AUGUST 1984 95p

Electronics & Music Maker

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THE MINI DOC SIX NEW ELECTRONIC PIANOS

WIN
KORG'S LATEST
MIDI MODULES

JUNO-106

PROGRAMMABLE POLYPHONIC SYNTHESIZER

MIDI

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

ELEMENTAL PARTS

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

PROGRAM MEMORY

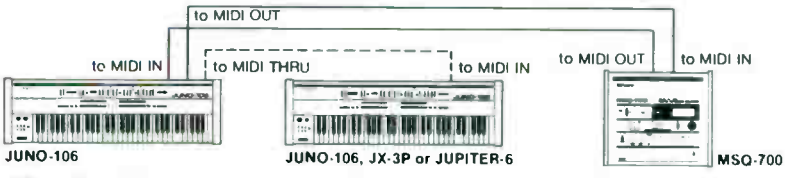
The DCO's waveforms and ranges are selected by touch pads and the PWM, Sub-Oscillator, Noise and LFO controls are adjusted by sliding controls. The tone color is tailored at will by both VCF and HPF. The VCA has a level slider and ENV/Gate select switch. A Chorus effect is provided to reproduce realistic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

Typical set-ups using MIDI

A. JUNO-106 + other MIDI Keyboards

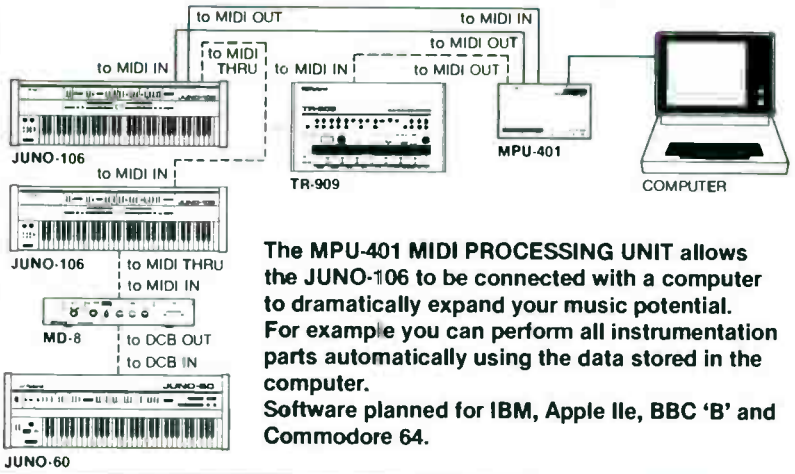
The JUNO-106 can control another MIDI keyboard. By connecting with its MIDI THRU jacks, the JUNO-106 can also control more than one MIDI keyboard simultaneously.

B. JUNO-106 + MSQ-700



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

C. JUNO-106 + MPU-401 + Computer



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

Roland

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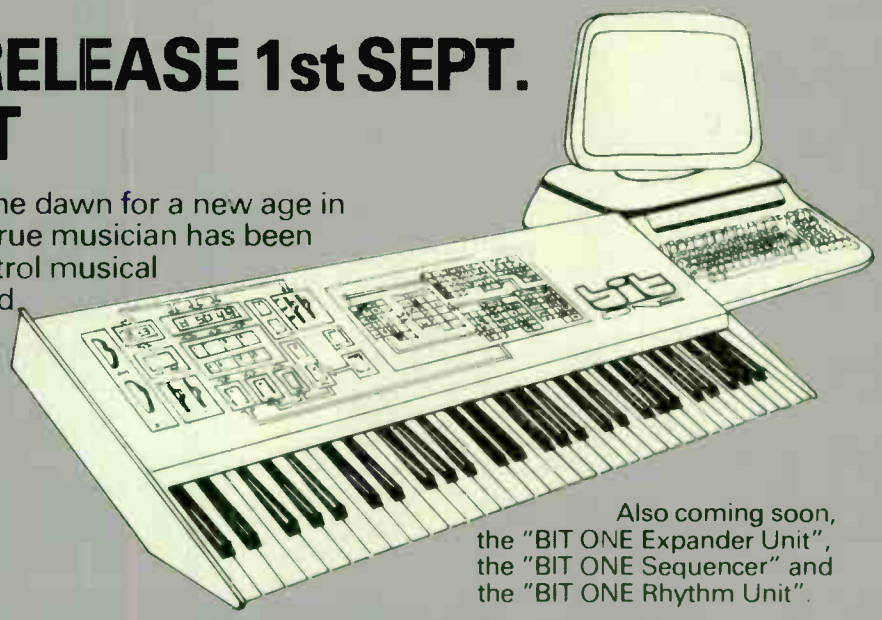

Sounds Great

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

Great Sounds

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

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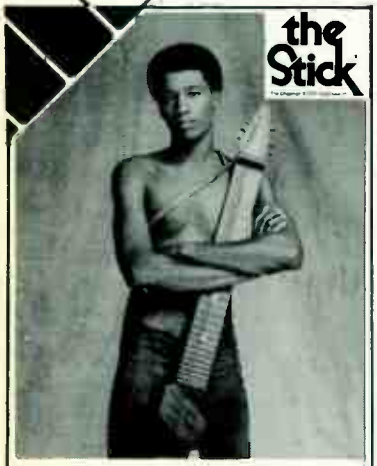

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Electronics & MUSIC Maker

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Advertising
Advertisement Manager Tony Halliday

Editorial Offices
E&MM, Alexander House, 1 Milton Road, Cambridge CB4 1UY
Tel: 0223 313722

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Comment

A Concerted Effort

News of the latest campaign to give electronic and avant garde music a fairer hearing by the popular and mass media reached these offices only a few days before this issue went to press, but already there are signs that it could be the most significant endeavour yet, and not simply because it comes from an unexpected source, ie. one of the UK's leading record companies.

The campaign is the brainchild of Johnny Black, sometime contributor to E&MM and now the Head of Press at Polydor Records in London. Initially, it takes the form of a letter (reproduced on page 8) that's been sent to most magazines, record and cassette labels that form a part of this country's New Age music scene, and the idea behind it is simple enough: to get as many people with an affinity for New Age music to send a letter to the Controller of BBC Radio One (and anybody else in a position of similar power, for that matter) demanding the same coverage as that already enjoyed by such minority musics as folk, jazz, and country and western.

However, it's our view that the campaign to deluge Broadcasting House with impassioned pleas for more avant garde music on the radio should be only a starting-point, a catalyst for some further – equally concerted – action.

Publicising New Age music is a job that no one other than its follower and practitioners will do, so there seems little point in adopting a 'let somebody else do the work' attitude. But that doesn't mean the task ahead of us is anything even approaching an impossible one.

True, avant garde music has a reputation for being in the main inaccessible and/or monotonous, but every New Age music fan goes through a lengthy period of time when ignorance and lack of exposure to the right records or concerts mean that he or she is only interested in the music served up day and night by the mass media. And it follows therefore that there are plenty more potential fans out there, just waiting to be converted.

The only problem is, that conversion will only take place if New Age music gets the required exposure, and the power to bring about that exposure lies in the hands not only of those who control the mass media, but also those who write, record, perform, and listen to the music themselves.

Every band – whatever their musical persuasion – knows that putting on a series of gigs is a pretty good way of getting their name known, so it should follow that musicians involved in creating electronic and avant garde music should adopt a similar attitude. Sadly, this appears not to be the case, though Ian Boddy's *Stagefright* article (see elsewhere this issue for the second and concluding instalment of this) will with luck persuade more than one or two performers to take their show on the road and publicise the cause of New Age music that way.

Releasing avant garde music on record or cassette is also a realistic possibility for most musicians and composers, but for some reason there are still hundreds of such enthusiasts who feel quite content in the knowledge that their work will never be appreciated anywhere outside the confines of their living room, unaware that every new avant garde release – of whatever form – is another step along the road to mass-acceptability.

E&MM, of course, does what it can in the way of reviewing readers' cassettes and records and promoting electronic music festivals such as UK Electronica, and one of the reasons for the magazine's continued success is simply that New Age music as a whole is becoming more and more popular, and the companies, organisations, and charities within it are getting stronger and stronger as each month goes by. And remember, New Age music has one advantage over almost any other form of music currently vying for media attention: its followers and performers are spread more or less evenly throughout the world, from the US and Australia to Japan, India and Scandinavia.

It would seem that the time is right for a major upsurge of public interest in New Age music, and that a concerted effort on the part of its adherents to bring that upsurge about has never stood a better chance of succeeding.

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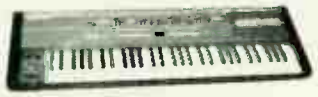

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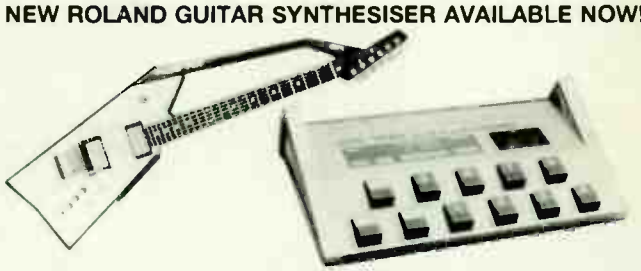

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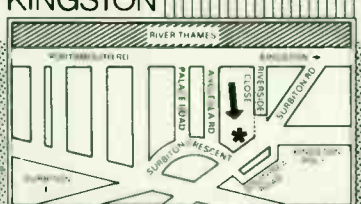

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NAMM SPECIAL REPORT

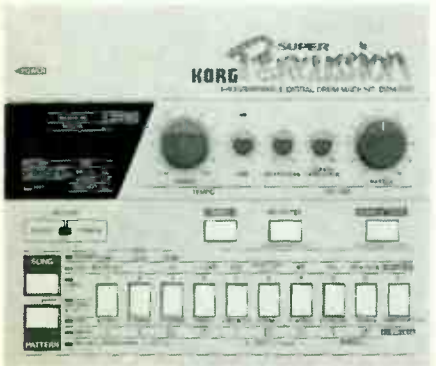
The National Association of Music Merchants' International Music & Sound Expo was held as usual in Chicago, Illinois at the end of June. E&MM sent a roving reporter to cover the entire show in just 48 hours, and below are some of the highlights of the new products he saw.

First off are **Korg** who announced several new products at the NAMM show. The Poly 61M synthesiser is an updated version of the popular Poly 61 keyboard released by Korg a few years ago. The 61M MIDI keyboard will allow you to control any other MIDI device such as the new Korg EX800 programmable polyphonic synthesiser module.

Designed as a stand-alone or rack-mounted unit, the EX800 offers an eight-voice programmable synthesiser with 64 memories and a built-in fully polyphonic 256-step sequencer. All voices and sequencer programs may be dumped to tape *via* a high-speed tape interface system, and MIDI information may be displayed on a TV screen when the unit is connected to a home computer. The EX800 may be linked to the Korg Poly 800 keyboard or any other MIDI compatible unit, as well as being controlled by the new Korg RK100 remote keyboard.

The RK100 is a lightweight shoulder keyboard for use with any MIDI keyboard *via* a simple cable which carries all MIDI data including key data, program change, pitch bend, modulation, volume control and active sensing. A total of 64 programs may be accessed at any one time, and these are simply arranged in eight banks of eight voices each.

Further new products from Korg include the DDM110 Super Drums and DDM220



Super Percussion drum machines. The Super Drums offer nine digitally-sampled drum sounds (using PCM technology), and rhythm programs may be created in real or step time, with up to 32 different rhythm patterns and a maximum of 385 bars per song. Programs can be stored on tape *via* the tape interface socket on the rear panel, while further rear panel sockets provide full sync facilities and a trigger output for the control of synthesisers or digital delay devices.

The Super Percussion DDM220 is similar control-wise to the Super Drums except that the machine's range of PCM encoded sounds are all Latin percussion instruments. Nine different instruments are available including congas, timbale, wood block, cowbell and cabasa.

Finally, the Korg KMS30 MIDI Synchroniser enables synchronised operation of synthesisers, drum machines, sequencers and multitrack tape recorders. The clock signals can be recorded onto tape and played back into the KMS30 to enable

further sequencer or drum machine parts to be recorded in perfect sync with any previously recorded tracks. Non-MIDI devices may be synchronised to MIDI equipment, and when using this facility the control clock frequency is switchable between 24 or 48 units per quarter note.

Further information on all these products may be obtained from Rose Morris, 32/34 Gordon House Road, London NW5. ☎ 01-267 5151.

See page 56 for details of how to win a MIDI keyboard system consisting of the EX800 expander module and RK100 remote keyboard.

The **Zen-On** Metrina Multi is an interesting new device that fulfils many of a musician's basic requirements. This small compact unit combines five useful functions in one. The Metrina can be a metronome with audible output and visual display, pitch pipes which generate 12 chromatic tuning tones with audible and visual readout, a stopwatch, a digital watch with 24-hour display, and an alarm clock. The Multi uses a liquid crystal display for all functions and a small built-in speaker for the audio output.

Further information from CSL Summerfields, Saltmeadow Road, Gateshead, Tyne & Wear, NE8 3AJ. ☎ (0632) 770431.

Fender Rhodes introduced a new MkV electric piano. Following on in the Rhodes tradition, the MkV retains all the important qualities of

the original design, but incorporates several new improvements.

A patented method of mounting the upper-register harmonic tone bars has resulted in an increase in clarity and note sustain. The lower register has also been redesigned so that the harmonic bars resemble more closely true tuning forks, and this should result in even the lowest notes sounding out clearly. Perhaps one of the most immediately noticeable improvements is the new keyboard action: this has an improved cam design which lengthens the hammer stroke by two inches, and produces a richer sound from the above-mentioned harmonic bars.

The piano is available in 73- or 88-note versions, and comes in a new style high-strength polymer case which accounts for a large reduction in the overall weight of the instrument.

Details from CBS/Fender, Fender House, Jeffreys Road, Enfield, Middlesex, EN3 7HE. ☎ 01-805-8555.

The **Syntauri Corporation** demonstrated the Proxima MIDI/16 and Proxima MIDI/16X hardware/software packages for the Syntauri Music System. The Proxima series combines the facilities of Metatrak software and the digital voices of the Mountain Music System synth with the facility to plug into the user's own digital or analogue synthesiser.

Proxima MIDI/16 offers a 3000-note sequencer, whereas Proxima MIDI/16X is capable of 20,000 notes or approximately 20 minutes' recording time.

Users may apply their MIDI keyboards to access the software capabilities of the Proxima system, whose features include record/playback, 16-track sound-on-sound, pitch bend, after touch, modulation amount and velocity. Any MIDI channel number may be assigned to any track, and the system also provides a drum sync facility. Owners of Metatrak software will find their files compatible and interactive with the Proxima software.

Further details from Computer Music Studios, 62 Blenheim Crescent, London W11 1NZ. ☎ 01-221 0192.

New from **Roland**, the MSQ100 MIDI digital keyboard recorder is the smaller brother of the MSQ700, and offers many of the same features. It's a one-track sequencer with overdub facility and a 6100-note storage capacity. Sequences may be recorded in real or step time, and all numerical data including 'tempo' and 'notes available' may be displayed on the LCD readout.

Details from Roland UK Ltd, Great West Trading Estate, 983 Great West Road, Brentford, Middlesex, TW8 9DN. ☎ 01-568 4578.

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INTERFACE

Write to: Interface, E&MM, Alexander House, 1 Milton Road, Cambridge CB4 1UY.

Campaign

Dear E&MM,

As you may know, I have been considering the possibility of starting a campaign to obtain for New Age music the same sort of status on British radio that is already enjoyed by other minority musics such as folk, jazz, reggae, and country and western.

At the moment, although there is wide interest in New Age music (as typified by Brian Eno, Klaus Schulze, Vangelis, Penguin Café Orchestra, Roedelius, Michael Nyman, Kitaro and countless others), there is no regular programme on any major radio station where this music can be heard.

To begin the campaign, I would suggest that fans and musicians involved in this sort of music should write to The Controller, BBC Radio One, Broadcasting House, Portland Place, London W1, giving their feelings and opinions on the state of modern radio programming and some good reasons why New Age music should be given a regular place on national radio.

The briefest look at the solo work of such pop stars as Andy Summers (Police), David Sylvian (Japan), Robert Fripp (King Crimson) and Phil Manzanera (Roxy Music) reveals that all of these talented and popular musicians are also working in the field of, and are being influenced by New Age music.

So why is it not on the radio?

Whatever you do, remember that there is nothing to be gained by complaining among ourselves that nobody plays this music on the radio. Unless the people who enjoy listening to and creating their own New Age music are prepared to make their feelings known, it will deserve to remain largely unknown.

Johnny Black
Head of Press
Polydor Records

Slightly Peeved

Dear E&MM,

With reference to your article entitled *State of Independence* in the June issue, the comments published in the section which carried my name and referred to the group The Primary were in my view a little misleading.

The problems we had at the cutting stage of the record (with distortion and EQ) were in fact overcome in a second cut. We do not wish the public to think that the record they buy suffers from any trace of bad cutting: in fact, the record sounds fine and is selling well. For those who are still interested in buying a copy of The Primary's record but were put off by the article, please forget what was printed and place your confidence in us.

Steve Hartwell
Peeved Records
37 Pointout Road
Bassett
Southampton
SO1 7DL

ARP Synth

Dear E&MM,

I have recently bought some vintage ARP synthesiser equipment, but no manuals were included. The problem I have is that although the ARP equipment has CV and Gate sockets on it, I don't know whether or not these are compatible with those on my Roland gear.

Martin Shaw
Shirley
Southampton

No problem here.

ARP and Roland synths have perfectly compatible CV and gate levels, so you should be able to interface one with the other quite easily: both makes of synthesiser use the one-volt-per-octave control voltage standard and a nominal 12-volt gate (trigger) voltage.

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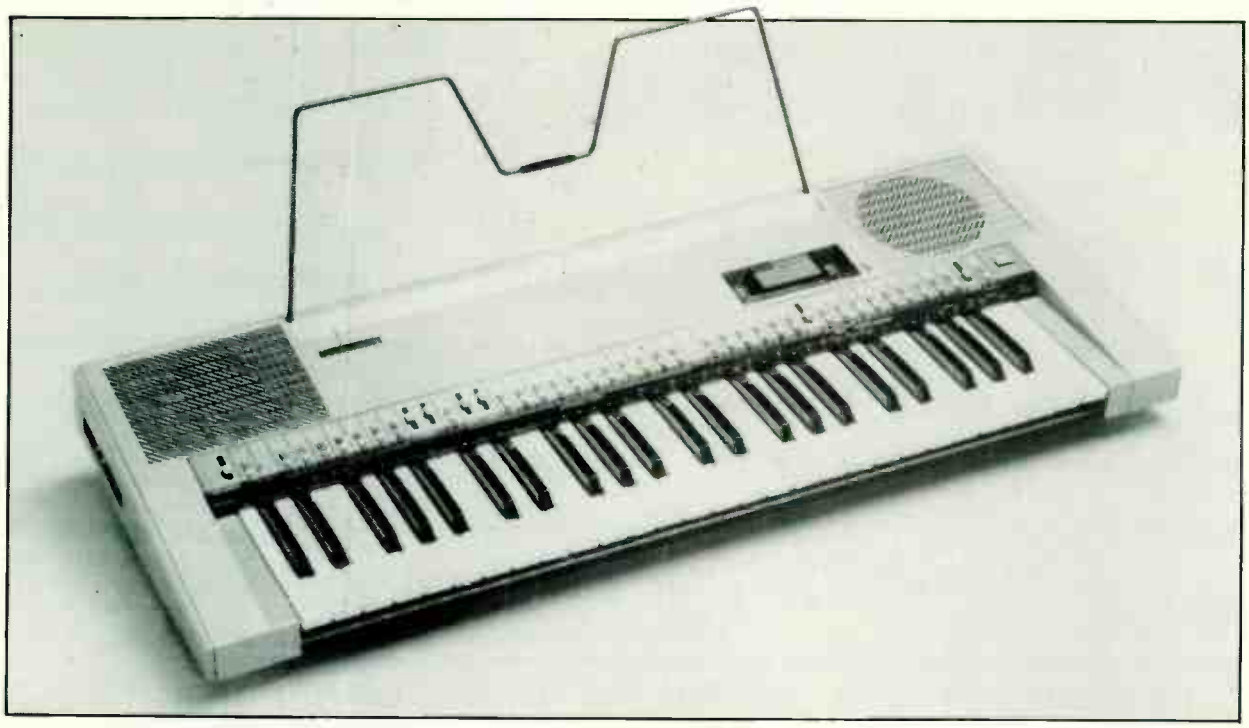
Technics SXK250

PCM Personal Keyboard



Japanese manufacturing giants Matsushita have transferred their PCM voice technology from the home organ to the personal keyboard, putting it within reach of most keyboard players. Nigel Gomme **gives a brief introduction on how PCM works and analyses its success in the context of the SXK series.**

The SXK250 – along with its smaller brother, the 150 – represent the latest arrivals in Technics' personal keyboard range. They're part of a conscious effort on the part of the parent company to remove the 'toy' image from the world of personal keyboards, and two of the techniques employed in the 250 – PCM voicing and RAM storage – go some way towards fulfilling that task.

The Technics under review here is neither particularly compact nor inexpensive, but there's no doubt that some of its features set it well apart from most of the flock of personal keyboards.

The 250 has an eight-note polyphonic, four octave (C-to-C) keyboard, and comes in a sleek grey-green metal and plastic case. It can be powered either from the mains or from a car cigar lighter socket using an optional adaptor, RP9550. Output is stereo, and is delivered *via* two 12cm speakers placed in the customary fashion at either end of the keyboard. Total maximum output is 2x5W per channel RMS, but should further amplification be needed, two RCA-type output sockets are provided, as is a standard headphone jack and a socket for the optional expression pedal, SZE1.

Factory Voices

The SXK250 has two separate but combinable voice sections: the poly orchestral and solo synthesiser presets.

The former bank houses eight preset polyphonic tones, all with adjustable sustain. These are Organs 1 and 2, String Ensemble, Brass, Accordion, Guitar, Piano and Harpsichord.

Presets are selected using four pushbuttons and a Bank switch, the latter incorporating an LED to indicate which bank has been chosen.

The mono section contains eight solo presets and an overall volume control, the voices available being Clarinet, Panflute, Trombone, Flute, Saxophone, Synthe-Chopper, Trumpet, and Cosmic Wah (?!): the section as a whole uses the same system of selection as the poly group.

Both voice sections are PCM-derived (more of this anon), and contain a well thought-out selection of generally pleasant and usable sounds, some of the voices in the mono section being particularly clear and true-to-life, in spite of their silly names!

Technics have also incorporated a couple of effects systems to 'enhance' the tonal quality of the keyboard's preset voices. The chorus/celeste facility succeeds to a fair degree in achieving this enhancement, particularly when applied to the Piano and Brass voicings, but the organ tremolo also provided sounded rather unconvincing, though I suppose someone somewhere will find a use for it.

PCM

Pulse Code Modulation is not a new process: in fact, Technics themselves have been applying it successfully to their range of home organs for some while, though it's only now that the system is being employed to relieve the personal keyboard user from the horror of most factory preset sounds from other manufacturers.

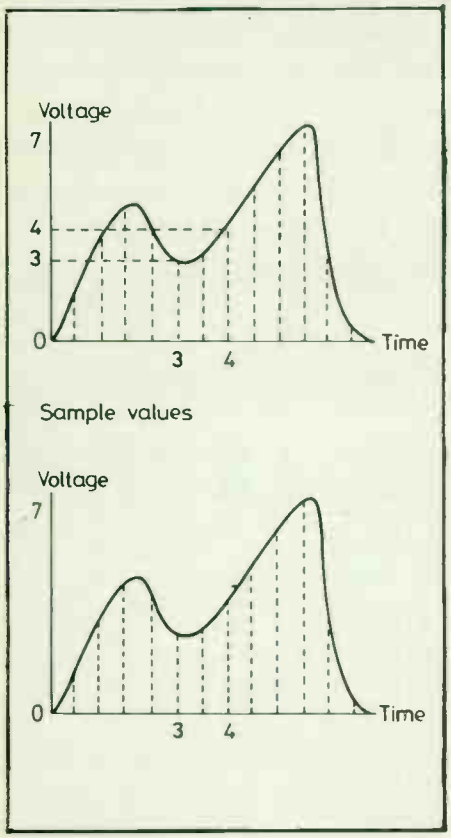
PCM is a relatively simple digital sampling system.

An instrument's sound (analogue wave) is code-modulated in an A-to-D converter and then stored on a ROM in binary form. When the sound is recalled, the pulses are passed through a D-to-A converter (or in this case, a PCM modulator) and something approaching the original instrument's sound is reproduced.

The analogue-to-digital conversion is carried out by rapidly scanning the sound wave and finding a numeric value for that wave. The numbers represent the voltage level of the particular sample, as shown in the diagram. The sample illustrated has one value of three (apertaining to a three-volt level) and another of four, relating to a four-volt level. These numbers are converted into binary and then stored in memory.

Rhythm Unit

As with the instrumental voices, the rhythm unit has a selection of preset, PCM-derived sounds, and utilises the same method of selection as the aforementioned voice banks. The available pre-programmed rhythms are March, Swing, 8-Beat, Disco 1, 16-Beat, Disco 2, Ballad, Bossa Nova, Rhumba, Samba, Waltz and Tango. As usual, there are slider controls for rhythm volume and tempo, as well as switches for the selection of pre-programmed intros and fill-ins, either of which can be activated manually or at intervals arranged by the 250's circuitry.



The unit makes use of seven percussion sounds, these being Bass drum, Snare, Open hi-hat, Closed hi-hat, Low, Medium and High toms, and Rimshot. Although these sounds are digitally sampled, I think it's only fair to point out that they are not really up to the standard of the voices available on purpose-built digital drum machines such as the Drumulator and SCI Drumtraks. However, taking the SXK250's price into account, they're of pretty decent quality: both the snare and bass drums have a good, punchy feel to them, and my only gripe surrounds the open hi-hat, which sounds rather too much like a burst of white noise – a great shame, since for once that isn't the way the sound has been created!

Fullband Setting Computer

This is the name Technics give to what is more commonly known as an auto-accompaniment section. The 250's variation on this well-used theme operates over the lower 19 keys, and contains the usual group of single-finger chord facilities that enable the user to play major, minor or seventh chords simply by playing the root note of those chords. Technics' built-in circuitry then automatically selects bass and chord patterns to suit whichever rhythm has been selected.

There are separate sliders for bass and accompaniment volume, and a Variation pushbutton which selects between a straight rhythmic chord and a chordal arpeggio.

