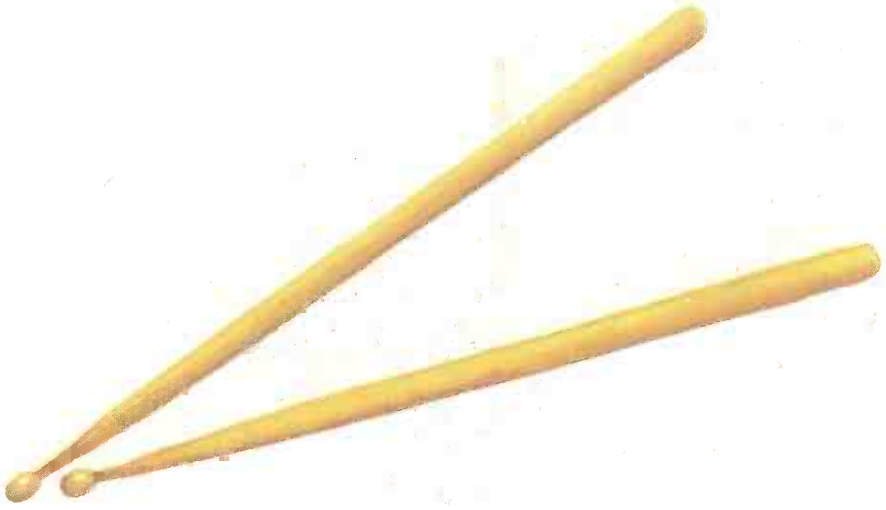

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