Also included in this section is the Program Chord Computer button which, once activated (along with the Record button), allows up to 100 chords to be stored in the SXK250's built-in memory. Chords have to be stored one at a time and are entered using the upper five keys on the keyboard.

A Reset button allows the user to clear the contents of the Program Chord Computer's memory at the flick of a switch, while a Cancel button – as its name might suggest – cancels all previous orders such as one-finger chords and so on, leaving the keyboard playable by more conventional (manual) means.

The Fullband Setting Computer itself controls the loading of user-programmed sequences onto a RAM pack that comes as standard with each SXK250. When there is no RAM pack in position, the FSC button selects the playback of accompaniment parts for eight songs, these being pre-programmed into the instrument by Technics in Japan.

The RAM pack can store up to four songs of 100 chords in length, but these must fall between keys 1 and 8, which span one octave from middle C upwards. Loading is quite straightforward: all you do is insert the RAM pack in the slot provided, press the Record and Program Chord Computer buttons simultaneously, play your piece and press key 1 on the keyboard. The song is now loaded into the RAM pack, and pressing key 1 for a second time (along with the Start pushbutton) recalls the song for playback.

Incidentally, should you wish to store more information than one RAM pack will hold, further packs are available from all Technics dealers at a price of £13.50 each including VAT.

Conclusions

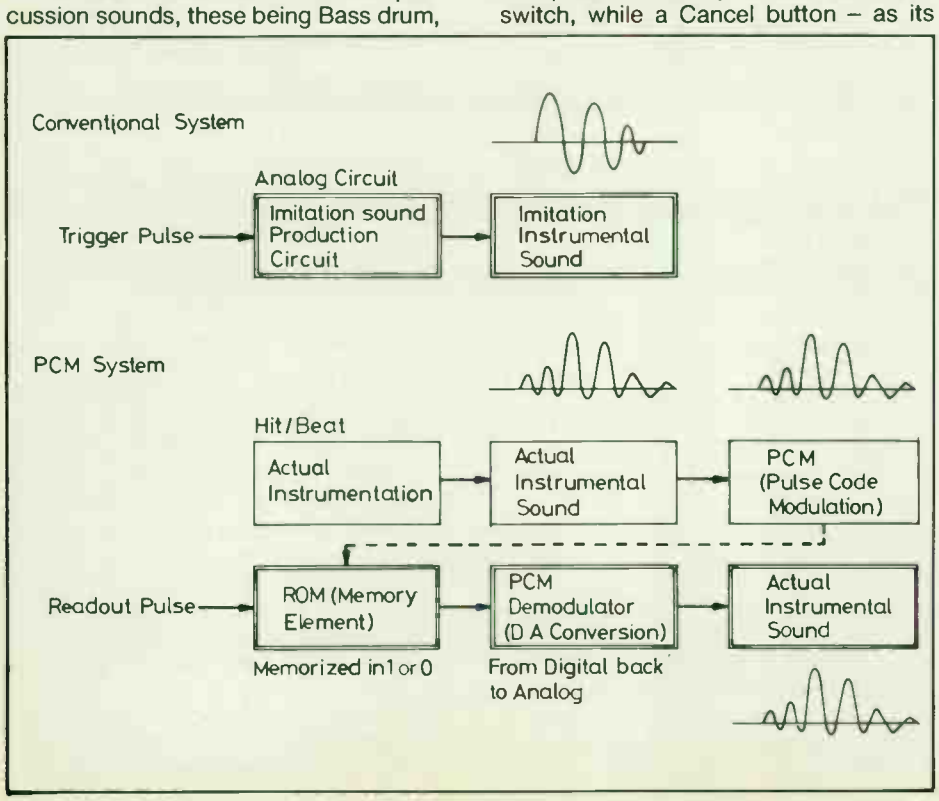
Summing up, the retail price of £499 means that the 250 isn't the cheapest personal keyboard available, but this is more than made up for by the quality of the preset voices. However, it should be remembered that this is purely a preset instrument and offers next to no user-programmability. If being able to alter sounds dramatically is important to you, you'll probably find something like the Yamaha MK100 (reviewed in E&MM July) fits the bill somewhat better.

On the other hand, the quality of the 250's voices – itself a direct result of the PCM encoding – is high enough to make using it as a solo instrument, as opposed to with its accompaniment features, a very real possibility, while the RAM loading is undoubtedly a handy feature, even if using ordinary cassette tape for storage would probably have been a better bet from a financial point of view.

The SXK250 is a comprehensively-designed and well-made keyboard that, for the moment at least, is in something of a class of its own sonically. It comes complete with a metal music stand and a dust cover, and even has an intelligible instruction manual.

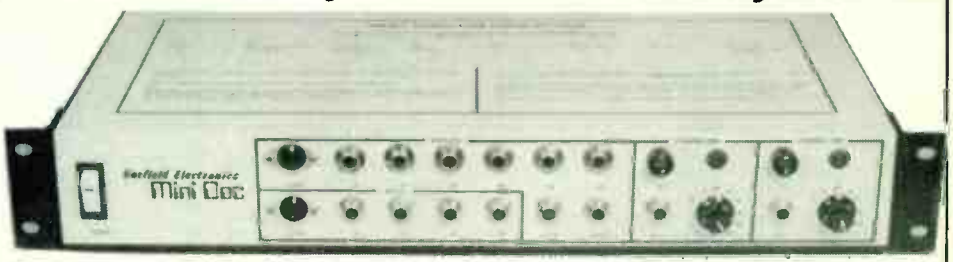
Nigel Gomme **E&MM**

The SXK250 carries an RRP of £449 including VAT, and further details can be obtained from Panasonic/Technics, 300-318 Bath Road, Slough, Berks SL1 6JB. ☎ (0753) 34522.



The Mini Doc

As E&MM's monthly mailbag amply demonstrates, interfacing and sync problems are still the biggest single headache for most electronic musicians and recording engineers. Most of these problems were solved by the arrival of Garfield Electronics' Doctor Click interface unit last year, but its high price tag put it out of reach of most keyboard players. Now the same company have come up with the Mini Doc, which aims to offer all the Doctor Click's more commonly needed facilities but at almost a quarter of the price. Ian Gilby **gives us a brief explanation of clock pulse standards and analyses the Mini Doc's ability to match them.**



Although MIDI is currently being pushed as the panacea to all synthesiser/microcomposer/drum machine interfacing problems by reputable instrument manufacturers, it has not yet achieved that status fully. In its wake lies a plethora of keyboard devices unwittingly discarded by their owners for being problematic and incompatible with newer machines, yet whose abandonment has resulted from their interfacing facilities rather than their sound generation ability.

This incompatibility problem, of driving one drum machine from a sequencer or vice versa, has only been overcome recently by using a device such as the Doctor Click from Garfield Electronics USA (reviewed in E&MM November 83). However, this unit's £2000-odd price tag prohibits its purchase to all but the well-paid musician or studio. But just because a musician doesn't have a lot of expensive instruments, doesn't mean to say he's free of interfacing problems. If anything, he's even more likely to be beleagured with them, and that's where the Mini Doc comes in...

Distributed in the UK by Music Labs of London, the Mini Doc seems the ideal solution to the above problem. Whereas not every player or band needs the sophistication found in the larger Doctor Click, the new Mini Doc will let you synchronise musical devices from most manufacturers, and for a vastly more respectable outlay of £525 plus VAT.

Timing

A quick explanation of musical instrument timing standards is necessary at this juncture if the existence of the Mini Doc is to be justified.

First, most modern electronic musical instruments such as drum machines, microcomposers and the arpeggiator units in synthesisers all have built-in timing generators, or 'clocks', which determine the rate or tempo at which a device runs. The definition of the timebase for each device is made in clock pulses-per-quarter-note (crotchet), but unfortunately different manufacturers (as usual!) adopt different timebase standards for the operation of their particular devices.

The LinnDrum, for example, uses the 48 pulses-per-crotchet standard, whilst Fairlight utilise 384 per crotchet. If you can't quite grasp the importance of this, then consider the following. An Oberheim DMX drum machine requires 96 clock pulses to advance it by one crotchet (or quarter-note). If you linked a LinnDrum to the Oberheim *via* the Clock in and outs and tried to control the Oberheim from the Linn, you'd find that the DMX drum patterns would play at *half* their original programmed speed, whilst the Linn would continue to play normally. In other words, the Oberheim would only advance by one crotchet (96) for every two played by the Linn (48 + 48 = 96 clock pulses-per-crotchet). Synchronisation of drum patterns would go out of the window.

Using the facilities available from the Mini Doc's front panel, such timing anomalies can be overcome. In the above instance, the clock output from the Linn could be connected to the correct front panel input socket specified by the timebase number – in this case 48. Apart from the 180° five-pin DIN socket for the Sync inputs and outputs required by Roland and Korg instruments, all other sockets employ quarter-inch jack connections.

You then have a choice of seven outputs, each compatible with a particular timebase and the machines that operate on that standard. These are Sync, 12, 24, 48, 96, 64 and 384, and between them cover the requirements of a vast range of products from the inexpensive Roland drum machines, LinnDrum (and LM1), Oberheim, PPG, Drumulator, and Memory Moog right up to the Synclavier and Emulator polyphonics.

So, returning to our problem. The Linn is now linked to the Mini Doc. We now take a jack from the Mini Doc output labelled '96' and plug it into the external Clock In socket on the Oberheim DMX, and that's it. It's now possible to control the DMX from the Linn directly, with no timing or synchronisation errors and no need to reprogramme the Linn's drum patterns.

What is more, if you also wanted to control the likes of a Roland MC4 and/or the step time 40-note sequencer on a Sequential Circuits Pro One synth, all you have to do is take an output from the relevant Mini Doc socket to the unit's Clock Input connection and away you go. The Mini Doc is that quick and simple to operate.

As all seven timing output sockets on the Mini Doc are active simultaneously, it's possible to drive seven different devices in parallel. Furthermore, if you use splitter leads one output can be used to drive four individual instruments requiring the same number of clock pulses, thus allowing a maximum of 28 different machines to be syncronised to one master machine. This is certainly power enough to fulfil most synthesists' needs, I would have thought.

Metronome

The Mini Doc's features don't stop there.

The 'Click' socket in the centre of the front panel, for example, outputs an effective audible click on every quarter-note beat (set by the master clock on your chosen input device) providing a useful metronome that can be monitored whilst creating drum patterns. This click can be readily recorded onto one track of a multitrack tape if necessary, as a master tempo reference.

For the usual sync-to-tape requirements, any clock output can be recorded onto tape and replayed into the relevant Mini Doc input. The Mini Doc will then enable you to derive exact synchronisation of all devices from the recorded tape clock. In a recording environment, this feature alone is a godsend and makes the Mini Doc a more or less essential purchase for all studios whose clientèle includes solo synthesists or groups doing a lot of synth/sequencer overdubs.

Recording a sync track on tape from one particular device without the Mini Doc would mean that only that particular brand of hardware could be re-synchronised to tape at a later date, and

anyone who does a lot of this type of recording knows about the problems that can be encountered when that happens.

As already stated, the Mini Doc makes light work of such tasks and relieves you of an otherwise gigantic headache, while at the same time opening up the creative scope of the recording. You could, for example, record your original tracks with a Drumulator whose timebase code has also been recorded on a spare track for syncing purposes, then erase the Drumulator parts completely, sync a Roland TR808, say, to the taped track *via* the Mini Doc and then re-record the new drum parts – all perfectly synchronised, beat for beat.

Arpeggios

The final Mini Doc functions enable control of the arpeggiator facilities on synthesisers – providing that they are fitted with clock input sockets. The two arpeggiator clock circuits provide independent control of clock rate and trigger waveform polarity for two channels. Each channel has an 11-position rotary knob for 'rhythmic value' calibrated from 1, 1T, 2, 2T ... up to 32, which determines the duration of the arpeggiated note played.

Effectively, this allows the user to impose some variation on the note rhythm selected from the keyboard. Thus, if you have two keyboards with externally triggerable arpeggiators and you hold down the same chord on each, by selecting different rhythmic values – eg. 4T (quarter note triplet) on Channel 1, and 8 (eighth note) on Channel 2 – two totally different-sounding arpeggios can be obtained.

A further switch labelled 'Invert' (complete with red LED indicator) adds even more flexibility to this section by offsetting the rhythm by half of its clock rate value. All manner of syncopation (off-beat) effects can be created through judicious experimentation with this switch, while quasi-echo effects can be implemented by setting both arpeggiator channels to the same rhythmic value, switching one of the channels to its inverted position. What you then hear is a stream of notes with a second group following quickly in succession – a form of single repeat echo, if you like.

That about completes the rundown of features, other than to mention the automatic reset facility provided by connecting a footswitch to the 'Start' output jack. This permits remote control of all devices connected to the Mini Doc.

Conclusions

Housed in a sturdy steel case that mounts in a standard 19" rack and with quick, easy access to all connections being available from the front panel, the Garfield Electronics Mini Doc would appear to be an almost invaluable tool. Basic operating instructions, as well as timebase information for all suitable products, are thankfully emblazoned on the top panel of the unit: much more practical than a spec sheet that inevitably gets lost!

I have no real criticism of the Mini Doc: quite simply, it is a superbly-made and quite ingenious device that should now be more widely available thanks to the efforts of UK distributors Music Labs who also handle the Doctor Click.

I do believe however that many more Mini Docs would be sold to the armies of up-and-coming young synth players if the price was cut dramatically. Don't get me wrong, I'm not trying to imply that the Mini Doc is overpriced for what it does. On the contrary, the asking price is more than matched by the range of facilities on offer, but it's still a shame that more people can't make use of its benefits. There are almost certainly enough potential customers ready to buy one at a lower cost to make the price reduction financially worthwhile in the long run, so how about it, Music Labs?

Ian Gilby **E&MM**

The Mini Doc retails at £525 and the Doctor Click at £1987, both excluding VAT. Both units are available from: Music Lab Sales, 72-74 Eversholt Street, London NW1 1BY. ☎ 01-388 5392.

Electro Harmonix Instant Replay and Super Replay

The science of digital sound sampling has been with us for several years now, but the affordable version never looked like it was going to arrive in the music shops – until now. Paul White **reports.**

Electro Harmonix have always had a reputation for building inexpensive effects units that deliver a strong sound, and now, after the arrival of designer David Cockerell (formerly of EMS) they have produced these simple to use sampling divices at a price that should be within reach of most musicians who take their work seriously.

Theory

Both these devices utilise digital storage, not to be confused with digital tape recorders: there is no tape and no moving parts.

The sound to be sampled is converted from its analogue form into a series of numbers, which are then stored in a random access memory (or RAM) in much the same way as in a home computer. Some time later it is replayed *via* a converter that restores the original analogue form.

Sampling theory dictates that the waveform must be sampled at a rate which is at least twice that of the highest frequency to be stored, and because of the limitations imposed by filter circuitry, a practical figure is nearer two-and-a-half times.

This means in effect that more memory is required to store a given length of sound at a large bandwidth than at a smaller one, and these parameters have to be juggled carefully by manufacturers in order to produce the right balance of delay time, sound quality and cost.

Both Replay devices have had to compromise on bandwidth in order to obtain relatively long storage times, but even so, the subjective results are fairly bright and not too noisy.

The Instant Replay

This is the cheaper of the two units and, like its more sophisticated relative, is built into the characteristic Electro Harmonix stainless steel box that will be familiar to owners of old Clone and Electric Mistress pedals.

Both pedals were reviewed at Syco Systems with members of staff in attendance, meaning that we couldn't pull them to bits as is our general practice and can't therefore comment on the units' internal construction, but I would imagine that the PCB is suspended from the controls in the usual EH manner: not particularly elegant but generally satisfactory.

The Instant Replay is designed mainly for the user who wishes to store percussive sounds, and these may be retriggered by means of the touch-sensitive drum pad supplied or by an external trigger pulse from a drum machine or synth. As the trigger input has a variable level control, the unit can be made to trigger from analogue signals (such as the voice output of a drum machine), enabling a variety of triggering sources to be employed.

Recording is very simple. A recording level LED is provided which should just glow at the loudest part of the sample, and once this has been achieved, pressing the Record button erases any previous samples. When the required sound is presented to the input, the LED flashes and the unit starts to record, thus ensuring that the sample starts in sync with the trigger pulse during replay.

The stored sound may be set to single-shot mode or repeat, in which the sample will cycle continuously: the one-shot mode is obviously the more useful for percussive sounds. A two-octave tuning range for the sampled sound is available by means of the pitch control, giving a maximum sample time of two seconds, and an external frequency input is fitted so that a keyboard producing a pure tone may be used to excercise a degree of pitch control over the stored sound.

The Super Replay

Working on a similar principle to the Instant Replay, this upmarket version offers a maximum storage time of four seconds, the frequency being controllable by any monosynth having a one-volt-per-octave control voltage output and a suitable positive gate output.

The pitch of the stored sound may be fine-tuned by means of the pitch slider, while a Superimpose button allows a new sound to be recorded on top of the

original, though perhaps not surprisingly, the sound quality deteriorates slightly every time this is done. Two or three layers may be recorded without problems, however, and a metronome beat sounds during recording to assist in the judging of sample length.

A Blend control allows the replayed signal to be mixed with the incoming audio signal, and a Decay Time control causes the sample amplitude to decay at a pre-determined rate when the key of the controlling synth is released. This facility is very useful and can be used to modify the envelope of the stored sound, enabling some quite novel sonic effects to be created.

Conclusions

Both units worked as they should do with no problems and, although their sound quality is undoubtedly a compromise, it is still more than adequate for live use or semi-pro recording.

The Instant Replay is really limited to use with percussive sounds, but it does this job very well. The Super Replay, on the other hand, is the more interesting unit as it opens up the possibility of keyboard-controlled sampling, albeit over only a two-octave range.

My own impression is that these devices are rather expensive considering the sound quality and facilities on offer, and their less-than-impressive appearance does nothing to dispel this feeling. However, if these are the sort of facilities you're after, there isn't much choice at this end of the market – yet!

Paul White **E&MM**

The Instant Replay retails at £299 including VAT and triggering pad, while the Super Replay costs £499. Further information is available from the UK distributors, Syco Systems, of 20 Conduit Place, London W2. ☎ 01-724 2451

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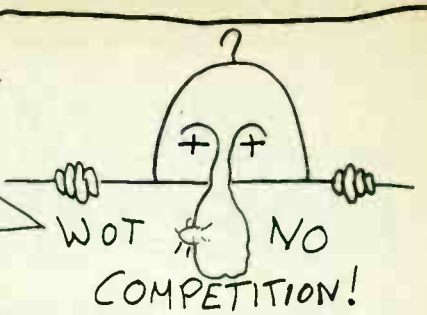

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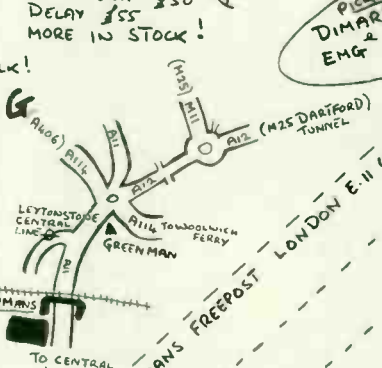

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CUSTOM SOUND 727 KEYBOARD COMBO

Paul White **examines a British amplifier that offers all the basic facilities demanded by the modern keyboard player, at a price that puts it within reach of most serious musicians.**

Custom Sound have always had a reputation for building value for money amplification, the best known of their products being the Trucker range of guitar amplifiers, which offered good basic facilities at an easily affordable price.

Their latest range of equipment is still economically priced, but the cheap and cheerful design philosophy has developed into something more sophisticated, combining improved electronic design with a more stylish presentation.

The 727 is a 75W combo and has three independent channels, each with Hi and Lo inputs, bass and treble EQ, and selector switches for reverb and external effects.

Construction

The fully-sealed speaker enclosure houses a Fane 15-inch driver, and a wide dispersion horn tweeter coupled to the power amplifier *via* a passive crossover network.

Weighing in at 28 kg, the unit is tastefully finished in black vinyl with matching handle, and plastic corners of the stackable type.

The high-efficiency Fane driver has an integral steel grille, and all the controls are well recessed out of harm's way, so that transit damage is unlikely.

Heavy duty castors are fitted (the rear ones having brakes), and the whole combo measures only 25 × 25 × 12 inches, making it very easy to handle.

Electronically, the construction follows the now familiar format whereby the rear panel holds the power amp circuitry and the mains input socket, the front panel acting as a mount for the pre-amp, which is built on a single long PCB and makes extensive use of op-amps.

A long dual-spring reverb line is mounted on a metal plate running the length of the amplifier, and this acts as a screen for the reverb and preamp circuitry to cut down hum leakage from the transformer.

The power amp stage uses two discrete output devices and is capable of delivering 100W into four ohms when an external speaker is connected.

Controls

The bass and treble controls are of the cut or boost type and have a very wide range, the bass control giving 40dB range at 80kHz and the treble having a range of 50dB at 10kHz.

The master section contains the master gain control and the reverb level, a presence control providing an alleged 16dB range at 800Hz.

Connections for auxiliary send and return signals are also on the front panel, as is a footswitch socket which permits remote switching of the reverb.

On the rear panel, there are two sockets for extension speakers (minimum combined impedence four ohms), a headphone output, and line and slave outputs, all on quarter-inch standard jack sockets.

In Use

Switching on the unit produced quite a loud switch-on thump as the power supply capacitors charge up and, although this probably doesn't overstress the loudspeakers, it is a little disconcerting.

With early Custom Sound equipment, circuit noise and background hum often presented a problem, but this new series seems to have got all that sorted. Mains hum is minimal, and circuit noise does not become noticeable until the gain is set to quite a high level: performance in this respect is as good as or better than most of the 727's contemporaries.

The combo was tested first with a bass guitar, just to check the speaker's performance at low frequencies, but no problems were encountered here even though the cabinet size restricts the efficiency at very low frequencies.

With electric piano and synthesiser, the sound was very clean and bright, largely due to the generous horn tweeter, and the EQ was more than adequate for any normal use.

Reverb units in combos are quite often less than perfect but the 727's is not bad at all, though it is susceptible to vibration and knocks: the basic sound is quite full and flattering to keyboards.

One area in which a compromise has been made in order to keep the cost down is in the auxiliary and reverb switching. Both these effects may be switched in or out individually for each channel, but there is no way to adjust the amount of the effect from one channel to the next. This may not be a serious problem to most players, but it is nice to be able to add, say, more chorus to an electric piano than to a synth.

Conclusions

The 727 is a reasonably priced combo incorporating most of the essential facilities generally used by modern keyboard performers. There are no unnecessary frills, but everything provided is of decent quality and the performance is in excess of what you would expect for the price.

The lack of flexibility inherent in the on-or-off effects selector system will probably put some people off, but a mixer-amp with proper variable sends is likely to cost rather more than the modest price of this combo.

I was a bit disturbed by the magnitude of the 727's switch-on thump, but otherwise this combo gets my vote of confidence, taking its price and facilities into account. It's nice to see a British manufacturer coming up with a product that's at least the equal of its foreign competitors.

Paul White **E&MM**

The Custom Sound 727 carries an RRP of £293 including VAT, and is distributed in the UK by Audio Factors, Audio House, Robin Lane, Pudsey, Leeds, LS28 9HY. ☎ (0532) 561949.

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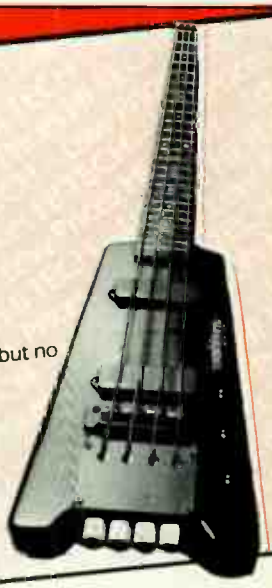

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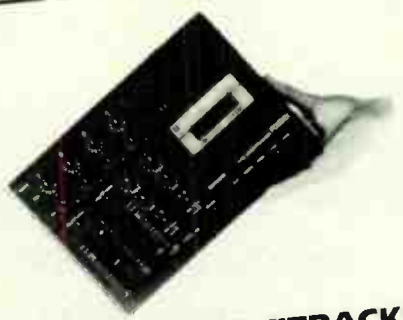

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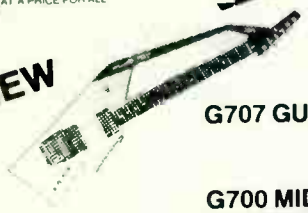

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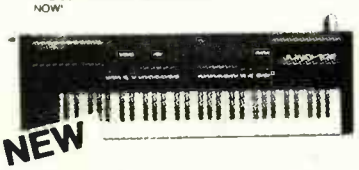

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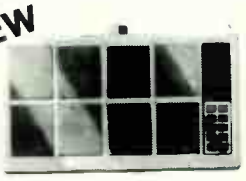

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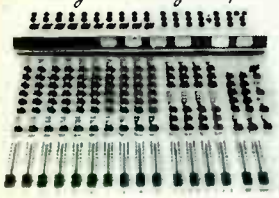

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Synclavier A New Appraisal

New England Digital's Synclavier is one of the world's most respected electronic instruments. Constantly under development, its design is virtually open-ended, while the numbers of successful musicians and producers using Synclaviers on record is evidence of the instrument's exemplary sound quality and operational behaviour. In a special report, Paul White **and** Geoff Twigg **analyse how the system works and what facilities are currently on offer from within the Synclavier's copious repertoire.**

The problem with high-technology music systems like the Synclavier, the Fairlight or the PPG is that they all look similar, and their appearance gives little or no clue as to their capabilities. Usually there's a keyboard, a computer terminal and a large anonymous black box with an assortment of disk drives scattered about the place, which isn't an arrangement many musicians really feel at home with – yet.

It is partly because of this faceless hi-tech look, and partly because of these instruments' fairy tale prices, that the full capabilities of these machines are rarely understood by anyone other than the manufacturer, the distributor and a few élite owners, a situation that E&MM is endeavouring to improve.

The Synclavier is perhaps most easily understood if we look first at the way in which it generates sound or, to be more precise, how it generates the electrical signals that are eventually converted into sound.

There are two ways in which the instrument does this, partial timbre synthesis and sampling.

Partial Timbre Synthesis

A sound may be built-up by adding together four elements which the manufacturers define as 'partial timbres', or partials for short. It is not necessary to use all four partials to build up a sound, because they can in fact be mixed in any proportion and the system programmed such that this mix can be different for different parts of the keyboard, allowing interesting and/or 'natural' sound variations to be created.

Before proceeding, it is necessary to define a partial and the ways in which its parameters may be varied.

Each partial may consist of up to 24 harmonics, which are under the control of a six-stage envelope generator for amplitude control and another one for harmonic control. Fully variable delayed vibrato, tremolo and portamento may be imposed upon the partial, and the decay envelope may be related to the keyboard position.

This is useful for simulating piano-type sounds where the decay period for low notes is much higher than that for the high ones.

In addition, a chorus facility may be implemented on any or all partials, and keyboard control of stereo placement is also possible.

An eight-voice Synclavier system has eight partial timbres, a 32-note system has 32 partials and so on. As previously mentioned, up to four partials may be triggered from one key, which gives a total of 96 harmonics, and this enables highly complex sounds to be generated.

FM

Each partial may also be frequency modulated, which enables either dramatic or subtle harmonic changes to be implemented, and a further six stage envelope generator allows dynamic control of this function.

Although the FM facility is not nearly so complex as that used by Yamaha in their DX keyboards, its use is more instinctive and the fact that four partials may be overlayed means that complex sounds may be built up relatively easily.

Portamento is polyphonic, enabling complete chords to slide together on the keyboard, and up to four portamento rates may be operational on the keyboard at any given time. They can even be programmed to slide in different

directions, and the rate itself is variable from instantaneous up to around two minutes!

The number of keys that may be played simultaneously depends on how many voices each particular Synclavier is supplied with, and how many partials are allocated to each sound. For example, a 16-voice machine using two partials per note would allow eight keys to be played simultaneously.

Partial timbre synthesis does not rely on the disk system for its operation, but sound 'patches' may be stored away on disk, enabling a library of favourite sounds to be built up for later use.

The functions used to create the partials behave as oscillators, but in fact they exist only in software. The computer calculates the result of the user's harmonic manipulations, and this is represented by an eight-bit digital signal. Eight bits may not *sound* like a lot of resolution, but in this case, amplitude control is exercised by using a further eight-bit code *via* a DAC to control the reference current of the output DAC, giving amplitude control at the point where the digitally encoded waveform is converted into analogue. The outcome of this is that full eight-bit resolution is maintained for all amplitude levels and in practice, this gives results of very high sonic quality.

The main computer however is a specially-designed 16-bit machine, and this is employed to the full in the sampling mode.

Sound Sampling

Unlike other sampling keyboards that have very limited sampling times imposed by the size of available memory, the Synclavier uses a system whereby sounds may be stored or recalled in real time from a Winchester disk unit. This gives a storage time of around 100 seconds for the 10 megabyte system and, with the maximum disk storage capability available, a whole album could be sampled with a sound quality rivalling that of the best digital tape recorders currently available. This long storage time is particularly useful in a recording studio, where whole sections of songs may be stored or vocal lines corrected in time and pitch before being re-inserted into the mix.

The 16 bits are used conventionally as 15 data bits and one sign bit, a sampling rate of 50 kHz giving a true signal bandwidth of 22 kHz.

When a sample is played back, the initial data comes from RAM within the system, but before this has run out, the disk unit is busy filling up the buffer so that a continous sample can be maintained. At present, the true sampling mode is monophonic, transposition being implemented by varying the rate at which data is clocked in and out of the buffer memory, but plans are afoot for a polyphonic system in the near future. In order to make the sound as realistic as possible, several samples may be recorded and allocated to different parts of the keyboard to reduce the effects of extreme transposition that occur when only one sample is used.

Once a sound has been stored, editing is simply carried out by moving the cursor along the Synclavier's screen display (which is configured as a graph of amplitude against time), and the scale may be expanded, allowing extremely accurate editing to be carried out. Edited sections may be rearranged into a different order, and each section may be independently manipulated in a variety of ways.

Samples can be blended or reversed, and digital filtering may be imposed on the results before the new edited version is stored under a new filename.

A frequency spectrum from one sound may be imposed upon a different sound enabling – among other things – digital vocoding to be produced, while complex spectral shaping or even inversions may also be accomplished by this technique, giving rise to new ways of manipulating real sounds to produce quite surreal effects.

Although the sampling system is monophonic, a new software release enables a fascinating new technique called Timbre Frame Synthesis to be used on existing machines and, in line with the manufacturers' policy, the software update will be supplied free of charge to existing owners.

Timbre Frame Synthesis

In this mode, a sample is examined at several points throughtout its duration and the spectral content analysed in 24 bands, the amplitude and phase of each component being measured and stored.

This information is then used to set up the partials so that these slices of sound spectrum are in effect resynthesised and can be faded into each other in sequence in order to recreate the original sound. The authenticity of this approach depends, of course, on how many frames are taken for a given length of sample, and a practical maximum seems to be around 50 frames per sample.

This technique is not limited to purely immitative synthesis, however, as the individual frames may be further modified, and a random vibrato function is incorporated which enables the random 'out-of-tune' effects of real instruments (such as brass) to be imposed on any sound.

As with the partial timbre synthesis, chorus may be added to enrich the sound, and special effects may be generated by deliberately undersampling the original sound so that only a few frames are used in the resynthesis process, giving rise to effects that embody the elements of both natural and synthesised sound.

In all modes of operation, the frames may be displayed in a 3D graphical fashion so that frequency and time may be examined simultaneously – useful for deciding on the breakpoints for subsequent digitial filtering.

16-Track Digital Recorder

This section memorises notes as they are played on the keyboard, and may be effectively treated as the equivalent of a 16-track tape recorder. On replay, however, the number of notes that can be played at any one time is limited by the maximum number of voices of the machine in question, but for more involved compositions, the Synclavier may be synchronised to a conventional multitrack machine for overdubbing.

Once stored, sequences can be bounced from track to track and varied in both time and frequency. Sections may be moved backwards or forwards in time relative to the other tracks, and whole sections can be looped, transposed or even inverted.

Between 8000 and 9000 notes may be stored in total, and there is a choice of temporal resolution enabling timing to be tightened up or otherwise modified.

Music Editor

New England Digital provide a powerful tool for the composer in 'Script', their own music notation system. The language is entered in lines of alphanumeric notation, usually in pairs – one for pitch and the other for rhythm. In conjunction with the music-printing option, you can print out scores in up to 16 parts with one or two voices on each. The updated software incorporates an extended library of music symbols, the ability to add or delete notes and insert text or symbols anywhere on the score by means of the cursor.

Once you have entered a composition in Script notation it may be compiled as a file in the Synclavier's Memory Recorder and played as if it were a recording made in the conventional way, that is, entered at the keyboard. Your composition can of course be manipulated to give precisely-controlled syncopation and polyrhythms which would be difficult to enter at the keyboard.

The most important part of any music composition language is the facility for editing, analysis and synchronisation to other media. To complicate matters slightly, it is possible to store, recall and edit music in the Synclavier in three different formats: Script notation, normal music notation and computer music notation. This may be seen as an attempt to satisfy the needs of a variety of different users, whether academic musicians, rock producers or music publishers.

The music printing option is among the clearest and most accessible we have seen, and will be further improved with the updated specification mentioned earlier. The only serious problems, which relate to all music analysis and printing systems, are due to the precision required when entering notes in real time. If you make any sort of mistake (by the computer's standards) this is analysed and represented in full graphic detail on the score. For instance, if, as we did, you press a note down gently and hesitate as it triggers, it's quite possible to record a double-headed note which is duly printed. Also, syncopations are represented to whatever resolution you have selected with no sympathy at all for rubato or musical license. This, of course, is why the secondary editing has to be so good,

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Controls

The keyboard console layout has been kept deliberately simple for ease of operation. All parameter and function switches are illuminated pushbuttons, there being only one rotary control at the left-hand side of the panel which adjusts the value of whichever parameter is selected, the actual value being displayed to the right of this control by a four-section, LED alpha numeric readout. As yet, the keyboard has no dynamic control and no performance wheels are fitted.

It is neither possible nor desirable to outline the precise control functions as to do so would entail reproducing most of the manual (which in this case would need to be serialised over the next 100-odd issues), but what can be said is that the manual is clearly and concisely written and that the software presents a user-friendly approach whilst displaying a lot of relevant information on the monitor screen.

Guitar Synth Interface

An interface unit is currently available that will allow an existing Synclavier system to be played from a Roland GR Guitar Synth controller, and a small console is provided which can be mounted either on the guitar or on a suitable stand so that the patches and relevant parameters may be easily changed.

The pitch is extracted by means of a zero crossing to digital converter, and some control over picking dynamics can be exercised.

Pitch tracking is fairly well behaved, but unless the release time is fairly short, the pitch will go flat during the release time unless the quantisation facility is invoked.

This may be programmed in semitones, quarter tones or eighth tones, making experimentation with oriental scales possible, and I imagine that this guitar interface shouldn't take too much getting used to, providing that you have some experience or understanding of guitar synths. However, experience has shown that setting up an orchestral string patch on the Synclavier and proceeding to play Motorhead riffs is not a particularly fruitful exercise...

Conclusions

No instrument can be all things to all people, and so we're not about to join in the argument as to whether this is or is not the world's greatest musical instrument; after all, even a relatively inexpensive acoustic guitar will always give a more realistic sound than a machine regurgitating an acoustic guitar sample.

The possible uses of the Synclavier system are extremely diverse. Some users have bought systems without the keyboard purely for the spectral analysis capabilities, whilst some producers use the storage facility extensively for salvaging backing tracks recorded by artistes of somewhat dubious technical skill.

The synchronisation facilities enable the Synclavier to link to SMPTE devices *via* a suitable interface, making it potentially a very useful machine for video production work.

It's difficult to comment on the sound of this instrument, as theoretically it will reproduce any sound required, but the specification in terms of sound quality is exemplary.

Whether or not this type of machine is worth its asking price of a country-semi must be a business decision; if it will do what you want it to do and will make you more money than you would get by investing the capital elsewhere, then the answer has got to be yes.

The Synclavier's design philosophy, assuming New England Digital adhere to it, means that the instrument will not become out-of-date in the foreseeable future, and the policy of automatically updating all owners' software when improvements are introduced makes for a refreshing freedom from planned obsolescence.

E&MM

Just as this issue of E&MM went to press, news reached us of some significant new hardware developments for the Synclavier, and we hope to bring you details of these in the September issue. Meanwhile, further details on the Synclavier system as it stands now should be available from the UK distributors, Turnkey, at Brent View Road, London NW9 7EL. ☎ 01-202 4366.

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THE FAIRLIGHT EXPLAINED

When the Fairlight CMI was released seven years ago, both the machine and its software represented a significant step forward in the application of computer technology to music. Today, the Fairlight is used in the making of popular music the world over, as well as performing an important role in the field of musical and technological education. Despite this, very few people are fully aware of what the CMI does and how it does it. Jim Grant, **who's been working with one for a number of years at the London College of Furniture, has decided to rectify matters by writing a series dedicated to explaining the Fairlight's workings. Part one appears below.**

Before the Fairlight's appearance, most computer music systems were the perogative of mainframes and their contribution to the world of everyday music was slight. Kim Ryrie (the Fairlight's father) and his Australian colleagues soon changed all that, however and their invention is now used in almost area of music production, to the extent that many people appreciate its sound without realising that they're listening to 'music by numbers'.

However, despite its widespread use, there are relatively few Fairlights in general circulation – less than 100 in the UK – and to see one in action at close quarters is a real treat. Herein lies the rationale for this series of articles. What does the Fairlight do? How does it do it? And what can the average musician do with it?

Hardware

To take delivery of a Fairlight leaves your bank balance empty and your living room full. The hardware consists of a Central Processor Unit (CPU), one – or optionally two – six-octave keyboards, a typewriter-style QWERTY keyboard, and a VDU with added lightpen. In addition, there are some long connecting leads, a Systems floppy disk drive and a box of disks containing library sounds.

Software

A foolproof system of connectors – and a quick glance at the manual on the part of the user – ensures that the Fairlight can be powered up in no more than five minutes. The VDU displays the expectant message 'CMI READY', while the CPU hums quietly: there are three fans pulling air through the innards, keeping 500 watts of power dissipation down to an acceptable temperature. . . .

Inserting the Systems disk in the left-hand drive (Drive 0) results in a faint click as the stepper motors engage. The operating software is loaded as a series of 'fetches' – each section of program loaded pulls in the next section. When this process has been completed, the user is faced with the Index page. See Figure 1.

Here lies one of the Fairlight's most powerful features. The whole system is menu-driven and the different options correspond to different VDU displays and sets of commands which are entered from the alphanumeric keyboard. Each option is referred to as a Page. A Page has one or more files resident on the Systems disk which are loaded when the Page is selected. Page 1 is the Index Menu itself (Figure 1), while Page 2 manages the files stored on the disk in the right-hand drive (Drive 1). These files are user-created, and there are seven different types, as indicated by the suffix after the file name. These are as follows:
NAME.VC is a voice file occupying about 20kBytes. It holds waveform data (16K) and extra information regarding looping and so on.
NAME.CO holds control information such as portamento, vibrato frequency and depth.

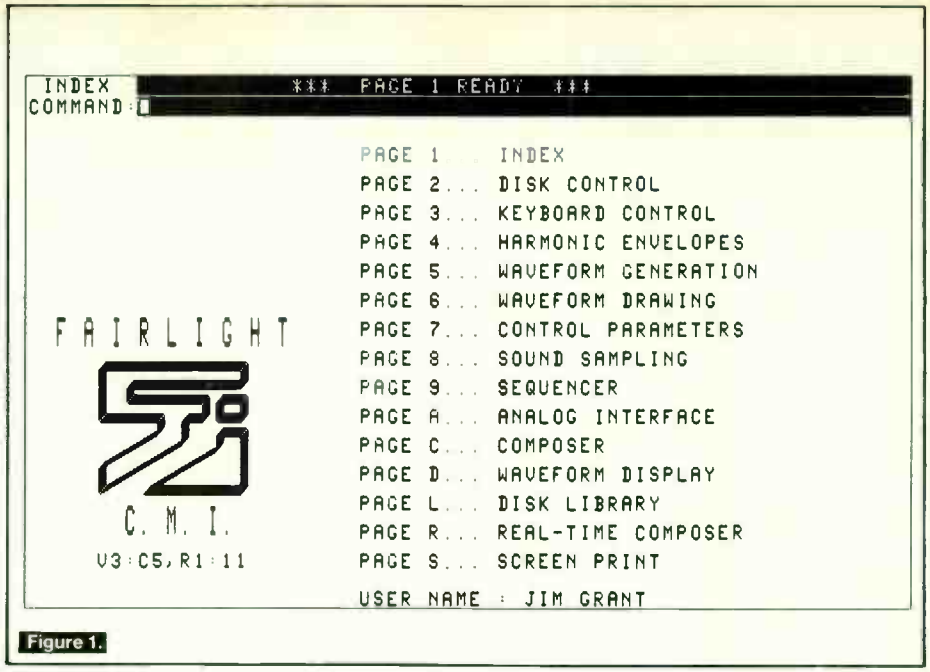

Figure 1.

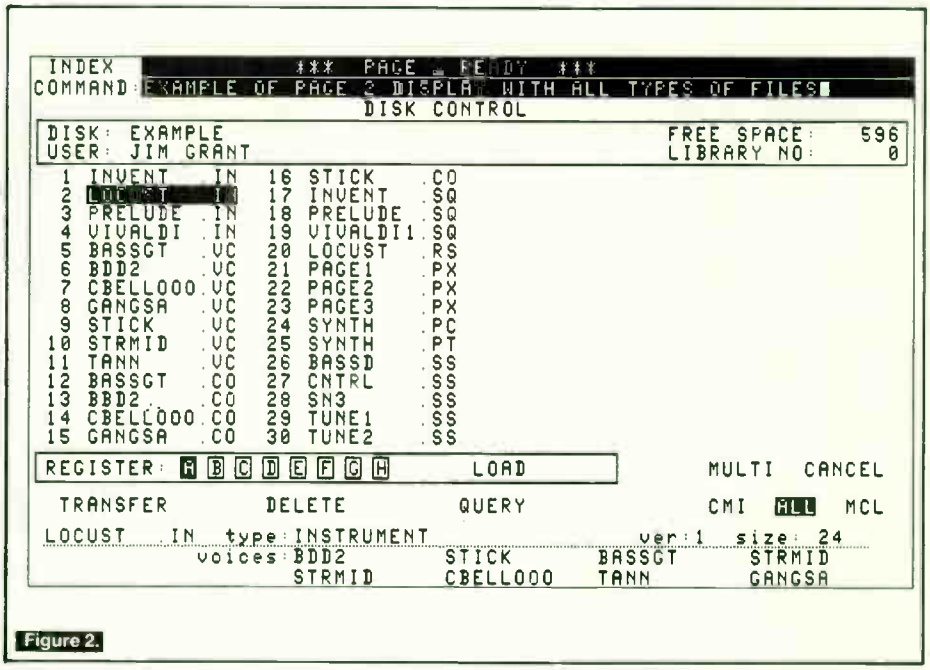

Figure 2.

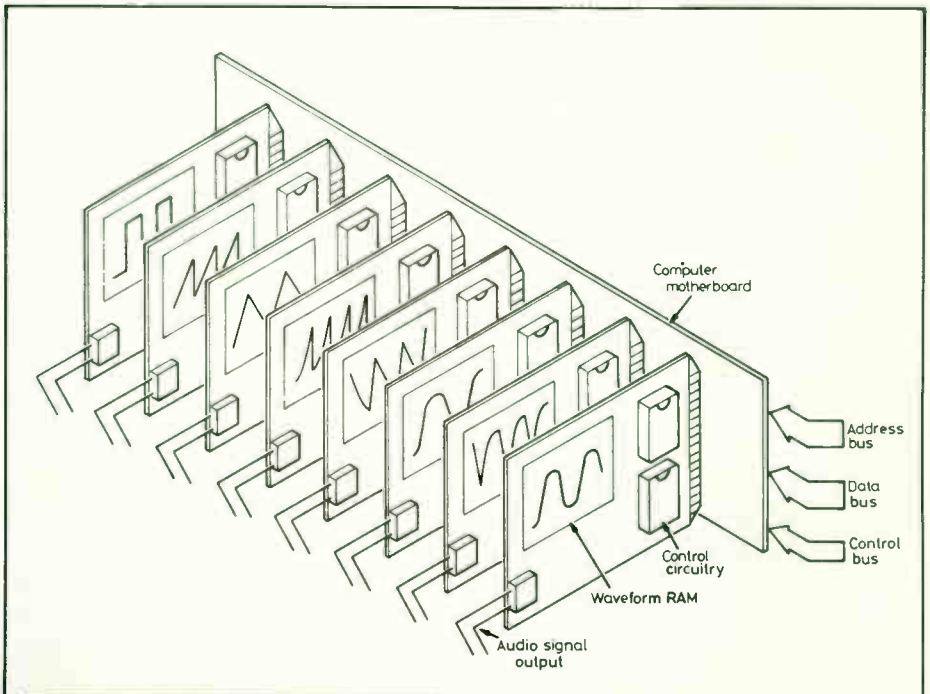

Figure 3. Fairlight channel cards with specimen waveforms illustrated.

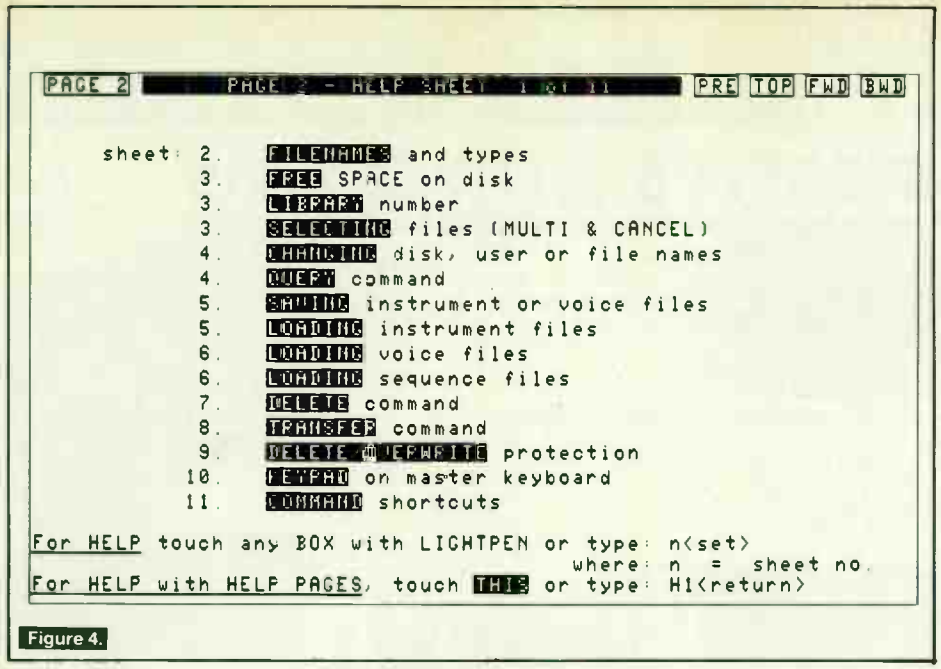

Figure 4.

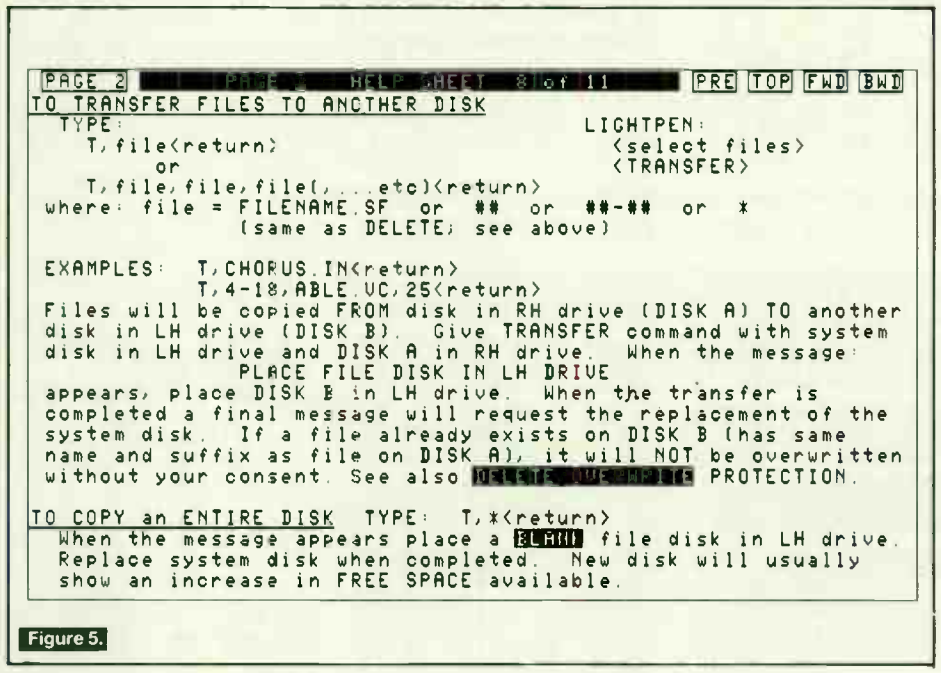

Figure 5.

NAME.IN configures the CMI to a particular instrument state. Voices are automatically loaded and spread across the keyboard.
NAME.SQ holds polyphonic keyboard sequencer information.
NAME.RS is a real time sequencer (Page R) file.
NAME.PX corresponds to a screen dump (Page S) to disk. This can be spooled later to a dot-matrix printer for hard copy.
NAME.PC, PT, SS are Music Composition Language (MCL) files. These are generated on Page C and hold text files that describe notes with duration, dynamics and so on.

A voice file can be loaded in a number of ways. Probably the easiest is to point the lightpen at the voice name and then at the command LOAD at the bottom of the display (Figure 2). Drive 1 springs into action immediately, and after a second or two the selected voice appears on the keyboard.

So far so good. But where does the voice information go, and how does it result in a sound when the keyboard is played?

Channel Cards

Inside the Fairlight, there are usually at least 16 circuit cards, the exact number depending on various options such as an analogue interface and sync card, and eight of these are known as voice or channel cards.

The Fairlight produces sound by a process called Waveform Synthesis. Each command that deals directly with sound generation must involve at least a section of a waveform. The waveform itself is held in 16K of RAM on each channel card as a direct digital representation, so that increasing amplitudes give larger binary numbers. Therefore, when an eight-note polyphonic sound is present on the keyboard, each channel holds the same voice data.

Put simply, the channel cards can be regarded as digital oscillators whose waveform is determined by the contents of 16K of RAM (Figure 3). Different pitches – as played on the keyboard – correspond to the RAM information being read and converted by a DAC at different rates; the channel cards perform this function autonomously. The computer section of the Fairlight passes parameters such as pitch, vibrato, portamento rate and looping points along its data bus, and once these have been received, the channel card outputs the sound until the parameters are updated.

Overall pitching of the CMI is determined by a system clock resident on a special card known as the Master card. We'll be referring to this on numerous occasions over the next few months, since it holds the circuitry for a good many of the CMI's functions. A 34MHz oscillator is onboard, and this is divided and fed to the individual channel cards. It's from this clock that the RAM clocking rates – and thus keyboard pitches – are generated. The whole instrument can be tuned by scaling the master clock.

Page 2 Commands

Looking again at Figure 2, there are several commands at the bottom of the display. TRANSFER allows files to be copied from one disk to another, using Drive 0 as the destination drive. This is essential for creating backup copies of important music and/or sounds. DELETE erases unwanted files to make room on the disk. Invoking this command prompts a confirmation message to prevent accidental erasure of important files. When a file is deleted, FREE SPACE increases by the deleted file size.

At the very bottom of the display is an example of the QUERY command. This tells us that LOCUST.IN file will automatically load eight voices, whose names are shown.

Help Pages

By this time, you're probably wondering how anybody using a Fairlight ever manages to remember all the commands, especially since we've only considered Page 2 and there are another 13 still to go.

The answer is simple: Help Pages.

Figures 4 and 5 show examples of Page 2 Help Pages. In fact, the entire user's manual is held on the Systems disk, and sections relevant to the current display Page can be inspected at any time by typing HELP (what else?).

Initially, an index sheet is displayed (Figure 4). Touching any of the highlighted options with the lightpen results in the Help sheet specific to the selected option being loaded and displayed. The user can flick backwards (BWD), forwards (FWD), or recall a previous place (PRE): commands can be entered from the Help sheets while viewing their correct format. The CMI then automatically reloads the display page that called the Help sheet in the first place, and executes the command. And yes, there are even Help sheets that explain the use of the Help sheets. . . .

That about wraps up the first part of what will doubtless become a saga of some duration. Next month, we'll take a look at Page 3 – the keyboard map – and the waveform display page, Page D.

Jim Grant **E&MM**

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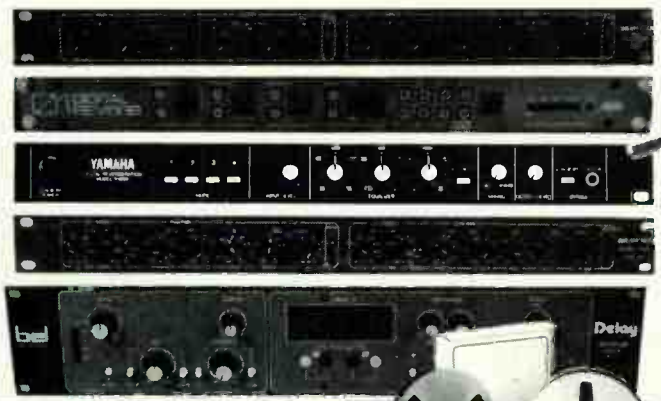

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pianissimo!

introduction: dan goldstein

two years ago, perhaps even less, the idea that technology would ever be applied to electronic pianos with the same urgency as it's applied to synthesisers would have seemed mildly absurd.

From a position of great prominence during the late sixties and early seventies, the electronic piano gradually declined in significance as musical tastes altered and synths offering the keyboard player a far greater range of sound possibilities became available at more competitive prices. For some while, and despite the efforts of a number of manufacturers and designers, it seemed that the piano's potential for further technological development would be limited to refinement of the electric grand designs introduced by makers such as Yamaha, Helpinstill, and Kawai.

However, advances in sound generation techniques and the introduction of a universal keyboard interface standard – the MIDI – have put the electronic piano firmly back in the limelight: hence the brief roundup of new models you'll find in the following pages.

It's interesting to note that the Japanese manufacturers – almost to a man – have so far devoted most of their efforts towards making instruments that are intended first and foremost for domestic use: witness the wood veneer finish on Yamaha's PF series, Roland's HP system and Korg's Symphonic Pianos. It would appear that, for the moment at least, Japanese marketing men consider the domestic arena a potentially more fruitful one than the professional scene, and as a result, the latest generation of Far Eastern electronic pianos have been styled and promoted as a tonally more versatile and ergonomically more convenient alternative to the acoustic piano in the family living room, rather than as a serious tool for the professional keyboardist.

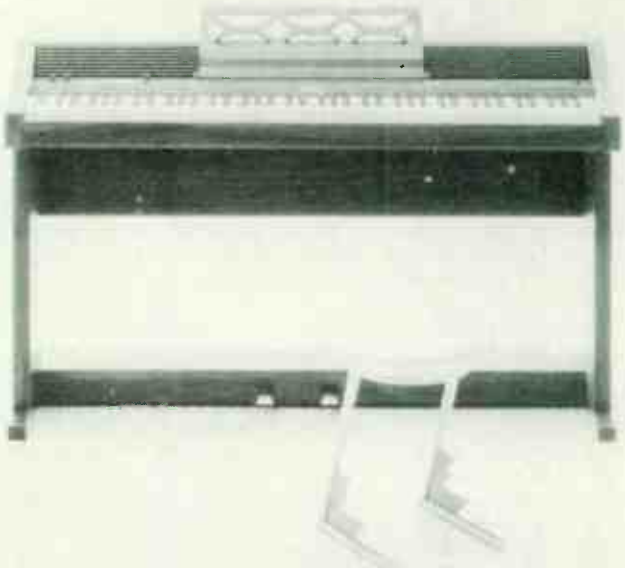
In some ways this is something of a pity, since almost all of the current breed of electronic pianos are sufficiently competent to warrant a degree of interest on the part of the professional, be he/she a session player, a gigging musician or a composer/arranger.

In other respects, however, it may be just as well that this first generation of technologically-improved instruments is being test-run by domestic rather than professional users, because as our tests show, much of the hardware is still in need of some further development. In particular, some of the keyboards are not quite as inspiring to play as their descriptions might suggest – though the phenomenal cost of producing a keyboard of acoustic piano-quality must be borne in mind, it's true – while it would also appear that fine piano voices are also often accompanied by excessive background noise, something that's obviously going to be of importance if a lot of studio work is envisaged, for example.

Still, these minus points can't detract from the fact that the electronic piano is now a much more refined, more versatile, and more usable a breed of keyboard instrument than it ever has been. Or the fact that its future looks brighter still.

hp300: £899

hp400: £1125



roland hp300 hp400 pb300 pr800

review:

geoff twigg

The Roland HP300 and 400 pianos are designed to fit unobtrusively into the average sitting room, being made of wood and sheet steel and covered in a veneer of wood-effect vinyl. They're also provided with a stand which raises the keyboard to the height of a standard upright piano, and there are two pedals set into the base of this stand which connect to quarter-inch jack sockets at the rear of the instruments to provide sustain or damping.

There is an on/off switch on the right hand side of the keyboard, and on the left are several switches fitted with LEDs which enable the user to select one of three piano tones, Electric Piano, Harpsichord and Vibraphone. There are also Stereo Chorus (on/off) and Tremolo (on/off and rate) controls, though this latter feature is not fitted to the 300. The rear panel offers mono and stereo outputs and an external input, both with high/medium/low level selection, a tuning knob which varies the pitch of the instrument less than a semitone in either direction, and the standard five-pin DIN MIDI In and Out sockets.

The tones produced by these instruments are all reasonable, though none of them is particularly wonderful, and while the touch-sensitivity is undoubtedly effective, it doesn't really resemble a piano keyboard to play. All the sounds are greatly enhanced by liberal use of the stereo chorus facility.

I would have welcomed the opportunity to combine some of the sounds provided in groups of two or three, but they are wired so as to be mutually exclusive, a red LED being illuminated on the preset currently selected. Although the HP400 is a nicely-styled instrument (in the tradition of the sort of furniture you find in discount warehouses), it seems a little expensive as a stand-alone piano at an RRP of £1125, and I would look for a better sound capability or a more realistic piano touch/key weighting from an instrument in this price range. However, as part of the trio completed by the PB300 and PR800, it emerges in a different light, while the smaller 75-key version – the HP300 – is about £200 cheaper and lacks the Tremolo but is in all other aspects is identical: I feel this represents better value.

pb300 rhythm plus

This is a drum machine similar to those that have become common on home organs and the like. It is equipped with two banks of preset rhythm patterns with individual selector buttons, and an LED indicating which preset is selected. Rhythm volume is controlled by a slider, and tempo is set with a large control knob which is not calibrated. There is, consequently, no way of setting this machine to a specific number of beats per minute without hooking it up to the accompanying keyboard recorder – but more of this later.

The presets are all fairly standard and usable (if you like that sort of thing) and

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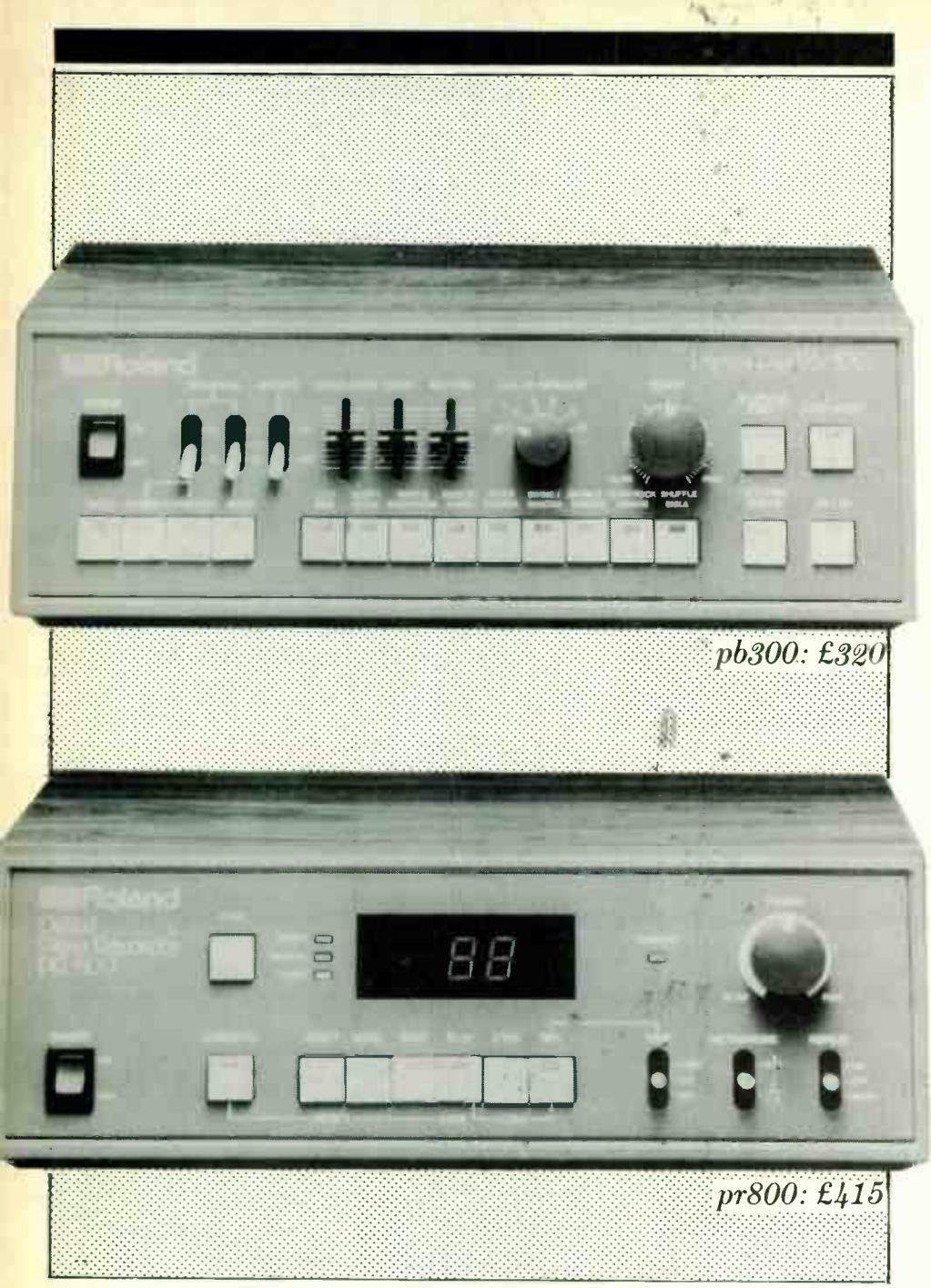

pb300: £320

pr800: £415

each has its own individual fill-in bar which may be inserted at 2, 4, 8, 12 or 16 bar intervals, or at will by pressing the Fill button. In addition to the standard kit sounds (the ride cymbal is pretty abysmal, but the rest are OK) it's possible to obtain an automatic bass line appropriate to the selected preset rhythm, and a chord or arpeggio on the notes you're playing with the left hand. These two are also controlled by sliders adjacent to the rhythm volume controller.

There is also a Hold facility which retains the pitch of the last bass note you played as the basic pitch for the accompaniment if you don't want to hold it down. The lower part of the piano keyboard is dedicated to this auto-bass/chord function, and the split point is fixed at the F sharp below middle C on both the HP400 and 300.

Other facilities include a tuning routine for the automatic bass/chord using the Tune button on the piano, a Synchro Start button which starts the rhythm unit only when you start playing on the keyboard, and finally a Nuance switch (sounds like a contradiction in terms) which transfers touch-sensitivity information from the keyboard to control the volume level of the rhythm unit.

pr800 digital keyboard recorder

This is an excellent little machine and for me represents the saving grace of the system. The front panel sports a liquid crystal display which, at your command, tells you which bar of the recording you are in, how much memory (as a percentage) you have left to record into, or what tempo the metronome is set at. This display is controlled by (surprise, surprise) a Display selector. The metronome may be selected to play in crotchets or quavers (quarter notes or eighth notes) at any speed from 40 to 240 beats per minute and with accents in 3/4 or 4/4, or with none at all. A damper indicator shows when the recorder detects you have depressed that pedal.

Recording and Playback are as simple on this machine as on any tape or cassette recorder and the quality of reproduction is, of course, perfect. If you press Record followed by Play, your exact performance at the keyboard will be recorded, mistakes and all, but you can go back and record again from any measure you choose, and the recorder automatically plays you in from two measures before so that you can get used to the tempo before the recording starts. Having punched in, however, it is not possible to punch out – you have to play on to the end.

Should you require a metronome, this can be selected and adjusted after you have pressed the Record button but before you press Play, which starts the recording. At the end of the recording, you press Reset to return to the beginning, or Forward or Back to go to any other part of your recorded passage. A pedal can be used to operate the Play/Stop functions if you want to get your hands ready on the keys. There is also a Repeat function (an excellent idea) that enables you to repeat the piece you have recorded indefinitely, or alternatively to mark any part of your recording to be repeated: up to two repeat marks may be used in any recording. In this latter case, the Reset button takes you back to the previous repeat mark, or to the beginning.

The keyboard is live during playback, enabling you to play duets. If you switch the recorder off the recording is lost, so Roland supply an interface that connects *via* a couple of jack sockets on the back of the recorder and lets you dump the contents of the memory to cassette. The Play, Record and Reset buttons double as Save, Load and Verify respectively and the entire contents of the memory – not part – may be shuttled to or from cassette tape. This of course means that you can build a repertoire of recorded material – say one half of your favourite duets – and the play them back while performing the other half 'live'

Auntie Maud would be really impressed!

conclusions

As a complete system, the HP400 (or 300), PB300 and PR800 chat away to each other along the MIDI bus and seem to get along fine.

Personally I found the rhythm unit both limited and limiting, and would very much rather use another (programmable) Roland rhythm unit, even though this would probably work out more expensive.

Having said that, this is not really the sort of set-up you can take out to gig with since it's really designed as a piano system for the domestic player, and in this context the rhythm unit is up to scratch, while the piano touch doesn't have to be too realistic I suppose.

Certainly, the recorder is an excellent unit and makes the Piano Plus system well worth looking at as well as being excellent value for money in its own right.

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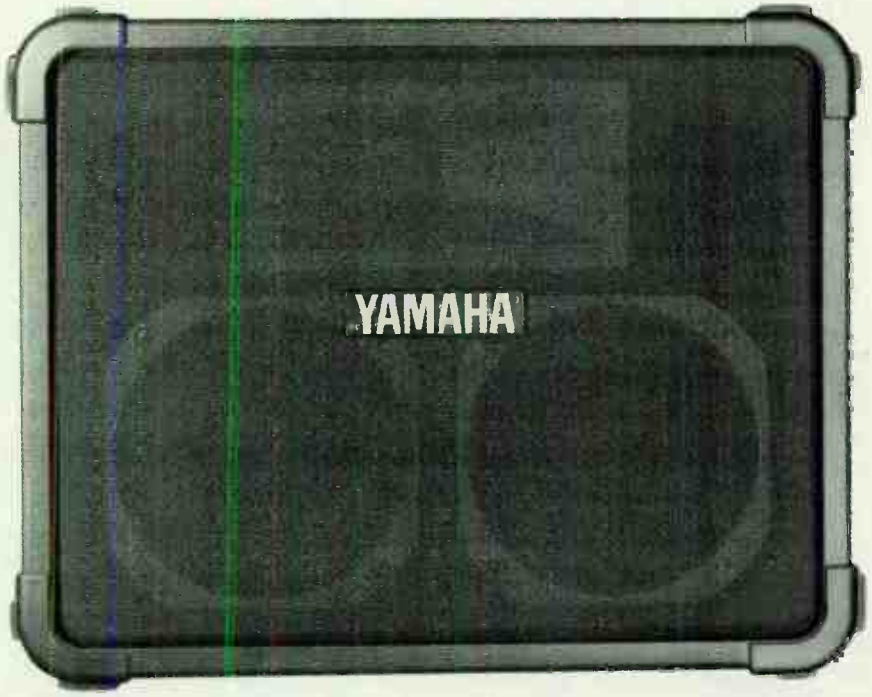

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siel px jr

review: kev harding

px jr: £399

Not being familiar with the Junior's big brother, the Siel PX, my initial impression was of a neatly laid-out keyboard, with a symmetrical switch and loudspeaker output blending very attractively with the parallel light blue lines that lie across the console. Add to this the dark grey body being offset by blue and white lettering and the notes themselves, and you've got a modern instrument that's visually very appealing.

Having to clamber amidst assorted junk for a two-pin socket adaptor did put a temporary damper on things but, having tackled one of the simpler problems not yet fully tackled by the European Parliament, the PX jr was eventually operational and responded with the gentlest of modulated 'swishes' from the built-in stereo chorus when switched on.

Like the instrument itself, the owner's manual was neatly set out and was conveniently sub-headed, with clear black and white photographs ensuring that the simple, easy-to-follow instructions were virtually idiot-proof, for which I was grateful. As these were available in Italian, French, English and German, I did wonder why the guarantee was written exclusively in Italian. Oh well, *non domando me*...

controls

The PX jr is a fully polyphonic, 72-note, electronic piano that incorporates a touch-sensitive keyboard ranging in pitch from a low F some two-and-a-half octaves below middle C, up to a top E almost six octaves away. The third A corresponds to 440Hz with the adjustable trimmer centred. This is clearly marked 'Tune' and not unexpectedly sports a flat sign to the left and a sharp sign to the right.

Fine tuning was at first a little difficult as the small plastic button was a bit awkward to get hold of and move, but after a while this didn't prove to be any real problem. The only slight hiccup in pitch came from the filter which, while cutting out unwanted sounds efficiently, also reduced the volume to a marked degree on some of the presets, and produced a slight 'clipping' effect which made the octaves sound very slightly flat.

The only other master control apart from the Tune button is the Volume control, which is marked off to indicate level and works perfectly.

The Siel's output is fed through a built-in 9W RMS amplifier and monophonic loudspeaker system, which is angled face-down and projects most of the sound through a cut-away section at the back of the piano.

Although a good idea for practice purposes, it was disappointing to find that the system was too inflexible to be of any greater use. Volume was often inadequate until nearing the maximum output, which was loud enough for solo practice but would be inadequate for use with a group. At higher volume levels the tonal quality deteriorated, often becoming sharply percussive across a wide range of pitches and occasionally producing speaker distortion, especially around the upper register of the keyboard.

The piano's size doesn't make it very portable, but as Siel offer supports and a black imitation leather carrying bag as optional extras, the PX jr would seem to be better suited for use in the context of a working band if connected through an external amplifier, for which there is a socket on the back.

Perhaps not surprisingly, doing this resulted in a considerable improvement in sound quality, but I was disappointed to see that no separate volume control was available, meaning that the built-in speaker still made its presence felt by being perpetually in use. (Though I imagine its output would just about be eliminated by the force of something like a 1K PA rig.) The only other slight problem was that the effect of the stereo chorus was diminished a little by using external amplification, probably something to do with the sound balance of the built-in speaker system.

There are two other jack plug sockets on the back, one for headphones which worked well and produced a reasonably good sound, the other for the sustain pedal that comes as standard with the piano. This probably doesn't take too much time to design or manufacture but does its job extremely well.

The stereo chorus is easy to use, a small red LED indicating that the switch is either on or off, while a Speed control effectively adjusts de-tuning to the required degree. The overall effect improved the sound quality significantly, altering the tone to give both greater warmth and depth, and is a real pleasure to use.

in use

There are five presets offered: Piano 1 and 2, Electric Piano, Harpsichord and Honky Tonk, and each has a small red LED which lights up when the voice is in use. It was a bonus to discover that any of the presets could be used together, and although this increases volume levels a fair bit, it does add some welcome colour to the original uncombined tones.

Sadly, some of the factory presets on their own were a bit disappointing. The Electric Piano and Harpsichord probably work best, but even these sounded weak without the user resorting to the stereo chorus. Combinations of several presets worked rather better, but few sounded really convincing without the use of sustain and the stereo chorus to add a degree of authenticity, always assuming, of course, that that's the quality you seek in an instrument of this type.

The touch sensitive keyboard has a very light feel and provides a positive response, but some players may consider it a touch underweighted and not quite dynamic enough. Like so many other designs the PX jr will go loud or soft but not very far in between.

It was felt that the lower range of the instrument offered the best response and generally worked well, proving to be the most satisfying audibly and especially effective when using its polyphonic qualities to the full on sustained chords. Unfortunately the same cannot be said for the upper register, where tone quality soon deteriorates under stress and often becomes harsh and/or shallow.

conclusions

In sum, the PX jr is easy to set up and use, and generally behaved itself during the test period. However, for the money I would have expected a little more in terms of sonic performance before investing in it as a main keyboard instrument, though in the context of a multikeyboard set-up, its inclusion may be more worthwhile.

If anything, this Siel is really an instrument of promise unfulfilled. A couple of MIDI sockets on the back, for example, would have made it a far more interesting proposition and I hope the manufacturers are working on this.

As it stands, this smaller PX may well win the approval of the domestic or semi-pro musician who needs a simple writing or practising tool, but from my own point of view, the Junior's beauty was only skin deep.

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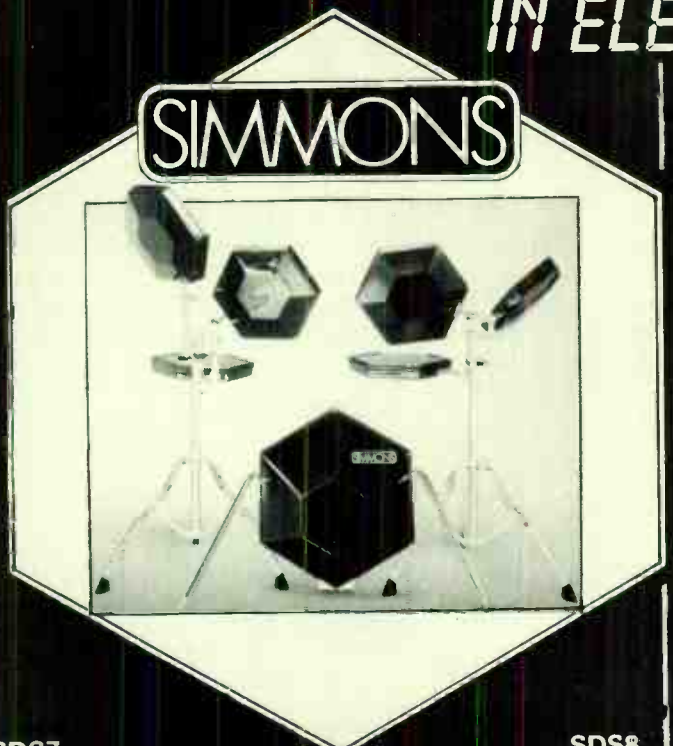

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yamaha pf15

pf15: £1049

pf10: £749

pf10

review: paul white

Electronic pianos have come a long way in the last decade, and this latest breed from Yamaha utilises the same frequency modulation system of synthesis that made the DX synthesisers an instant legend.

The PF15 has an 88-note A-to-C keyboard and as well as being velocity-sensitive, the keys have a weighted action that will appeal to musicians who've been trained on a conventional acoustic piano.

Internal amplification is provided for practice or domestic use, and this is fed to two built-in loudspeakers *via* a stereo chorus circuit that may be switched in or out as required.

For recording or concert use, two line level outputs are provided so that the full effect of the stereo chorus may be maintained, and the output level is independent of the volume slider.

A choice of ten different voicings is available at the touch of a button, and a transpose facility allows the pitch to be tuned up or down a fourth in accurate semitone steps, a separate tuning control facilitating fine tuning to other instruments.

construction

The PF15 is no lightweight at 77lbs. its steel construction making it a very substantial piece of engineering, although its sleek design means that it will fit in with most front room furniture. Overall size is 52" × 4¾" × 15⅜".

The distinctive brown paintwork is complemented by simulated wooden end cheeks, while two matching plastic grilles house the speakers at either end of the front panel for maximum stereo effect within the confines of the instrument itself.

Internally the construction is surprisingly simple and uncluttered, as all the sound generation is handled by Yamaha's own custom-built LSI circuits, which keeps the component count down to an absolute minimum. The built-in amplifiers are capable of providing five watts each and, although this doesn't sound a lot, in fact it's quite sufficient for domestic use or practice.

controls

Because of the preset nature of the instrument, controls are a bit thin on the ground, and the front panel sports only six pushbuttons and two sliders if you don't count the mains switch. To the extreme left is the transposition slider, which has click stops every semitone allowing C to be transposed down to G flat or up to F: definitely a boon for club performers who back different singers every night, each one demanding the

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same songs but in different keys.

Next come the voice selector buttons which are arranged in two banks of five; the first button selects the bank and then the next five buttons select the voices from that bank.

Bank one contains three piano and two harpsichord voices, whilst bank two offers the choice of a further three piano voices, vibes and clavinet.

Next button along switches in the stereo chorus which is fully preset, being based on a charge-coupled, delay line circuit. The pseudo stereo effect is produced by ivnerting the phase of the time-modulated component fed to one channel, which is a pretty standard way of producing this effect, but one shortcoming of this method is that a stereo recording replayed in mono is likely to cause the effect to disappear, as the two antiphase components cancel each other out.

To the right of the chorus button is the volume slider which is calibrated zero to ten (just for a change), and the operation of this control should be no problem to anyone who is bright enough to find it.

To the extreme right of the front panel is the power switch (accompanied by the obligatory LED) and the output is muted for a few seconds after switch-on, presumably to hide embarrassing sounds that might otherwise ensue.

rear panel

The back panel conceals seven sockets recessed safely behind a chocolate brown facade, each one being labelled in the same shade of chocolate brown just to stop things getting too easy. Facilities on offer here are line input, sustain, key hold, stereo output and a choice of two types of headphone socket. Also lurking here, disguised as another socket, is the fine tuning control.

The line input allows another musical instrument or rhythm machine to be played through the internal speakers, while the sustain socket connects to a momentary action footswitch, so that a reasonable approximation of the sustain pedal on a conventional piano can be put to use.

The hold function is one not to be found on an acoustic piano: connecting a footswitch to this socket allows notes or chords to be sustained indefinitely while new melodies are played over the top. Stereo line output is *via* two separate jack sockets so that only one may be used if mono is required, and a choice of standard quarter-inch or mini jack headphone sockets is thoughtfully provided, so that you can use the 'phones off your Walkman or whatever.

in use

Since playing the piano is not my *forte*, I enlisted the help of one Mick Jones, who owns and plays both a grand piano and a Fender Rhodes in addition to various synths.

His first reaction (apart from 'Cor, I thought my Rhodes was heavy!') was approval for the weighted keyboard, which responded in a positive and reassuring manner, being if anything a little more positive and even than that of an acoustic piano.

All six piano sounds were found to be useful, though it should be mentioned that they are simulations of electric instruments rather than acoustic ones. One preset was discovered to be quite close to the Fender Rhodes sound, being a little brighter and generally less muddy, and indeed it was at this point that Mick suggested swapping his Rhodes for it in the sure and certain knowledge that no one would notice.

There are two harpsichord presets which also met with complementary approval, but it was the vibes and clarichord voices that elicited the most praise. All these voices sounded good with or without help from the stereo chorus, and the only criticism revolves around the level of background noise. The chorus is noticeably noisy when switched on (though not unusably so) but another source of noise also gave cause for concern. If a low note is played using one of the piano voices so that there are few high frequency components, a burst of noise is heard during the note, though this dies away with the note leaving silence when the piano is not being played.

This is not a noise gate, as it's possible to hear the noise being progressively low pass filtered during the decay, so presumably some form of tracking filter or dynamic noise reduction is being employed.

Although probably adequate for live performance work, the noise factor could be a real problem when recording, so this must be borne in mind if you're in the process of deciding which electronic piano to buy.

pf10

Using the same circuitry as the PF15, the 10 features a reduced keyboard length, effectively losing one octave from either end. The keys are still velocity-sensitive but cost has been saved by using a standard sprung plastic keyboard instead of the more sophisticated weighted action of the PF15.

All voices and facilities are otherwise identical, but it should be noted that the sustain pedal provided is a simpler device than the elegant unit supplied with the PF15.

conclusions

Both these pianos offer ten very useful preset sounds and could certainly be used instead of the popular electro-mechanical pianos that until now have been pretty much the industry standard.

Yamaha's FM synthesis techniques produce a bright, harmonically rich sound, and the only negative comment must be aimed at the high level of background noise, which is really not on for instruments of this price and calibre.

With this reservation then, I feel Yamaha have succeeded in building a fine-sounding pair of pianos that look and feel first class.

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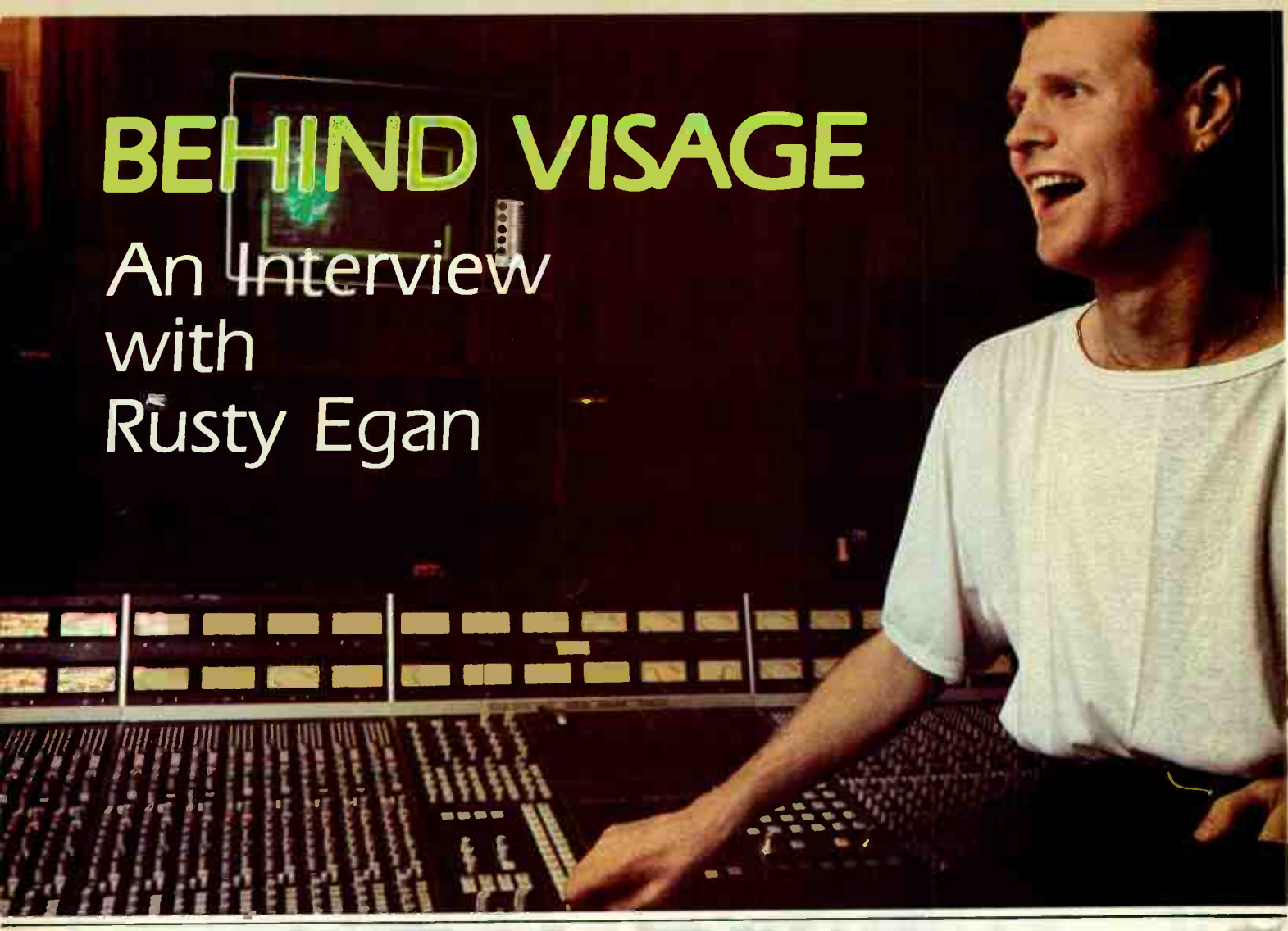
BEHIND VISAGE

An Interview with Rusty Egan



Modern music's recent history has produced a number of drummers and percussionists – Richard Burgess, Phil Collins, Warren Cann – who have left their original instrument and turned instead to making music with modern technology. Rusty Egan is another such player. As a founder-member of Visage, he pioneered the use of drum machines and micro-composers and helped fuse them into a band sound that was both original and commercially successful. He's now a co-director of both the Camden Palace nightclub and Trident recording studios, and Dan Goldstein **spoke to him shortly after the completion of the third album by a re-formed Visage.**

Whatever else may be said about Britain's punk movement of the seventies, what can't be denied is that it gave much of our youth culture a much-needed shot in the arm, calling a halt to what had been almost a decade of musical stagnation. However, one thing it did not achieve was a smartening up of rock music's image. If anything, the anarchic nature of much of its music (itself in keeping with the movement's philosophy), the unkempt appearance of its followers and the decrepitude of many of its live venues only served to blacken rock's image further.

Two subsequent – and somewhat less dramatic – movements tried to alter this state of affairs, and Rusty Egan, the subject of this month's cover interview, was intimately involved with both of them.

The first – 'Powerpop' – was an attempt to fuse punk's raw musical energy with the mass appeal of pop lyrics and attitudes. Powerpop's most significant band were the Rich Kids, a four-piece founded by former Sex Pistols bassist Glen Matlock and including Steve New, Midge Ure, and Rusty Egan on drums.

It was Egan's first major venture into playing and writing music ('I had done a few other things, but nothing really worth talking about'), but in spite of some enviable press backup and a large cult following, the Rich Kids split up after a brief but promising career.

'I was very, very disappointed when the Rich Kids split up. Musically I think we could have been the first Human League or Depeche Mode, because Midge and I were drifting towards that sort of instrumentation. Our favourite LP at the time the band split was Kraftwerk's *The Man Machine*, and we were trying to write songs along the same lines as 'The Model'. The only problem was that Glen and Steve wanted us to be a more conventional band, so Midge and I formed Visage while the Rich Kids were still technically in existence: we felt we'd found our ideal sound, and we needed a band to play the sort of music we wanted.'

Ure and Egan formed Visage around Steve Strange, an eccentric, highly individual character who shared their *penchant* for German electronic music, and who'd already begun to make a name for himself in the then-burgeoning London club scene as a nightlife personality extraordinaire.

That scene had by this time established itself as the centre of the second major post-punk movement, that of the new romantics, and Visage quickly found themselves at the forefront of the crusade. During 1980, Ure, Egan and Strange had joined forces with several other musicians, Magazine's John McGeogh, Dave Formula, and Barry Adamson, and keyboardist Billy Currie from Ultravox. However, the first Visage record – the single, 'Fade to Grey' – didn't appear for a while, largely be-

cause Ure had been persuaded by Currie to join Ultravox, and a spate of gigs following the runaway success of *Vienna* had taken both of them temporarily out of the Visage fold.

When it was released, however, 'Fade to Grey' became an instant hit, as did the album (entitled simply *Visage*) from which it was taken.

'That first album was recorded in Martin Rushent's back garden. He had this garden shed with a whole load of studio equipment in it – things like a 24-track Studer tape machine and MCI desk – just waiting for a proper studio to be built, which he couldn't afford to do at that time. The size of the place didn't affect us at all. We just went in there and told him we could DI everything. Martin couldn't come to terms with that at first, because he was used to recording conventional guitar bands like the Buzzcocks and Stranglers. But we just went in and DI'd all the keyboards, guitars and drum machines.

Early Simmons

'The drums didn't present any problems because just before the start of recording *Visage*, Richard Burgess had introduced me to Simmons percussion. I remember him showing me this piece of board, which turned out to be the SDS4, I think. It wasn't properly finished at that time – it was just a board with some wires hanging off it and the numbers 1–4 printed on it. I asked Richard what they were and he said "they're the outputs", so we plugged them in, used a Roland Microcomposer to clock everything, and every time I wanted to change one of the sounds I had to get a little screwdriver out and adjust the pots!'

As well as being one of the first musicians in the UK to make use of Simmons modules, Egan was also keen to use the Fairlight as soon as Burgess brought up the subject, with the result that the CMI was used extensively on *Visage*.

'I think we were one of the first bands to put the Fairlight on a UK release, though Peter Gabriel had already been using one and also of course Richard was working with one with Kate Bush at that time.

'We wanted the first album to be non-stop, so that all the tracks ran on from each other, and we used the Fairlight for a lot of those link passages in between tracks. We used it for percussion things as well: the drum break on "Fade to Grey" is all Fairlight, for example.'

Only a few months after the release of *Visage*, the London club scene had mushroomed into a nationwide phenomenon, and Strange and Egan capitalised on this success by opening the Camden Palace nightclub in North London – now one of the capital's most fashionable nightspots.

Yet they didn't neglect their musical activities. A second Visage album – *The Anvil* – was recorded at Mayfair Studios with the same line-up as before minus John McGeogh, who was touring with Siouxsie and the Banshees. It displays a slightly harder edge than its predecessor (though the sound is still unmistakably Visage), but although the album spawned two further hit singles ('The Damned Don't Cry' and 'Night Train'), tensions within the bands were beginning to threaten its musical future, as Egan recalls.

'The second album was really the turning point as far as Midge was concerned, because I don't think he was very happy being in the same band with a very outlandish character, which was what Steve Strange was becoming. In the end he left to concentrate his attentions on Ultravox, and I was left to re-mix most of *The Anvil* myself.

'There was a bit of studio time left over after *The Anvil* was finished, and I started working on some new songs with Billy Currie and Dave Formula. Thing's didn't really work out the way they should have done, though, mainly because we argued all the time about how we were going to go about recording.

'Basically, they wanted me to write programs in step-time into a Roland TR808 (which isn't the way I normally work with drum machines), so that the percussion track would be a finished item before the rest of the song. I'd always worked from a Linn code on tape – a simple bass and snare pattern that I could add details to at a later stage in the recording – but they insisted they couldn't work that way, and it seemed to me we were spending three days doing something that normally took me about two hours.

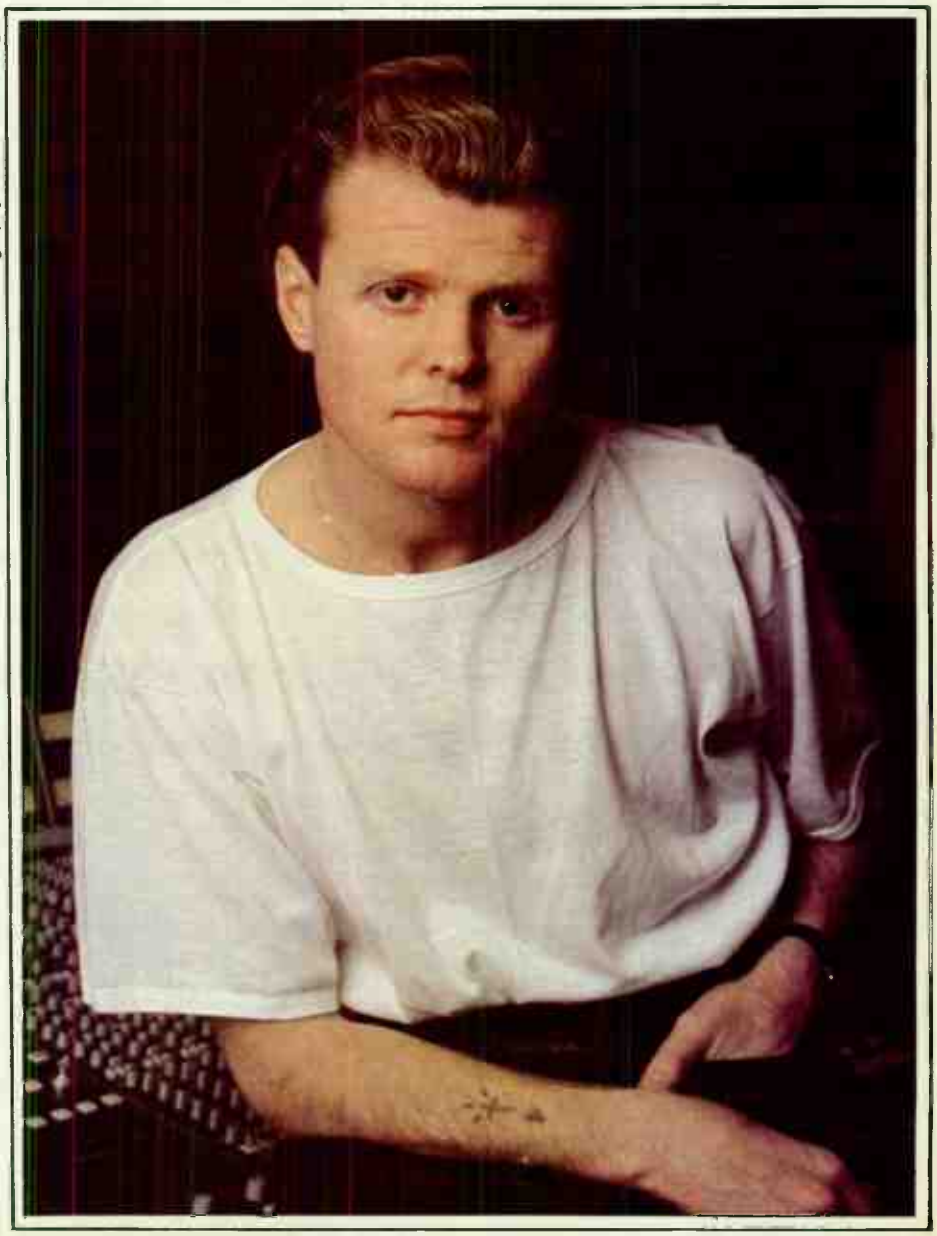
'We recorded the follow-up single to 'Night Train' ('Pleasure Boys') and two other tracks that are on the new album, but that was as far as we got. We were arguing too much to make working with each other worthwhile'.

Microcomposing

'For a while it seemed that would probably be the end of Visage, but I started working with a bass player, Steve Barnacle. We bought some new equipment – an SH101, a Juno 60 and an MC202 Microcomposer – and we began working on some new songs in his bedroom.

'Things were going pretty well, so I decided we should play them in a band. I got hold of Mulligan from Fashion and he

'Indirectly, that's how I started getting back into things like the Fairlight and Synclavier (both of which are used extensively on the album). I was hiring cheaper synths and finding that it was just impossible to get good sounds out of them instantly if they were unfamiliar to me, so I decided to cut out that stage and simply hire in computer instruments



Photography: Matthew Vosburgh

with programmers: it's a lot easier to work that way.'

Collaborations

There's always been more to Egan's work than simply Visage, however. As a drummer, programmer and producer, his services have in the past been much in demand by musicians and record companies alike. These days, Egan's collaborations aren't so frequent, 'partly because there are so many new bands around, and partly because I've been getting more out of working with up and coming musicians than with established stars.

'Most of what I do now I do as a producer. I find an upcoming artist or band and put them in the studio. I've formed my own label – WAR ('Where Artists Record') – to record new bands, and I normally let them get on with whatever they want to do at first). As a producer it's my job to show people what technology can do for them: a lot of people just don't seem to realise what you can do with something like a Linn code. I've always believed that every song needs the right tempo, and getting a band to play in time with a Linn code can make all the difference. You can sample a guy's bass guitar on the Synclavier and program his bass line to run in time with the code, and more often than not he'll be amazed by the results.

'The other side of the story, I suppose, is that all the technology in the world can't help you if you haven't got a song. I know a guy who's got a LinnDrum and all the rest in his living room, and every now and then he plays me a tape of what he's done, and it just sounds like Giorgio Moroder – the sort of think I could do, and I'm a drummer! What he needs to do is find a couple of songwriters who are looking for some electronic backing, because without a song he's nothing.

'The same is true of the *Art of Noise* EP on ZTT. The guy behind that, JJ, does all our Fairlight programming for us, and he's brilliant at what he does, but at the end of the day his record is just a collection of very good sounds – its got no real musical backbone to it.

'Like I say, JJ is a fantastic programmer, though there is one thing I don't like about the way he works, and that's the way he offers me other people's disks and my disks to other people. I'm a bit worried about my samples turning up on other people's records – in fact I think it may have already happened – so I can see I'm going to have to buy all my disks off him in future!'

Fairlight or Synclavier?

With all his experience of computer-based systems, Egan should be in a position to say which of the two technological labyrinths is the more competent performer all round. In reality, he finds such a judgement more than a little difficult to make.

'The first thing I would say is that both the Fairlight and the Synclavier have got the potential to be better than any other keyboard instrument around. But what you've got to remember is that neither of them can ever be any better than the guy who's operating them, because if he doesn't know what he's doing, his instrument is next to useless.

'In most respects I'd say the two are about as competent as each other. I've had more experience of the Fairlight, so you might think I'd be biased a bit towards that, but if anything I have a feeling that the Synclavier is better at reproducing big orchestral sounds, for example.

'The other thing is, I don't think sampling will ever be able to recapture everything you can get out of an acoustic instrument itself. If you're absolutely intent on getting the sound of a violin, then I think you've still got to find someone to play the violin and stick it directly down on tape. On the other hand, if you want to reproduce the *size* of say, an orchestra, then something like the Synclavier is ideal.'

What sort of instruments were sampled for the new Visage album?

'Oh, all sorts of things. Aboriginal pipes with beautiful, breathy tones, a swirling *Swan Lake* string sound, heavy *Jaws* cellos – sampling the same cello over and over again in different ways to get an ensemble of them – doors banging, lots of bass guitar, plus the basic drum kit sounds, though I still played quite a few little things like cymbals myself, because it's nice to hear a mixture of sampled and real sounds.

'I've found both the Fairlight and the Synclavier to be useful for a lot more than just their sampling, though. The advantage of both systems, as I see it, is the amount you can manipulate sounds and write a whole song using the separate outputs I love the way you can write a multitrack piece into the sequencer, and then change the instruments that are actually doing the playing. You can put in a rhythm pattern, and then change one of the instruments from say a bass drum to something like a cello. It's easy to become a bit extreme when you've got that much control at the touch of a button, but if you use everything sensibly it can be very effective.'

programmed some of the songs into the Microcomposer, and feeling very confident, we recorded a Radio 1 session for David Jensen. Four songs in a day, with Steve Strange doing the lead vocals in just two hours, though luckily they gave us another day to mix everything!

It was around this time that Egan and a production partner became interested in acquiring Trident Studios, which they discovered quite by chance was up for sale.

'I'd used Trident before with a couple of bands and I liked the atmosphere there. My partner and I got a deal to do a session there one day and we turned up to find it was closed. So we made a few enquiries, borrowed some money on the strength of a publishing company we'd just set up, and eventually bought the studio in partnership with its manager, Steven Stewart-Short.

'What I like most of all about Trident is the sense of history it has. I can't go in there without thinking that this was where *Hunky Dory* and *Perfect Day* were recorded, that that piano had been played by people like Elton John and Stevie Wonder.

'We've also since opened Trident II (where the colour photographs were taken) as a smaller studio and mixing facility. The only problem for us is that it seems to be quite difficult to make money out of running a studio these days, unless you're lucky enough to be booked up every day throughout the year. What happens is you have to use the time when the studio isn't booked by other bands for your own recording, and try to scrape a living that way.

'All of the new Visage album was recorded at Trident, simply because I was able to get the studio time at more or less half the normal rate, which isn't bad. We also had to hire most of our gear, because apart from the smaller synths I've already mentioned, we actually don't own all that much equipment ourselves.

The New Visage

As well as surrounding himself with the latest in musical technology – and in keeping with his current attitude towards collaborations – Egan has now gathered together a group of talented musicians whose names are not, as yet, on the lips of every music journalist in Europe.

'Only Steve Strange and myself are left from the original group. There's Steve Barnacle on bass, and his brother Gary on sax. In fact, Gary's done session work for people like Soft Cell, but because he's actually a member of Visage (as opposed to just being a session player) he's playing keyboards and helping with some of the songwriting. We've also got a young guitarist called Andy Barnett, who I think is going to be very well known soon. He's got very much his own style, something like a cross between Adrian Belew and Eddie Van Halen, and his playing features very strongly on the album.'

Release of the new album – titled *Beat Boy* – is scheduled for the end of August, though it'll be preceded by a new single, 'The Love Glove'. Strangely, although the album as a whole possesses a rawer edge than its predecessors – with more thudding percussion, manic sequencers and cutting guitar lines than ever before – the single is an altogether milder concoction. Egan explains.

'The songs on the album were written over a two-year period, and 'The Love Glove' was actually the last one to be recorded. It was written by Steve Strange, and it's a moody, atmospheric track – very 'European'. I kept the percussion on it very simple, because I think drummers can get in the way of things sometimes. All there is is some bass drum, tambourine and cabasa, plus a few little fill-ins, so it's a very mild, gentle sound.

'The reason we're releasing it as a single is simple. When you want to tell somebody something, if you shout at them they flinch and move away from you, whereas if you say it quietly, they're more likely to listen to you. So this is just our way of saying to the people on radio and in the media, "Listen. Visage are still very much around"'.

Dan Goldstein **E&MM**

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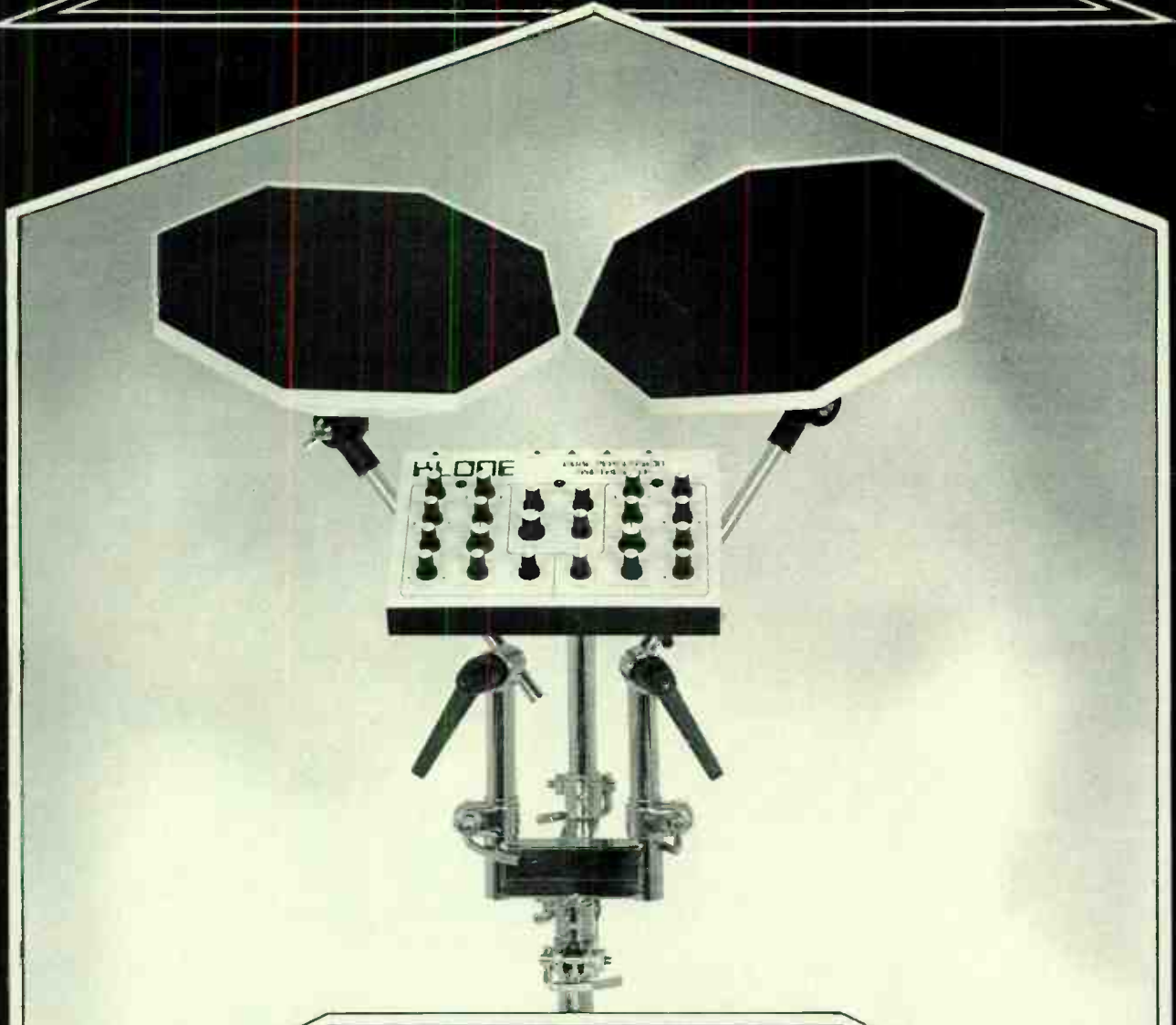

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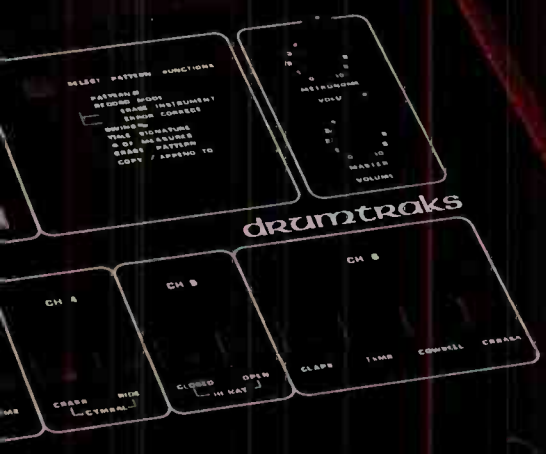

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An equally important player in the *Traks Music System* is the Drumtraks digital drum machine. Through MIDI, Drumtraks connects directly to your Six-Trak. This lets you synchronize the playback tempo of the sequences which you have stored in the Six-Trak's memory with the rhythm patterns you have programmed in your Drumtraks. Standard clock inputs and outputs are also provided for controlling traditional sequencers and synthesizers. The Drumtraks features 13 digitally recorded real drum and cymbal sounds. However, since you can program both volume *and* tuning individually for each of these 13 sounds, you can further expand your "drum set" to include the sound of gongs, 32-tom rolls, gorilla claps, and more. And just for fun, you can program all of your volume dynamics and accents in real time from any MIDI equipped velocity sensitive keyboard instrument such as the Prophet-T8! Let Drumtraks keep the beat in your music system!

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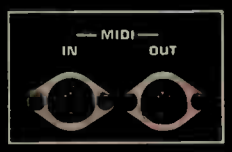

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HEAD OVER HEELS

with The Cocteau Twins

In a world of musical plagiarism and conformity, The Cocteau Twins stand out as a welcome spark of originality: their blend of metronomic rhythms, crashing guitar chords and beautifully treated vocals is as enduringly fascinating as it is instantly captivating. Dan Goldstein **spoke to the band – now a three-piece once again – about how they arrived at their distinctive sound and how it's maintained both live and in the studio.**

The 'alternative' charts published in the weekly music papers have only one criterion for the inclusion of new releases – that they are distributed independently of the major record companies. The music itself can be as derivative, monotonous and unremarkable as its creators wish, but one band, The Cocteau Twins, make music that can rightfully be classed as 'alternative', since it contains few if any reference points to anything recorded by anyone almost anywhere in the world.

Since their first EP release – *Lullabies* – just over two years ago, they have dominated the above-mentioned charts with every new record they produce, and only an unwillingness to adopt the promotional attitudes of more 'professional' outfits has prevented them from achieving wider acclaim, though their most recent single, 'Pearly Dewdrops' Drops' made the Music Week Top 40 with consummate ease.

The band was formed about three years back in the town of Grangemouth, Scotland, and at its inception consisted of Robin Guthrie, guitar, drum machines and keyboards, Will Heggie, bass guitar, and Liz Fraser, vocals.

'We'd had no previous inclination to make music prior to the Cocteau Twins being formed', Guthrie recalls, 'so it was a new thing for us. I don't think we were directly influenced by anybody. I can remember that at that time we all liked what the Birthday Party were doing, but I don't think you can listen to our early records and honestly say that our music sounds much like The Birthday Party.'

After rehearsing a number of their own songs over a period of a few months, the Twins sent a demo tape to 4AD Records ('because that was the label The Birthday Party were on, and we didn't see much point writing to anybody else') and much to their surprise, the label's MD, Ivo Watts-Russell, invited them down to London to record *Lullabies*.

The single was distinctive enough to attract the attentions of Radio 1's John Peel, and the extensive airplay he gave it saw it into the alternative charts without much further ado.

The Twins then went into Blackwing Studios to record their first album – *Garlands* – for 4AD.

'That was in the days when Blackwing was still a 16-track', Guthrie remembers, 'and we had both Eric Radcliffe and John Fryer engineering. We were very green then about how to go about recording, so Ivo did most of that work in the early days and went down as Producer on the records.

'Our songs were written in much the same way they are now, with myself and the bass player writing the music first and Liz coming up with the lyrics and vocal line afterwards. If you listen to *Garlands*, and in fact most of what we've released on record, you'll realise that most of the main melodies are carried by the bass, while anything I do on guitar or keyboards is just something extra to fill up the space.'

Garlands is an unusual LP in many ways. The way the songs are arranged, structured, and produced sets it apart from just about anything else this writer has ever heard, and although the percussion lines are limited to some extent by the use of a DR55 Dr Rhythm ('We did actually have a drummer in the band for about two weeks, but he just couldn't play in time' – Robin), the power of Liz Fraser's vocal delivery – and the colourful intensity of her lyrics – are enough to send most newcomers reaching for the superlative.

Yet strangely, Liz had never received any formal vocal training prior to The Cocteau Twins' formation, and has only recently been receiving lessons (from the same tutor who's currently instructing Vince Clarke, of all people) on how to use her already excellent singing voice to its fullest.

'Before we formed The Cocteau Twins, I'd never even listened to the way any other singers sang, and it's only just recently that I've begun to appreciate them. I don't base my singing style on any other singers: I just do what comes naturally.

Lyrics

'When the band started I began reading books a lot more, and I get most of my inspiration for lyrics through them. I can't get inspiration from seeing things, I can only get excited by images – things that are conjured up.

'I think I'm also more interested in the way words sound and what you can do if you say words in different ways than in what the words themselves actually mean. I can't really say which authors or books have influenced me – I can never remember names – but it's really just certain groups of words and the way they sound'.

The period following the release of *Garlands* saw more than a little uncertainty surrounding the Twins' composition and direction. Will Heggie left the band, leaving Guthrie with the task of writing and performing the band's music singlehanded, while a brief flirtation with former-Associate Alan Rankine – who produced the Twins' next vinyl product, 'Peppermint Pig' – pleased Guthrie and Fraser not at all.

Head Over Heels

Things took a turn for the better however with the recording of *Head Over Heels*, The Cocteau Twins' second album for 4AD. Guthrie assumed a co-producer's role (with John Fryer) as well as writing and arranging all the music, and instrumentally his endeavours were aided by the addition of some new hardware, in the shape of a Drumulator, several keyboards (including a Jupiter 8 and a Mellotron) and a Fender Jazzmaster guitar.

'It's a nice instrument, a good guitar to play. But to be honest with the amount of effects and things I use, most guitars end up sounding much the same as each other. My basic effects set-up is a Boss pedalboard with Overdrive, Heavy Metal, Vibrato and Flanger pedals, and the signal then goes to a Roland Dimension D chorus unit and a Boss DE200 digital delay – and that's just what I use live!

'In the studio, I'll use whatever the particular control room has in the way of effects. Blackwing has got all the usual stuff, and recently we've been recording up at a studio near Edinburgh called Palladium, and they've got all sorts of gear, AMS delays, harmonisers, ADTs, you name it. What I also like about Palladium is the fact that they've got loads of different instruments you can play about with, which are all included in the price of the recording. It's a residential complex . . . well, no', Guthrie has a sudden change of heart. 'It's actually more like somebody's house that's been turned into a 24-track studio where the artists can live while they're recording.

'Anyway, they've got a lot of different instruments up there, grand piano, synths, lots of different bits of percussion, and because we did some of *Head Over Heels* there, it ended up having a wider sound, with different sorts of instruments in it.

'I like recording up there, simply because all that gear is included in the basic price. If you want to record at a 24-track down here in London, it costs you fifty quid just to hire out a cymbal for the day, or so it seems'.

Head Over Heels also saw a refinement of the way Liz Fraser's voice is

captured on disc, though she herself remains blissfully unaware of the processes involved in getting her vocals sounding just as they should.

'I'm not really a very technical person, though I've got to the stage now where I know what an amp and a microphone are! And of course I know what sounds good on my voice . . . '

Robin takes over.

' . . . Liz likes to hear her vocals a certain way through the foldback when we're playing live, so we have everything going through an ADT and a DeltaLab digital delay. Obviously there are effects on the vocals out front as well, but those vary from gig to gig because different PA companies have different racks of effects, which is why we try to keep the foldback sound consistent.

'In the studio I normally record Liz's vocals completely dry, only adding effects at the mixing stage. That way you can go back to the beginning and start again if you want to change something'.

Song to the Siren

The Liz Fraser vocal performance that is best-known among casual listeners remains her rendition of Tim Buckley's 'Song to the Siren', which appeared last year on 4AD under the banner 'This Mortal Coil', an umbrella heading for a band that consisted of members of The Cocteau Twins, Modern English, and Colour Box. Liz takes up the story.

'Ivo had this idea of a single that became a version of a Modern English song, but he was stuck for something to put on the B-side of the twelve-inch, so he suggested we do 'Song to the Siren'. He liked it so much it became more or less the A-side of the seven-inch and got a lot of airplay, but neither Robin nor I really like it much now. I think the vocals on it are very, very shaky, because they were recorded too quickly – I didn't really have time to rehearse them properly'.

Given the chance, would she re-record the song?

'No, absolutely not.

'There's going to be a This Mortal Coil album coming out this autumn, but I haven't really been involved with it at all, though Robin's played on a couple of tracks'.

Moving back to the Twins themselves, the band was recently restored to its original three-piece format by the addition of bass player Simon Raymonde, though as he relates, he more or less fell into the band by accident.

'I'd known Ivo for a little while, and met Robin and Liz through him. I leapt at the chance to record with the band, because although I'd been in various different bands before, I'd always thought of The Cocteau Twins as being one of the best around. In fact, I suppose if there was an ideal band for me to be in, then this is probably it!'

Raymonde's contribution made itself felt instantly on 'Pearly Dewdrops' Drops', on which the Twins sound more like a group of musicians playing together where previously they appeared to be only a loose collection of overdubs, and which also saw the band take control over production exclusively.

'We've been doing some mixing at a studio down here that nobody knows about', says Guthrie, his finger to his lips. 'The guy who owns it doesn't want anybody to know of its existence because he hasn't got planning permission for it yet. But he's got about £70,000 worth of gear down there, a 24-track machine, a Harrison desk and everything. What we've been doing lately is recording songs up in Edinburgh and then coming down here to mix them. It's working out OK like that, but we're hoping to get a home studio soon – probably based around the Fostex B16 – so that we'll be able to demo songs at home without having to write at a professional studio'.

Liz continues: 'The way we did *Head Over Heels* was perfect, but it was a complete contrast to the way we recorded *Garlands*, when we had all the songs written before we went into the studio. For *Head Over Heels* we went in with nothing and wrote it all in the studio, but we don't want to do that again, so we're going to start writing songs again soon for the new album'.

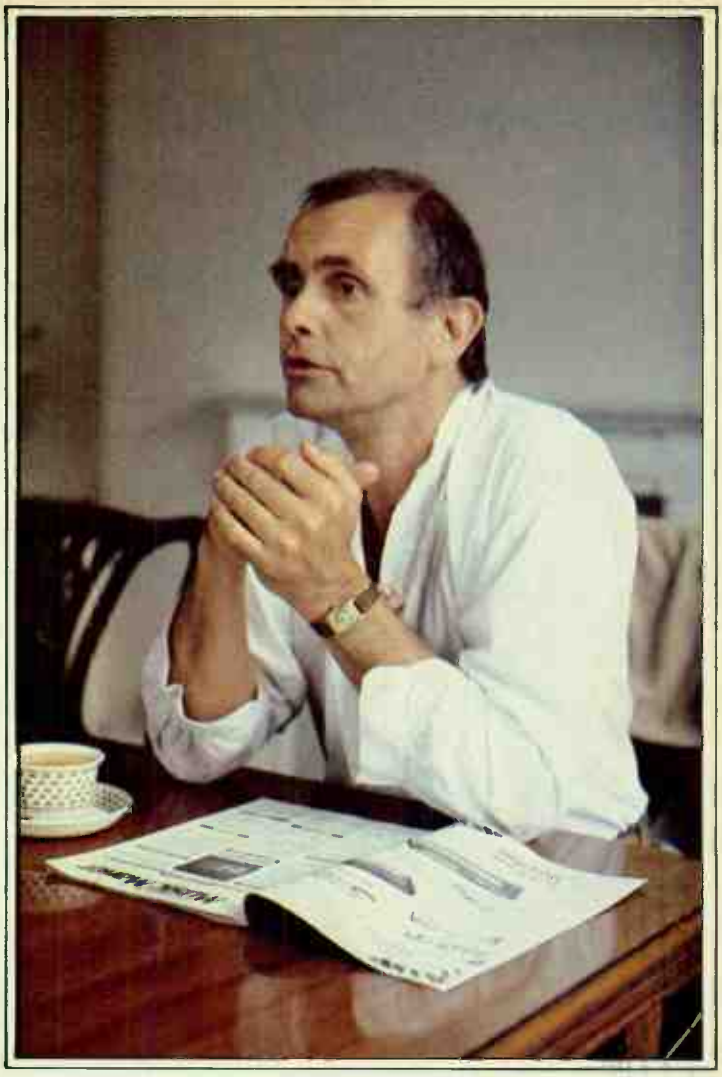
And start they will, just as soon as Robin has found some new chips for his Drumulator ('it's one of the very early ones, and I'm not sure whether the new sounds that are being developed for it will fit').

Once complete, the album should be in the shops before 1984 is out, and I for one fully expect it to be as refreshingly different as its predecessors. Looking back on The Cocteau Twins' already considerable past achievements, there seems no reason why it shouldn't be, though the penalty for a band being both original and prolific, of course, is that a brief career can seem like one that's an awful lot longer and more glorious, and The Cocteau Twins already have quite a history to live up to.

Dan Goldstein

SELF PORTRAIT

Through his work both as a solo artist and as part of German avant garde duo Cluster, Hans-Joachim Roedelius has profoundly influenced the development of contemporary European art music over the last decade or more, yet his background and his attitudes to music-making remain something of an enigma. Dan Goldstein **attempted to solve the mystery when Roedelius visited Britain recently to promote his latest vinyl offering,** *Gift of the Moment.*



Photography: Matthew Vosburgh

Hans-Joachim Roedelius - known to his friends as 'Achim' - is a man who likes to take things slowly. His favourite phrase seems to be 'step-by-step' and it's a term that could just as easily be applied to his musical career, a long intertwining story that's seen him release no fewer than ten albums under his own name, and countless others in collaboration with artists such as Brian Eno, Holger Czukay, Michael Rother, Conrad Schnitzler and most notably Moebius, his collaborator in well-known avant garde unit Cluster.

He started out in life without the slightest inclination or aspiration to be a musician, though his grandparents on his mother's side had been a church organist and a choir leader respectively, so there was some precedent for his eventual conversion to the world of music composition and performance in the mid- to late-sixties.

'I was living in Berlin and doing odd jobs just to make a living. It was when I was working as a physiotherapist and masseur that I began meeting artists who gradually introduced me to the arts

in general and music in particular. I became involved in an arts action centre – Zodiac – around 1968, and joined various different bands playing improvised music: in those days my main instruments were flute, violin, and cello, but we were already picking up acoustic instruments with microphones and treating them electronically.'

During his time at Zodiac, Roedelius met up with two musicians in particular – Moebius and Conrad Schnitzler – with whom he felt he had a lot in common, and under Schnitzler's guidance, they formed Kluster (as it was then spelt) and left Berlin to go on tour through West Germany.

'Our music at that time was very harsh and improvised,' Achim recalls. 'For a lot of performances we simply got up on stage and played the first thing that came into our heads.

'Our first record came out in 1970. We were working in Köln (Cologne) and we met Conny Plank, who was working as an engineer in a small recording studio. He introduced us to Oscar Gottlieb, a composer and arranger of church music, who asked us if we'd like to make a record.

'We agreed, of course, and played in the studio for about an hour and a half: again, the music was largely improvised. Gottlieb assumed the role of producer and selected his favourite bits of music from what we'd recorded and then released it as an album on his own label. It came out under the name *Klopfzeichen* ('Knocking Signs'). It was re-released recently with a new cover: the old sleeve design was very beautiful but I think it was rather too expensive to make!

'The music is very rough, very chaotic, and it was played using only very basic instruments. Moebius and I had an electric organ – a Gem, I think – and he also had a self-made Heathkit drum kit that we miked up and treated with tape echo machines. We also played some other percussion – bells, bits of scrap iron, anything that would make a noise.

'Later on Gottlieb released a second record – *Kluster Zweiosterei* – which was just more extracts from what we'd recorded in that first session.'

Transition

After the release of the second Kluster album, Conrad Schnitzler left the group, and Moebius and Roedelius changed the spelling to Cluster. They continued touring Germany, playing where they could and making the odd recording for their own consumption.

'After Conrad Schnitzler left, we became conscious – gradually – that our music wasn't very listenable, and we began making it more structured and melodic, though we never actually sat down and wrote music with that idea in mind.'

Despite a transistion towards a more accessible sound, Cluster's music remained highly individual, consisting largely of ambient, repeated passages using an assortment of instrumentation. A major reason behind that individuality – at least in Roedelius' case – seems to have been a relative isolation from other forms of music.

'Right from the time I first became interested in music, I always wanted to do my own thing, and I didn't really listen very carefully to any other people's music. When I left Berlin to go on tour with Cluster, I lived with Moebius and he played me a lot of tapes of pop and rock music, things like Family, Third Ear Band, Jimi Hendrix, and I found I liked it a lot. I suppose it must have influenced me, but not by a very large amount, I don't think.

'I never had any traditional music education, so I never learned how to write or compose music the way a lot of serious musicians do. But I love classical music, and again it must have influenced me a little, I suppose.'

Sky Records

It was in 1973 that Moebius and Roedelius settled down in Northern Germany and attracted the attentions of Sky Records, a Hamburg-based independent label specialising in avant garde or 'off-the-wall' music. The label's proprietor was immediately impressed by Cluster's approach to music-making, and a ten-year relationship started between the two parties, with Sky releasing almost anything the band – or either of the members individually – came up with.

'I've always enjoyed making records very much, and I suppose I've been very lucky to have so much of my music released by people.

'I've released ten solo albums and a lot of other records in collaboration with other people, and most of them have been on Sky. It's difficult for me to say whether or not I prefer working on my own or with other people – it depends on the sort of mood I'm in.

'When I'm working in collaboration with someone – with Moebius, for example – we normally record at a big recording studio such as Conny Plank's studio in Köln, which is a very nice place to work. But if I'm doing a record on my own, I usually do most of the recording at home. Whenever the mood takes me, I sit at my piano – a lovely old Bosendorfer grand, over 100 years old – and play, and I put everything I play on tape. Then I play back that tape and select the best parts from it, and work on them until I'm happy with the way they sound.'

So what sort of set-up does he have at home?

'Oh, a very simple one. I mainly use an old Revox A77, a low-speed model that hasn't been serviced in the ten years I've had it! Over the years, my approach to recording has become simpler. A few years ago when I was doing a lot of work with synthesisers, I had my own multitrack recorder and mixing desk, but now I think I'd be very happy with just a four-track recorder and something like dbx noise reduction, which I like because I overdub so many times I run into a lot of hiss problems.'

Eno

One of Roedelius' best-known collaborators is Brian Eno, who met up with Cluster in 1974 at a gig in Hamburg. Significantly, Eno was sufficiently impressed to join Moebius and Roedelius on stage during the concert, and afterwards, Cluster invited him to their home studio, where they recorded for about a week.

'It was very, very easy. We got on with Brian instantly, and we agreed on so much. Unfortunately, I think the music from that first session is lost. Brian took the tapes away with him but I don't know what he did with them. It's a shame because some of the music we made together was very beautiful.'

Some while after that first session, Eno invited Cluster to help him record one song – 'By This River' – on his *Before and After Science* album...

'The album was recorded at Conny's studio. I think Brian was inspired by the scenery and atmosphere of Northern Germany to write 'By This River', and certainly it's a very beautiful song.

'Later on, we recorded *After the Heat* with him, again in Köln with Conny. We enjoyed playing together, but I remember being very much in awe of Brian's abilities. He knows so much about recording techniques and music in general, and sometimes I found he was racing ahead of me. There were a couple of pieces on that album that lost me completely, and I had nothing to do with them, but when it came to putting the writing credits on the record sleeve, Brian insisted that my name be included on those songs, because he said my presence in the studio had influenced the way the music had been recorded. I

don't think that was really right, but it was very nice of him!'

Electronics

Roedelius' willingness to incorporate virtually any form of instrument into his music eventually turned him in the direction of the synthesiser, though only one of his albums, *Open Doors*, contains music that is recorded entirely on synth, in this case a Korg MS20.

'It's a marvellous instrument with a big range of sounds, some of which are very beautiful. I can't understand people who look at it and say that it isn't complicated enough, because the field over which it can operate is enormous: I certainly had a lot of fun with mine.

'Recently I've drifted a little away from synthesisers and gone back to recording a lot of my music on piano. My latest record is mainly piano-based, but it does have some synthesiser on it, a Korg Poly 61, which I think is like an MS20 only polyphonic.'

That new album, *Geschenk des Augenblicks* ('Gift of the Moment') was recorded at Roedelius' home in rural Austria and at a recording studio in Rotterdam, where Achim teamed up with cellist Arjen Uittenbogaard and violinist Tjitse Letterie, whose instrumental textures add an unexpected new flavour to what is otherwise mainly a keyboard album. However, as Roedelius relates, the album very nearly didn't appear at all...

'I sent the tapes to Sky as usual, but for some reason the label's Director didn't like it (to be honest I don't think he knows very much about music – he's really just a businessman), so I went looking for a deal with a lot of other record companies in Germany, but still without success. Finally I sent a tape to EG Records here in London, and they offered me a good contract, the only provision of which is that I play concerts if they want me to.'

Would that pose a problem, necessarily?

'No, not in itself. But I'd have to make sure I was familiar with the acoustics of the concert venue, and I'd rather play in places like art galleries and small venues rather than large concert halls, again because the acoustics can be very disorientating.

'Also, the audience would have to expect music that was mainly improvised, because I'd rather play that way than just perform what I've already recorded on my albums.'

The Future

If he does play live in this country, Roedelius is assured a warm and healthy welcome from a large number of devoted Cluster fans, while any further record released (either in a solo capacity or with other musicians) will doubtless meet with a similarly warm reception.

'For the last four or five years I've been working mainly on my own, but at the moment I'm recording with a solo saxophonist and I've also been commissioned to write some music for a modern dance company in Venice, which should be interesting.

'The other thing I'd like to do – assuming I get the chance – is to write some film music. The thing I dislike about so many films is that the music is an afterthought: it would be nice if someone were to make a film based on the music, rather than the other way around...'

And with that, Hans-Joachim Roedelius rose from his seat and prepared to leave for Austria. His manner is much like his music – quiet, unassuming, fascinating – and whatever he does in the future, he will always be remembered as a innovator and composer of great standing, even though he himself rejects such titles.

'No. I don't see myself as a composer in the strict sense of the term. I never really plan what I'm doing, and I make my music more by chance than conception. I can never just sit down and write, just like that. I leave that to the serious composers!'

Dan Goldstein **E&MM**

'Gift of the Moment' is released this month by Editions EG, 63a Kings Road, London SW3 4NT.

E&MM/ROSE-MORRIS COMPETITION

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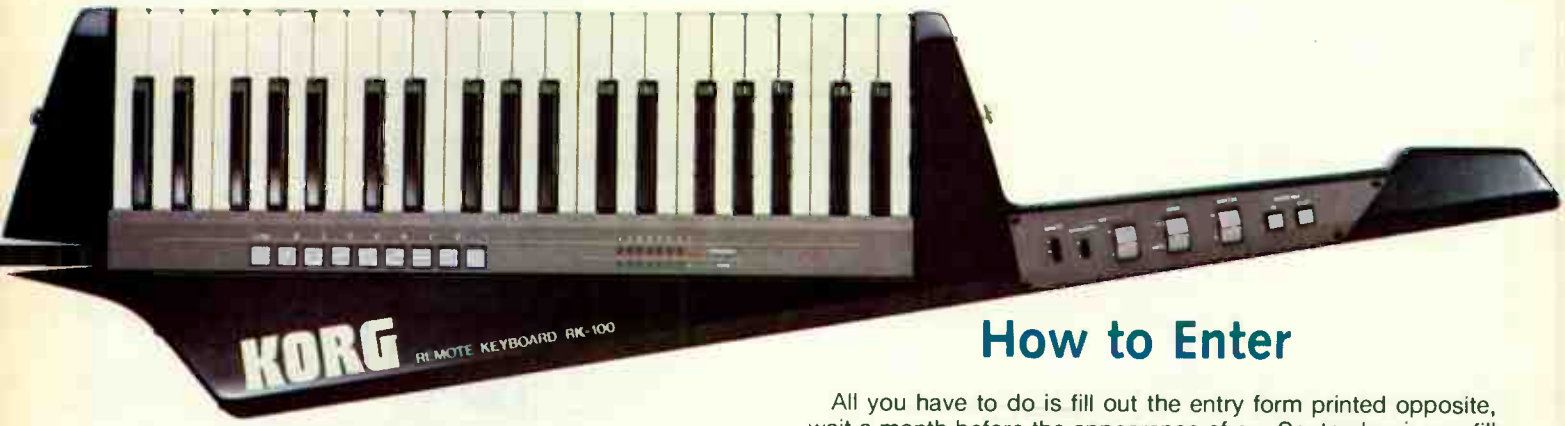


Shown for the first time in the UK at this month's British Music Fair, the Korg EX800 expander module and RK100 remote keyboard are the latest MIDI instruments from this prestigious Japanese music hardware stable. And you can win both of them simply by filling out the entry form with the answers to this month's questions and a second set that'll be appearing in next month's E&MM.

The EX800

An eight-voice polyphonic programmable synthesiser module that essentially duplicates the facilities offered by the hugely popular Poly 800 synth, the EX800 module works as a sound source for any MIDI-equipped synthesiser, and includes such features as a 64-program memory and 256-step polyphonic sequencer. Interfaced with another MIDI-compatible instrument or personal computer, the EX800 will respond to key data, pitch bends, modulation, sequencer clock input, program number change and volume, and will also load/unload program and sequencer data to a micro.

The RK100

A lightweight keyboard for remote control of any MIDI synthesiser, the RK100 features a full-size three-and-a-half-octave keyboard, the range of which can be extended a further octave at either end of the scale by use of an octave selector switch. The instrument's 'neck' houses three performance wheels that control volume, pitch bend, and modulation, the last being switchable between frequency and VCF modulation. Programs can also be changed remotely and the MIDI Out DIN connector is lockable, reducing the likelihood of lead problems to a minimum.

How to Enter

All you have to do is fill out the entry form printed opposite, wait a month before the appearance of our September issue, fill out Part 2 enclosed therein and send both forms to the competition address. Do NOT send in your answers to Part 1 until you've completed Part 2: any entrants doing this will be disqualified automatically.

Closing date for the competition is September 30 1984, and the winner's name will be announced in the November issue of E&MM. In addition to the first prize of the Korg EX800/RK100 system, there'll also be E&MM T-shirts for the first ten runners-up pulled out of the hat.

Good luck!

RULES

*Closing date for all entries is second post, September 28, 1984. The winner will be the competitor whose entry is the first all-correct to be picked out of the hat during the week following the closing date. The winner will be notified by post or telephone no later than October 5. The judges' decision is final and no correspondence regarding the choice of winner or runners-up will be entered into. We regret that all entries must be on the official entry form published in E&MM August 1984: **no photo-copies can be accepted.** Employees of Music Maker Publications and Rose-Morris and their relatives are ineligible for entry.*

Diagram 1

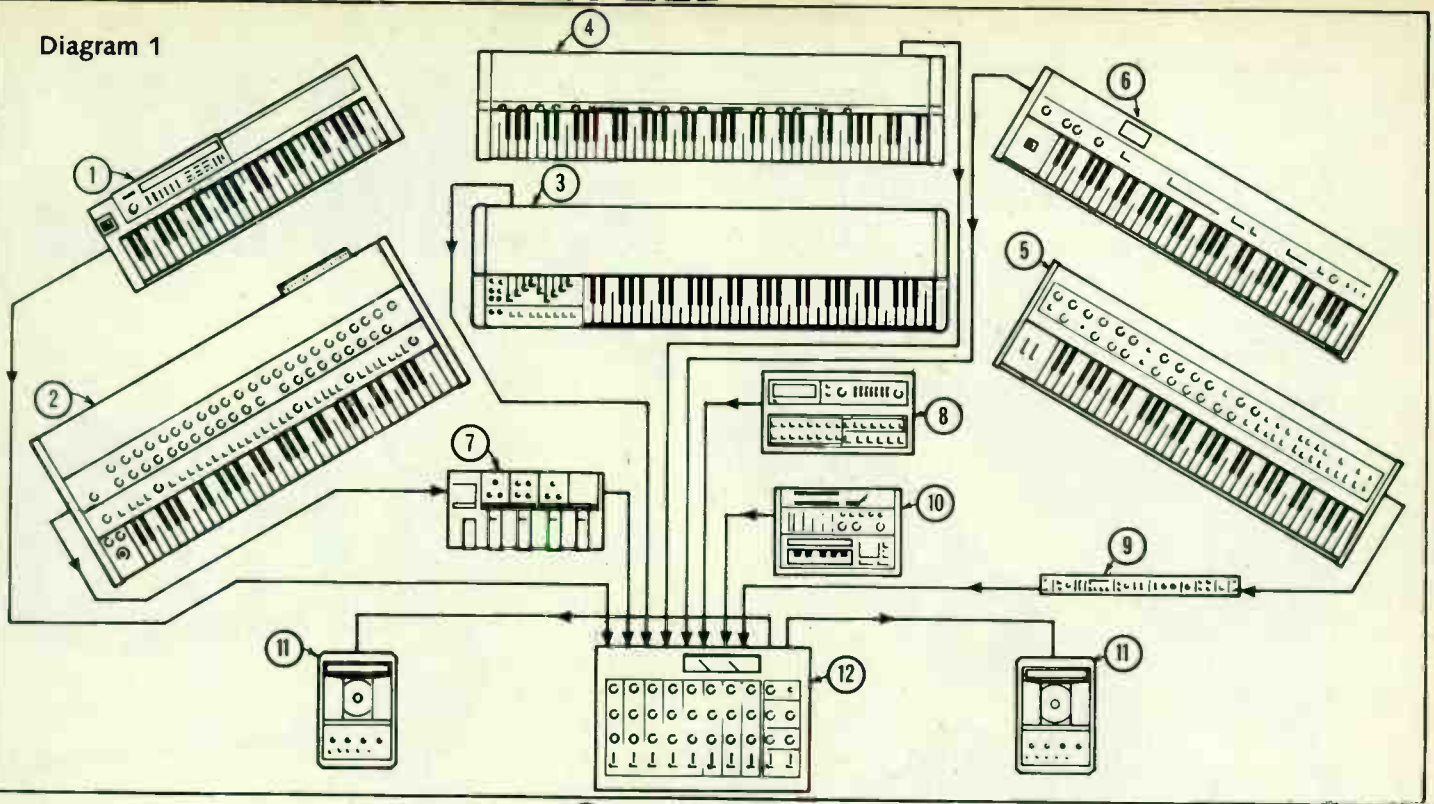
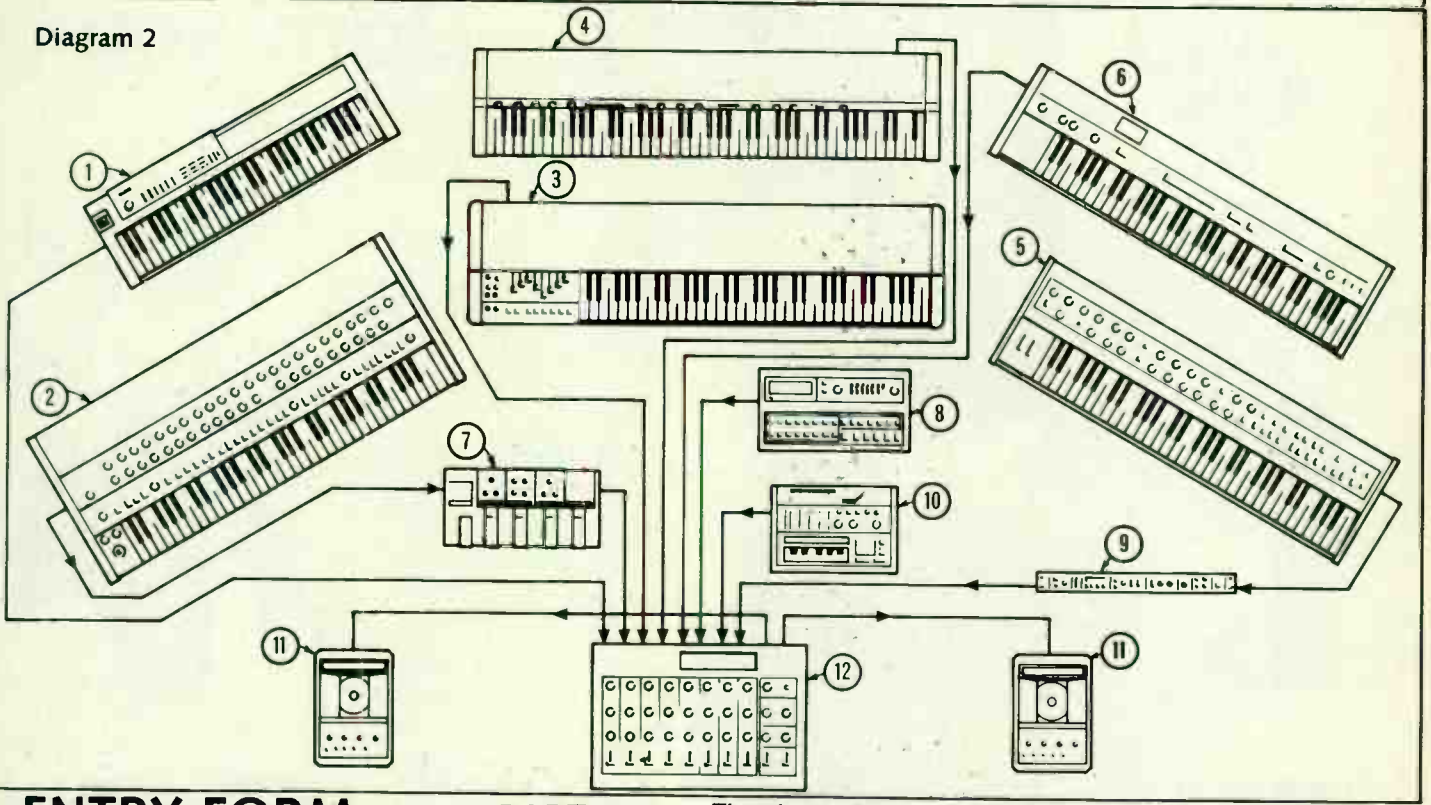


Diagram 2



ENTRY FORM

PART 1

The 12 Korg products represented are:

1. .....
2. .....
3. .....
4. .....
5. .....
6. .....
7. .....
8. .....
9. .....
10. .....
11. .....
12. .....

The above diagrams show a schematic representation of a typical keyboard player's set-up that makes use of 12 different Korg products. The figures are identical in almost every respect, except that eight details from Diagram 1 have been omitted from Diagram 2.

To complete this part of the competition, all you need do is first mark (using circles, crosses etc.) on Diagram 1 those details that are not present in Diagram 2, then list all the Korg hardware represented in the illustrations.

When you've done this, keep this month's entry form and wait until you've completed next month's part of the competition before sending it to us. Do NOT send Part 1 separately. Part 2 of the competition will appear in E&MM September.

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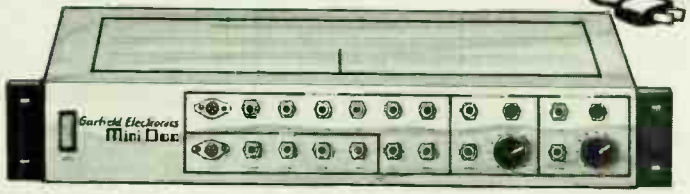
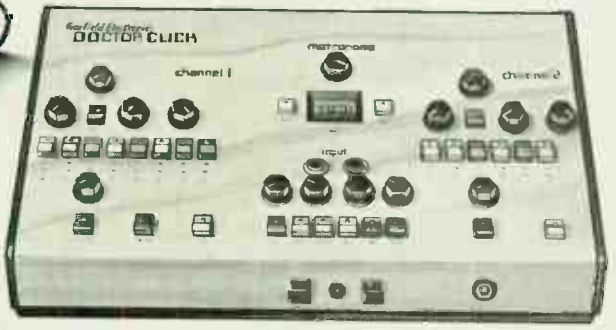


Doctor Click



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ON RECORD

In which Dan Goldstein **wades through the latest vinyl releases and comes up with some surprising conclusions . . .**

David Sylvian
Brilliant Trees
Virgin V2290

Since Japan were officially wound up something approaching two years ago, David Sylvian's output has been only just the right side of sporadic, with only two singles collaborations with Riuichi Sakamoto to his credit in tnat time. However, it would seem that the wait for something more substantial has been well worthwhile, since *Brilliant Trees* is an album to rank alongside the very best that Japan were capable of producing, and in its finest moments eclipses even that band's greatest musical achievements.

The single, 'Red Guitar', gave some inkling as to the album's musical direction: an overall sound that bore an obvious relationship to Japan's closing episodes but contained a looser, jazzier feel attributable both to greater production confidence on Sylvian's part and to the addition of a new group of performers. But for all its strengths, 'Red Guitar' was not the massive hit it should have been, and in fact only scratches the surface of the ground covered by *Brilliant Trees*.

Of all the people/places/events that influenced the creation of the album, it would seem that two of Sylvian's guest musicians – guitarist and technological visionary Holger Czukay and jazz-ethnic trumpeter Jon Hassell – have left the biggest mark on the recorded outcome.

Czukay's touches – particularly the vocal tapes and ethereal lead guitar on 'Nostalgia' – add sparkle and uncertainty where previously there was none, while the sheer beauty of Hassell's tonal and melodic colours (especially on the title track, which he co-wrote) provide the perfect parry for Sylvian's powerful yet serene vocal lines.

There's more.

Jazz brass-players Mark Isham and Kenny Wheeler provide a more familiar wind backing for side one's (generally) more conventionally-structured material, while the album's synthetic tones remain in the more than capable hands of Sakamoto, Richard Barbieri, and co-producer Steve Nye.

All seven tracks present on *Brilliant Trees* are arranged and produced with a subtlety and economy that even *Tin Drum* only hinted at, while Sylvian's lyrics are still as thought-provoking (and as emotionally unsettling) as they ever were during Japan's lifespan.

If you listen to *Brilliant Trees* a couple of times and find the noncomformity of its cultural and musical blend disconcerting, I can only suggest you immerse yourself in different musics from traditional Far Eastern to German new wave electronic, before giving it at least one more try.

It may not set the album charts alight, but it's my belief that *Brilliant Trees* serves to confirm Sylvian's growing stature as an artist with incomplete but occasionally masterful control over the materials at his disposal.

1984 will not see a better album.

Hirudo
The First Incarnation
Hirudo H001

Not, perhaps, the most easily obtainable album to come under review in these columns but, on the credit side, a further example of German innovation and exploration, albeit in a totally different direction to the You album reviewed in E&MM June.

Like You, Hirudo are a duo (consisting of Uli Kutschera and Peter Fischer) but there the similarities end, for whereas the Genetic Factory Wonders concern themselves primarily with synthetic textures – and, to a large extent, 'synthetic' playing – Hirudo seek to recreate the splendour of orchestral colours using only the bare minimum of instrumentation.

And, by and large, they succeed very well.

Some splendid (Kawai) grand piano-playing by Kutschera acts as the focal point for most of the tracks on *Incarnation*, while Fischer's string synths and TR808 percussion touches provide a grand but sensitive backdrop.

Just occasionally, the duo slip into overkill in the dynamics department (particularly during the 12-minute-long epic, 'Finale') but in general they control themselves capably enough, and as a reward, have succeeded in creating what is quite probably the most sensitive synth album of 1984 so far.

Should you be interested in getting in touch with Hirudo, the contact address is Okenstrasse 4, 7800 Freiburg, West Germany.

Tim Story
Untitled
Uniton U024

A simple but rather beautiful recording from a Norwegian label with an increasingly respectable repertorie, *Untitled* is a collection of short, piano-based pieces of what is often termed 'ambient music', after its popularisation by men such as Eno, Harold Budd and Gavin Bryars.

Story writes, arranges, performs and produces all his material, and although this occasionally results in his music assuming a certain one-dimensionality, in general the pieces recorded here are well constructed and thoughtfully played.

It would be easy to classify *Untitled* under the heading used in the opening paragraph, but I suspect Story's major influences may lie elsewhere in the music of some of his fellow-Americans, among them systems music composers such as Philip Glass and Steve Reich.

Throughout the album, various other instruments (among them vibraphone synthesiser and electric guitar) are used to add colour and individuality, though the two last-mentioned only succeed in disturbing the compositions' tranquility when used – as they are on occasion – to excess.

Not brilliant, but an album that's both rewarding and relaxing to listen to from a composer of some originality who looks to have a bright future ahead of him, which is more than you can say for some . . .

Review copy supplied by Lotus Records, 23 High Street, Newcastle under Lyme, Staffordshire, ST5 1QZ.

Klaus Schulze
Angst
InTeam ID 20.003

Whether or not Schulze has deserved the accolades heaped upon him by much of the electronic music fraternity over the past three years or so is perhaps open to debate, but what is rather more clearcut is that his most recent recorded output has been of an abysmally low standard, and sadly *Angst* – the soundtrack to a German feature film of the same name – does nothing to improve matters.

Because although he remains one of the more adventurous musical arrangers on the EM scene – witness the stupendous vibraphone and celeste sounds on 'Freeze', the album's opener – melodically and structurally his music is still as predictable as ever.

'Pain' seems an apt title for a drum machine-based electronic thrash whose melodic content changes not one iota during the track's entire nine-minute length, while the tonal changes that take place (slowly) during 'Surrender' and 'Beyond' occur as surely as night follows day. Whatever structural step Schulze decides to take, you can bet your life you've heard it before on half-a-dozen Tangerine Dream albums, none of them released much after 1978.

This is all rather aggravating, for three reasons.

First, because Schulze commands a large and loyal following most of whom I'm sure will derive little pleasure from listening to *Angst*. Second, because goodness knows how many millions' worth of musical technology has gone into production of this aural desert. And third, because there are hundreds of budding ten-year-olds mucking about with Juno 60 arpeggiators whose musical output is equally rewarding and who could probably benefit greatly from the extra revenue a couple of LP releases would doubtless provide.

BACK ISSUES

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

Issues not mentioned below are sold out, but photocopies of articles (see E&MM Feb 83 and Feb 84 issues for indices of features) can be obtained from the above address at 50p per article.

This Back Issues page supercedes all previous listings.




1981

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, Teisco SX 400, Aria TS 400, M.C.S. Percussion Computer, Soundchaser, Beyer Mics. TC Effects Boxes, Tempo Check ★ Projects: Spectrum Synthesiser, Electric Drummer, Volume Pedal

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

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

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, Milab Mics ★ Projects: Digital Signal Processing For Sinclair Spectrum, Tap Tempo, Amdek Delay Kit

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

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

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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

JULY Human League ★ Steve Jolliffe ★ Jade Warrior ★ Reviews: Korg Super Section ★ Yamaha DX9 ★ Microsound 64 Keyboard ★ TED Digisound ★ TransAm Pearl Five Amp ★ Ibanez DM1100 DDL ★ Yamaha MK100 Keyboard ★ Features: Cheap Synth Buyers' Guide ★ Stagefright (Ian Boddy) ★ Spectrum MIDI ★ Understanding the DX7 Pt4 ★ CM: JMS MIDI Software ★ PDSG Pt3 ★ Projects: The RackPack ★ BeeBMIDI Pt2.

Understanding the DX7

In the latest instalment of E&MM's guided tour of Yamaha FM, Jay Chapman **takes a preliminary look at user-programming by editing existing factory voices, with particular emphasis on LFO routing and control.**

In last month's article we started looking at programming the DX series of instruments by starting from scratch, ie. a VOICE INIT. This month we begin to explore the other obvious programming approach, that involving the modification of existing programs. As the DX series are complex instruments, we'll find that side issues will be brought into focus during our explorations which it will be advantageous to discuss in context – in this article the LFO routing is considered in some detail, for example. Don't think of this 'going off at a tangent' as being of less importance than the rest of the text – you need to be an expert in all aspects of your DX before you can become an expert at programming it.

As I mentioned above, the opportunity arises in the example discussed this month to take a close look at the LFO modulation

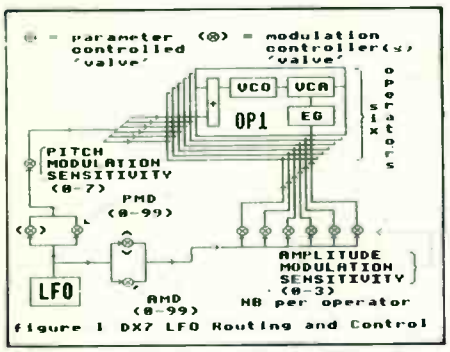


figure 1 DX7 LFO Routing and Control

routing and control, which is not quite as straightforward as you might imagine. Whilst the LFO itself is quite conventional – in terms of its function if not its implementation – the effect of applying it to the Operators varies according to their status as either carriers or modulators. To complicate matters further, the various modulation controllers – wheel, breath, pedal and after touch – can also be involved, but a detailed look at their use will have to wait for another article.

The analysis, understanding and modification of existing programs has to be the most important factor in learning to program the DX series. The more programs you are able to analyse to find out how the facilities available combine to produce the sounds, the bigger the library of ideas you'll be able to refer to as you attempt to create your own programs. You may well have already gathered that experimentation and gaining of experience is both hard work and extremely time consuming, but no amount of reading about programming can be an effective substitute. This series of articles should help you set out on your quest, however.

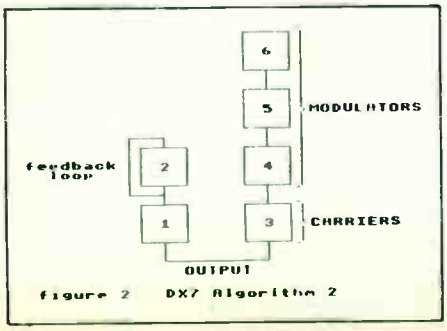


figure 2 DX7 Algorithm 2

The most obvious source of existing programs has to be the ROM packs supplied with the DX7 (or the cassette supplied with the DX9). Don't restrict yourself to these, however, as more and more DX7 and DX9 patches are being published either in E&MM or *via* the DX Owners' Club. Don't stick to patches specific to whichever DX synth you've bought, either, as both have the potential to educate you. Of course, it will usually be somewhat easier for DX7 owners to investigate DX9 patches, but there's no reason why things shouldn't work the other way round.

Power Chords

Let's get to work. The sound I'm going to talk about was what I needed for the backing to a very famous song, see Figure 3.

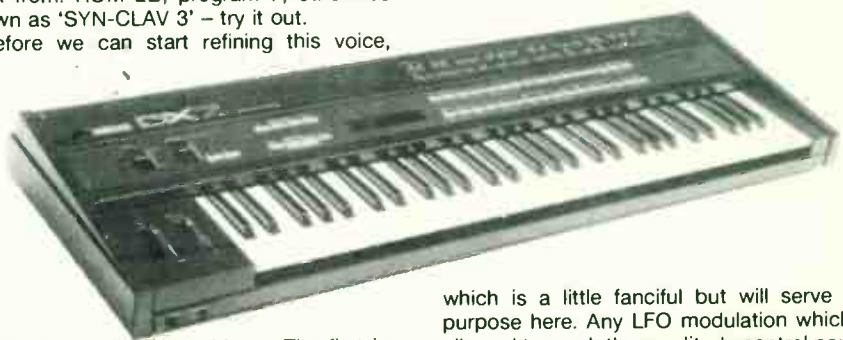
4 Bsus4	B	Asus4	A	Gsus4	G	F#sus4	F#
4							

Figure 3.

Since the above is a very small 'lift' from the song, I'm hoping the extremely rich megastar who wrote it won't come down on me like a ton of bricks yelling 'copyright infringement' . . . The backing is normally played on a guitar and I wanted to get the effect of sustained 'power chords' with plenty of guts. Note that this doesn't necessarily mean that I want to imitate the guitar exactly. It may well be that the best result is obtained not by slavishly copying (buy a guitar instead!) but by getting the effect/atmosphere/ feel right.

The first thing to do is search through the sounds already available to see if there is anything that even vaguely approximates the sound you have in your head. At this stage actual sound quality/accuracy is far more important than the envelope of the sound. Having zipped through the 128 ROM voices, I found one that seemed suitable as a base to work from: ROM 2B, program 7, otherwise known as 'SYN-CLAV 3' – try it out.

Before we can start refining this voice,



there are two obvious problems. The first is the sample and hold variations (which definitely have no part to play in my power chords!), while the second is that the overall envelope of the sound needs to imitate the natural guitar sustain curve, which dies away even though the chord remains held.

Let's deal with the sample and hold problem first. Since I want to stop the effect altogether (rather than modify it in some subtle fashion) all I need to do is consider the routing that's responsible for the effect and I should be able to find the right point to shut the effect off. Have a look at Figure 1 which, I hasten to add, is intended to be a 'logic' diagram rather than any suggestion of circuit connections inside the DX7.

The 'valve' symbols correspond to the knobs and sliders that one finds in abundance on most synths. On the DX7, the same job is handled by the data entry slider and +1/−1 keypads allowing you to set parameter values. In most cases, a zero value for the parameter means that the valve is closed and the highest value, which is often 99, means the valve is fully open.

The reason I go into this in some detail is because the modulation controllers have an extra feature in that you can effectively restrict the size of the maximum valve opening. Thus a parameter for a modulation controller is setting not a fixed size for the effect but a maximum size. A useful example is the case of after touch controlled vibrato, which should not be allowed too large an after touch range (eg. by reducing the maximum) as the amount added then becomes uncontrollable.

We'll say little more about these controllers for now, other than that you can consider them as taking effect (for pitch and amplitude control at least) at the points indicated by the 'bracketed valve' symbols in Figure 1.

LFO Routing

As you can see from Figure 1, whichever modulation control is produced by the LFO can go on to affect either Operator amplitude or pitch, or indeed both.

I've shown the amplitude effect being connected to the Operator's envelope generator, which is a little fanciful but will serve our purpose here. Any LFO modulation which is allowed to reach the amplitude control part of an Operator effectively combines with the EG's output to control the VCA. To cut a long story short, if we apply a slow sine wave from the LFO to a carrier Operator we should hear tremolo. (I know guitars have tremolo arms that alter pitch not amplitude – but they got the name wrong!)

The pitch modulation is shown combining with the other pitch control components – usually the keyboard pitch control output and the output from modulating Operators. I'm sure it will be obvious that a slow sine wave affecting a carrier Operator will result in a vibrato effect.

The LFO modulation routing starts at the lower left-hand corner of Figure 1. By use of the Pitch Modulation Depth (PMD) and Amplitude Modulation Depth (AMD) parameters (green keypads '12' and '13') we can set the maximum level of modulation sent out from the LFO. PMD is the parameter I would use to set the maximum level for vibrato overall, for example. For both amplitude and pitch modulation, there may be dynamic changes unrelated to the AMD and PMD parameter settings due to the various modulation controllers.

This is illustrated in Figure 1 by the fact that the modulation controllers' 'valve' is drawn in parallel with the Modulation Depth valve for both AMD and PMD. You could, for example, have a slight amount of vibrato permanently present – *via* the PMD valve – and add extra vibrato using the breath controller (say) and the modulation controllers' valve.

The next stage in the routing of pitch modulation is a parameter/valve called Pitch Modulation Sensitivity (PMS), which sets the sensitivity of all six Operators to any pitch modulation that has come from the LFO directly (PMD) or *via* the modulation controllers. This is the green keypad '15'. You may be wondering why this control exists as it seems to duplicate the PMD control. Isn't 50% sent out (PMD) into 100% sensitivity (PMS) the same thing as 100% sent out (PMD) into 50% sensitivity (PMS)? Well, yes it is . . . but that's not the end of the story. The real answer to the question is that the PMD parameter *would* be redundant if we didn't have to worry about the modulation controllers. Since we can't apply different amounts of a modulation controller's effect to the pitch and amplitude – we are only allowed to specify on or off in each case – we need some other means of specifying the effectiveness of pitch and amplitude modulation separately. The reason that this is done *via* the PMS parameter (and as we will see in a moment, the AMS parameters) is to save duplicating a pair of parameters for each of the four modulation controllers.

The last important point on LFO routing is to do with the fact that there is an AMS (Amplitude Modulation Sensitivity – green keypad '16') parameter for each Operator, while there is only one PMS parameter serving all the Operators. My guess as to why this is so is dragged from the depths of FM theory and should probably be taken with the odd ton or two of salt, but here it comes anyway.

If you allowed different amounts of pitch modulation *via* multiple PMS parameters, you could change the modulator/carrier pitch relationships and would therefore get timbral changes tied directly to the vibrato – but this is not normally what is required. Instead, we normally want the relationship between the pitch of modulator and carrier to remain fixed during vibrato (ie. to avoid timbral changes). This must happen if there is only a single PMS parameter as they must then vary the same amount at the same time.

We do have another way of forcing timbral changes, however, which is by individually altering the amount of amplitude modulation applied to modulators and carriers. We can do this using the multiple AMS parameters. Rather than providing parameters that would only confuse the issue, the DX7 has been cleverly designed to avoid a proliferation of redundant parameters and to concentrate on offering a sufficient and suitable set.

Back to the Program

Where were we? Oh yes, we wanted to lose the sample and hold effect. Since the maxi-digression above means that we now have an in-depth understanding of the LFO routing firmly in place, it shouldn't be too difficult to work out what to do.

The first thing to notice is that the sample and hold effects are all related to amplitude – pitch is not affected. This gives us a demented irregular tremolo effect on Operator 3, which is a carrier, and drunken timbral movement due to the amplitude changes forced upon most of the modulating Operators. The most obvious way to get rid of the sample and hold amplitude modulation is to set the LFO AMD parameter (green keypad '13') to zero. Try it and you'll see that it certainly does the trick. Don't be fooled into thinking that you've done enough, however, because if you use any of the modulation controllers which happen to be set to affect amplitude, the sample and hold will rear its ugly head again. What you should do is tidy up properly and set all of the AMS parameters to zero as well (green keypad '16').

In this way, you should get to know exactly how your programs work. If you have parameter settings you know nothing about (eg. the AMS settings if they were left set) which contribute to the sound at some point in the future without you realising (why? – because you change some other parameter, that's why! – are you following this?), you're probably not going to be able to reproduce some of your programs very easily . . .

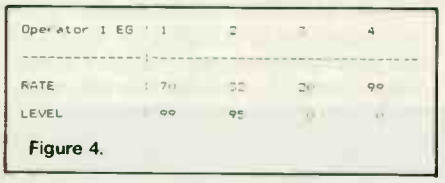


Figure 4.

Envelopes

Enough on the LFO routing and its related preambles – let's get the envelopes on the carrier Operators mimicing a power chord held while the sustain dies out. The program uses algorithm 2 – for the moment at least – so the carrier Operators are 1 and 3. Try the values in Figure 4 for carrier 1's EG.

The most obvious feature of the envelope is that Level 3 is set to zero, as it must be if the sound is going to fade even though the keys remain held down. Since a guitar's output takes quite some time to fade, Rate 2 is set quite slow. For simplicity's sake, I usually copy the new envelope into all the other carrier Operators at this point. In later articles we will see that we might want to have differing envelopes for each carrier.

Copying envelopes is very easy. In EDIT mode (where I hope you already are – otherwise you're not really trying, are you?) you select the Operator whose envelope you wish to copy (in our case, Operator 1) using the purple OPERATOR SELECT keypad. You then press the orange STORE keypad, which should give you the following display:

```
EG COPY
from OP1 to OP?
```

Now press the green keypad bearing the number of the Operator you are trying to copy to (in our case Operator 3) when the '?' will change to that number and the job is done.

While messing about with the envelopes I suddenly noticed that high notes were fading out much faster than low ones. If you've read your manual you should immediately suspect Keyboard Rate Scaling (green keypad '26') which you'll find is set to its maximum value of 7 – I found that a value of 1 was more suitable.

Customising

We've now got the basis for the 'power chord' sound more or less sorted out. The most interesting (and difficult) part of this approach to programming must now be attempted – customising the sound. The approach I'm going to describe revolves around some fairly logical thinking. For example, the available options are as follows:

1 Alter some current component(s) of the sound.
2 Add some new component(s) to the sound.
3 Change the potential for modulation(s).

Before we can do any of the above, we need a full understanding of what is currently going on.

The first item to consider is the algorithm. In this case it is algorithm 2, which is reproduced in Figure 2. We can see straight away that there are only two audible components since there are only two carrier Operators (1 and 3). If you read the articles in E&MM May and June, you should have a good idea of how to find out what is going on, but in case you didn't(!) the next step is to listen to the sound from each carrier Operator in turn with the other carrier switched off. To do this, press green keypad '3' which will toggle Operator 3 off, and then press '3' again to switch Operator 3 back on, followed by '1' to toggle Operator 1 off, listening to the results at each stage of the process.

Looking at the frequency settings of Operators 1 and 3, we find they are both at 1.00. As I wanted a full sound, my first change was to detune the two carrier Operators very much as might be done to two oscillators on other synths. Try setting the frequency of Operator 1 to 1.1 and set its Detune to −4 so that the effect is not too over-done – one little idea for your library.

I then wanted to play with adding a component or two to the sound, so I badly needed an unused Operator or two. Not all the sounds on the ROMs are really going to need all six Operators for their major components: quite often, the last couple of Operators are producing subtle effects which may well not relate to the sound you are trying to produce, so don't be afraid to steal some Operators for your own use – it's your synth!

Which of the Operators are the 'last couple'? I hear you ask – the answer is to use your ears to find out. Switch Operators in and out and see what changes occur, and try altering the levels of Operators, particularly modulators, and listen for timbral changes. Typically, the top Operator(s) in stacks of four can often be found to have little to do with the current sound output, so let's have a look at the stack of four in our current algorithm.

Turning off Operator 6 seems to have no effect at all, so we can certainly claim that for our own use. Operator 5 definitely *does* contribute to the sound, but I preferred the sound without it (at least as a base to work from) so that gave me two Operators to play with.

It can be extremely useful to have the feedback loop available, as an Operator can often be saved by using it – it effectively gives you a somewhat constrained modulator/carrier pair of Operators. If you press the relevant green keypad ('8') you will find that the feedback parameter is set to 2. If you reduce this to zero there is no great change in the overall sound, so we can keep the feedback loop for future use. . .

Oh dear.

In the style of cinema serials of old, I'm afraid I've run out of room for this month, leaving you, I hope, on the edge of your seats wondering what on earth is going to happen next. Do try experimenting with the two spare Operators and the feedback loop over the next few weeks, and I'll add the finishing touches to the keyboard 'power chords' next time.

Jay Chapman **E&MM**

BeeBMIDI 3

Last month's article was intended to set readers building our interface unit for the BBC Micro on the path to writing some software of their own for MIDI. This month Jay Chapman **provides a full listing of a comprehensive voice dump program, written in BBC BASIC and 6502 Assembler, for the Yamaha DX7.**

Even if you don't have the necessary DX7-BeeBMIDI interface-BBC Micro combination, you should still find that there is something in this article for you. In particular, analysing the programming techniques used to convert the MIDI data from numbers into something readable – for example, the keyboard note numbers into the note name and octave – should be of interest. DX owners will be pleased to find a routine for converting the Fixed Frequency Coarse and Fine parameters into a meaningful frequency value, which is a problem all the other dumps I've seen have ignored! Last but by no means least, the dreaded checksum byte is dealt with. I feel this is much called-for since the checksum idea seems to have foxed quite a few people.

Using the Program

Having typed both the BBC BASIC programs in (cooling your blistered fingertips in a bowl of ice) and checked them carefully, you should then run the 6502 Assembler Source program. Note that I always save such a program before running it, in case the machine code assembles on top of the residence source program (due to one of my fate-tempting typing errors). I strongly suggest you follow my example!

You have now assembled the four assembler routines into the part of RAM usually reserved for the User Defined Character Definitions – since we don't define any characters this area is free. The point to bear in mind is that we are not in any way interfering with BASIC memory area, and BASIC won't interfere with the machine code either.

You must now save a copy of the assembled code which will be loaded in later by the main program. To do this type in: `*SAVE MC CA3 CFF`
The significance of the 'CA3' and 'CFF' will become apparent later. If you are working with tape rather than disk, you should do the *SAVE onto tape immediately following the save of the main program.

Next chain 'DX7DUMP' (or whatever name you saved the main program under) which will automatically load the machine code and present you with a menu asking you to make a choice. Have a look at lines 1080 to 1130 for the menu. As you can see, it's possible to receive or send a program to/from the DX7 or disk/tape as well as displaying the voice parameters on the screen or printing them out.

The printout format is intended to mimic that of the 'YAMAHA DX7 VOICE DATA LIST' forms, as shown in the DX7 manual and used by the DX Owners' Club. Analysis of voices is greatly aided by being able to see all the voice parameters at the same time (rather than one at a time as on the DX7 display) and a great deal of time transcribing voice parameters onto paper need no longer be wasted. The ability to save voices on disk effectively extends the number of 'on-line' program memories available in the same way as the Yamaha RAM packs, but is a lot cheaper if you already have a BBC Micro.

The program is more or less self-explanatory in use, but you may well find it worthwhile (re)reading page 22 of your DX7 manual ('Using MIDI') which should explain some of the prompts you get whilst sending to or receiving from the DX7.

It is unfortunate that there is no way of asking the DX7 to transmit data from MIDI. All transfers have to be initiated at the DX7 end, and because of this the Function parameters have not been dealt with as their transfer would be impracticable (unless you want to spend 10 minutes pushing keypads in sequence for each voice transfer!). Also, these parameters are voice-independent –

Figure 1.

```
&F0     MIDI System Exclusive information follows.
 67     YAMAHA identification code.

&00       sub-status=0;MIDI channel number=1
&00       YAHAMA format number: 0=data for 1 voice
```

```
1000 pg0=&C00:par=pg0+6:dx7dmp=&CB2:chksum=&CD8:dx7snd=&CEB:chkres=&CA2
1010 control_reg=&FCFC:?control_reg=&03:?control_reg=&15:*LOAD MC
1020 notes$="AABCCDDEFFGG":sharps$=" #  # #  # #":curves$="-L-E+E+L"
1030 wave$="TRIA-NGLE SAW  DOWN SAW  UP   SQUA-RE   SINE      SAMP/HOLD "
1040 DIM off_on$(1), no_yes$(1):off_on$(0)="OFF":off_on$(1)="ON ":no_yes$(0)="NO ":no_yes$(1)="YES"
1050 REPEAT
1060 CLS:PRINT''''SPC(20)"DX7 Single Voice MIDI Dump for the BBC Micro"'
1070 PRINT SPC(26)"(C) Copyright 1984 J D G Chapman"''
1080 PRINT'SPC(25);"1.  Receive a voice from DX7."
1090 PRINT'SPC(25);"2.  Send current voice to DX7."
1100 PRINT'SPC(25);"3.  Load a voice from disc/tape."
1110 PRINT'SPC(25);"4.  Save current voice to disc/tape."
1120 PRINT'SPC(25);"5.  Screen current voice."
1130 PRINT'SPC(25);"6.  Print current voice."
1140 REPEAT INPUT ''"                Select option [1 to 6]: "option:UNTIL option>=1 AND option <=6
1150 CLS
1160 IF option=1 THEN PROCreceive,
1170 IF option=2 THEN PROCsend
1180 IF option=3 THEN PROCload
1190 IF option=4 THEN PROCsave
1200 IF option=5 THEN PROCscreen
1210 IF option=6 THEN VDU 2:PROCscreen:VDU 3
1220 UNTIL FALSE
1230 DEF PROCreceive
1240 PRINT''''''''SPC(15)"Ensure that you have set FUNCTION 8 to SYS INFO AVAIL."
```

unless you own a DX1 – and will generally not all apply anyway.

I sincerely hope Yamaha are updating the DX7 software to respond to transmission requests over MIDI – it really is an important feature and I for one am rather surprised to find it missing.

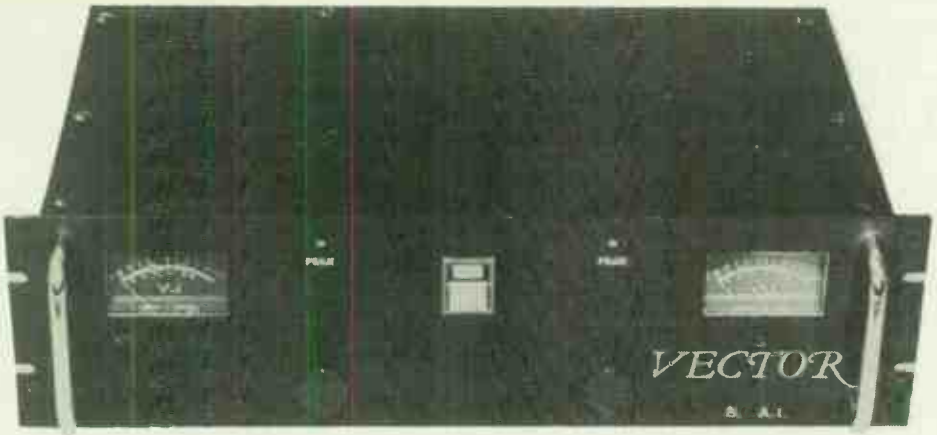
Machine Code

The addresses of the routines below (which are called in the main program) were picked off the assembly listing and set up in line 1000 of the main program. You should also see from the assembly listing that the routines start at &CA3 and finish at &CFF – remember the *SAVE MC?

The rx_midi routine has been discussed in previous articles, so we'll move on. The dx7dmp routine listens on MIDI In and checks whether the streams of bytes it receives correspond to a DX7 voice data transmission on MIDI channel 1. Lines 1200 to 1320 of the Assembler Source program check for the sequence in Table 1. ('&' indicates a HEX number)

```
1250 PRINT''SPC(18)"Select the voice you wish to receive on the DX7."
1260 PRINT SPC(16)"(Repeat selection until informed voice received OK)"
1270 REPEAT CALL dx7dmp:CALL chksum:UNTIL ?chkres=0
1280 PRINT''SPC(32)"VOICE RECEIVED OK"''
1290 D$=INKEY$(500):ENDPROC
1300 DEF PROCsend
1310 CLS:PRINT''''SPC(15)"Ensure that you have set FUNCTION 8 to SYS INFO AVAIL."
1320 PRINT'SPC(15)"Ensure that you have set INTERNAL MEMORY PROTECT to OFF."
1330 D$=INKEY$(1500):CALL dx7snd
1340 PRINT'''SPC(15)"The current voice is now in the DX7 EDIT buffer."
1350 PRINT'''SPC(15)"TO SAVE THE VOICE IN THE DX7 you must:"
1360 PRINT'SPC(25)"hold down the orange STORE keypad and"
1370 PRINT'SPC(25)"select the voice number to be REPLACED."
1380 D$=INKEY$(1500):ENDPROC
1390 DEF PROCload
1400 CLS:REPEAT PRINT''''''SPC(30)"LOAD filename";:INPUT ": "file$:UNTIL LEN(file$)>0
1410 file$=LEFT$(file$,7):PRINT'''SPC(30)"LOADING: '";file$;"'"''''
1420 chan=OPENIN(file$):IF chan=0 THEN PRINT''SPC(30)"VOICE'";file$;"' NOT FOUND":GOTO 1440
1430 FOR I=0 TO 161:pg0?I=BGET#chan:NEXT I:CLOSE#chan:PRINT''''''SPC(30)"LOADING COMPLETE"
1440 D$=INKEY$(500):ENDPROC
1450 DEF PROCsave
1460 CLS:voice$="":FOR f=145 TO 151:voice$=voice$+CHR$(par?f):NEXT f
1470 PRINT''''''SPC(30)"SAVE filename <";voice$;">";:INPUT ": "file$:IF file$="" THEN file$=voice$
1480 file$=LEFT$(file$,7):PRINT'''SPC(30)"SAVING: '";file$;"'"''''''
1490 chan=OPENOUT(file$):FOR I=0 TO 161:BPUT#chan,pg0?I:NEXT I:CLOSE#chan
1500 PRINT''''''SPC(30)"SAVING COMPLETE"
1510 D$=INKEY$(500):ENDPROC
1520 DEF PROCscreen
1530 SEP$="+-----+-----+-----+-----+-----+-----+-----+"
1540 L$="|     |     |     |     |     |     |     |"
1550 PRINT''SPC(31)SEP$'SPC(31)L$'SPC(31)"|1    |2    |3    |4    |5    |6    |7    |"
1560 PRINT SPC(31)L$'SPC(31)SEP$'SPC(37)"|POLY/|PITCH BEND |   PORTAMENTO    |"
1570 PRINT"  ********************************   |MONO +-----+-----+-----+-----+-----+"
1580 PRINT"  **                            **   |     |RANGE|STEP |MODE |GLIS-|TIME |"
1590 PRINT"  ** YAMAHA DX7 VOICE DATA LIST **   |     |     |     |     |SANDO|     |"
1600 SEP$="   +-----+-----+-----+-----+-----+-----+":PRINT"  **                              **"SEP$
1610 L$="   |     |     |     |     |     |     |     |":PRINT"  **********************************"L$'SPC(34)L$
1620 PRINT"DATE/PRESET No.:_______/________"L$'SPC(34)L$
1630 PRINT"VOICE NAME:_____ ";:FOR C=0 TO 9:PRINT RIGHT$(" "+CHR$(par?(145+C)),1);
1640 NEXT C:PRINT " ______"SEP$
1650 PRINT'"PROGRAMMER:_____                                    +--+"'SPC(63)"|OP|"
1660 L$="   |     |     |     |     |     |     |     |     |     |     |  "
1670 SEP$="   +-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+"
1680 PRINT SEP$"--+"'L$;FNpg0(14);" |6 |"'L$;FNpg0(35);" |5 |"'L$;FNpg0(56);" |4 |"
1690 PRINT"   | ";RIGHT$("  "+STR$((par?134)+1),2);"  | ";FNpg0(135);"  |";MID$(wave$, 10*(par?142)+1, 5);
1700 PRINT"| ";FNpg0(137);"  | ";FNpg0(138);"  | ";FNpg0(139);"  | ";FNpg0(140);"  | ";
1710 PRINT off_on$(par?141);" |  ";FNpg0(143);" |  ";FNpg0(77);" |3 |"
1720 PRINT"   |     |     |";MID$(wave$, 10*(par?142)+6, 5);"|     |     |     |     |     |     |  ";FNpg0(98);" |2 |"
1730 PRINT L$;FNpg0(119);" |1 |"'SEP$"--+"
1740 PRINT"   |ALGO-|FEED-|WAVE |SPEED|DELAY| PMD | AMD |SYNC |PITCH|AMPL-|"
1750 PRINT"   |RITHM|BACK |     |     |     |     |     |     |ITUDE|"
1760 PRINT"   |     |     +-----+-----+-----+-----+-----+-----+-----+-----+"
1770 PRINT"   |     |     |              LFO                |MOD. SENS. |"
1780 L$="   |     |     |     |     |     |     |     |     |     |     |"
1790 PRINT SEP$'L$'"   |7    |8    |9    |10   |11   |12   |13   |14   |15   |16   |"'L$'SEP$
1800 PRINT '"+--+"'"|OP|"'"+--+--+---+----+-----+-----+--+--+--+--+--+--+--+--+-----+--+--+--+--+"
1810 FOR opn=6 TO 1 STEP -1
1820 PRINT"| ";opn;"|";FNratio_fixed(opn);"|";:IF opn=3 PRINT off_on$(par?136); ELSE PRINT "   ";
1830 PRINT"|";FNfreq(opn);"| ";FNdetune(opn);"  |";:FOR EGP=0 TO 7:PRINT FNpg0op(opn,EGP);"|";:NEXT EGP
1840 PRINT FNpitch(8+21*(6-opn));"|";FNcurve(11+21*(6-opn));"|";FNcurve(12+21*(6-opn));"|";
1850 PRINT FNpg0op(opn,9);"|";FNpg0op(opn,10);"|":NEXT opn
1860 PRINT"+--+-+---+-----+-----+----+--+--+--+--+--+--+--+--+-----+--+--+--+--+"
1870 PRINT"   |MODE/|FREQ |FREQ |DET- |1 |2 |3 |4 |1 |2 |3 |4 |BREAK|L |R |L |R |"
1880 PRINT"   |SYNC |COARS|FINE |UNE  +--+--+--+--+--+--+--+--+POINT+--+--+--+--+"
1890 PRINT"   |     |     |     |     |     |    RATE   |    LEVEL  |     |CURVE|DEPTH|"
1900 SEP$="   +-----+-----+-----+-----+-----+-----------+-----------+-----+-----+-----+"
```

```
1910 PRINT SEP$'"   ¦       OSCILLATOR      ¦         E. G.         ¦KB LEVEL SCALING ¦"'SEP$
1920 L$="   ¦     ¦     ¦     ¦     ¦           ¦           ¦     ¦     ¦     ¦ "
1930 PRINT L$'"   ¦17   ¦18   ¦19   ¦20   ¦21         ¦22         ¦23   ¦24   ¦25   ¦"'L$'SEP$''''''''
1940 PRINT" +--+"'" ¦OP¦"'" +--+-----+-----+-----+--+--+--+--+--+--+--+--+-----+-----+"
1950 FOR opn=6 TO 1 STEP -1
1960 PRINT" ¦ ";opn;"¦  ";FNpg0op(opn,13);" ¦  ";FNpg0op(opn,16);" ¦ ";FNpg0op(opn,15);"  ¦";
1970 IF opn<>3 THEN PRINT "  ¦  ¦  ¦  ¦  ¦  ¦  ¦  ¦"; ELSE FOR r1=126 TO 133:PRINT FNpg0(r1);"¦";:NEXT r1
1980 IF opn<>3 THEN PRINT "     ¦";:GOTO 2010
1990 PRINT " ";MID$(notes$, (par?144+15) MOD 12 + 1, 1);
2000 PRINT MID$(sharps$, (par?144+15) MOD 12 + 1, 1)+STR$((par?144+15) DIV 12);" ¦";
2010 PRINT "  ";RIGHT$(" "+CHR$(par?(144+(7-opn))),1);"  ¦":NEXT opn
2020 PRINT" +--+-----+-----+-----+--+--+--+--+--+--+--+--+-----+  ";RIGHT$(" "+CHR$(par?151),1);"  ¦"
2030 PRINT"    ¦KEYB.¦OUT- ¦VELO-¦1 ¦2 ¦3 ¦4 ¦1 ¦2 ¦3 ¦4 ¦KEY  ¦  ";RIGHT$(" "+CHR$(par?152),1);"  ¦"
2040 PRINT"    ¦RATE ¦PUT  ¦CITY +--+--+--+--+--+--+--+--+TRAN-¦  ";RIGHT$(" "+CHR$(par?153),1);"  ¦"
2050 PRINT"    ¦SCAL-¦LEVEL¦SENSE¦    RATE   ¦   LEVEL   ¦SPOSE¦  ";RIGHT$(" "+CHR$(par?154),1);"  ¦"
2060 PRINT"    ¦ING  +-----+-----+----------+----------+     +-----+"
2070 PRINT"    ¦     ¦  OPERATOR ¦      PITCH E. G.      ¦     ¦NAME ¦"
2080 SEP$="    +-----+-----+-----+----------+----------+-----+-----+"
2090 L$="    ¦     ¦     ¦     ¦           ¦           ¦     ¦     ¦"
2100 PRINT SEP$'L$'"    ¦26   ¦27   ¦28   ¦29         ¦30         ¦31   ¦32   ¦"'L$'SEP$'''
2110 SEP$="       +-----+-----+-----+-----+-----+-----+-----+-----+"
2120 PRINT SEP$'"       ¦17   ¦18   ¦19   ¦20   ¦21   ¦22   ¦23   ¦24   ¦"
2130 PRINT SEP$'"       ¦    MODULATION WHEEL   ¦      FOOT CONTROL     ¦"
2140 PRINT SEP$`"       ¦RANGE¦PITCH¦AMPL-¦EG   ¦RANGE¦PITCH¦AMPL-¦EG   ¦"
2150 PRINT"       ¦     ¦     ¦ITUDE¦BIAS ¦     ¦     ¦ITUDE¦BIAS ¦"
2160 L$="       ¦     ¦     ¦     ¦     ¦     ¦     ¦     ¦     ¦"
2170 PRINT SEP$'L$'L$'L$'SEP$'''SEP$'"       ¦25   ¦26   ¦27   ¦28   ¦29   ¦30   ¦31   ¦32   ¦"
2180 PRINT"       ¦25   ¦26   ¦27   ¦28   ¦29   ¦30   ¦31   ¦32   ¦"
2190 PRINT SEP$'"       ¦     BREATH CONTROL    ¦      AFTER TOUCH      ¦"
2200 PRINT SEP$'"       ¦RANGE¦PITCH¦AMPL-¦EG   ¦RANGE¦PITCH¦AMPL-¦EG   ¦"
2210 PRINT"       ¦     ¦     ¦ITUDE¦BIAS ¦     ¦     ¦ITUDE¦BIAS ¦"
2220 PRINT SEP$'L$'L$'L$'SEP$:D$=INKEY$(500):CLS:ENDPROC
2230 PRINT L$'L$'L$'SEP$
2240 D$=INKEY$(500)
2250 CLS:ENDPROC
2260
2270 DEF FNpg0op(opn,rel_pgn)=RIGHT$("  "+STR$(par?(21*(6-opn)+rel_pgn)),2)
2280
2290 DEF FNpg0(pgn)=RIGHT$("  "+STR$(par?pgn),2)
2300
2310 DEF FNratio_fixed(opn)=CHR$(ASC("R")-(par?(17+21*(6-opn)))*(ASC("R")-ASC("F")))
2320
2330 DEF FNfreq(opn)
2340 LOCAL coarse, fine, freq$, RorF
2350 RorF=par?(17+21*(6-opn)):coarse=par?(18+21*(6-opn)):fine=par?(19+21*(6-opn))
2360 IF RorF=0 AND coarse=0 THEN coarse=0.5 ELSE IF RorF=1 THEN coarse=10^(coarse MOD 4)
2370 IF RorF=0 THEN freq=(1+fine/100)*coarse ELSE freq=coarse*(1.023293^fine)
2380 IF RorF=0 THEN ="   "+RIGHT$("  "+STR$(INT(freq)),2)+"."+RIGHT$("00"+STR$((100*freq+0.5) MOD 100),2)+"   "
2390 freq$$=STR$(freq):IF INSTR(freq$,".")=0 THEN freq$=freq$+"."
2400 ="   "+LEFT$(freq$+"000",5)+"Hz "
2410
2420 DEF FNdetune(opn)
2430 LOCAL det, det$
2440 det=par?(20+21*(6-opn))-7
2450 det$=" ":IF det>0 THEN det$="+" ELSE IF det<0 THEN det$="-"
2460 =det$+STR$(ABS(det))
2470
2480 DEF FNpitch(pn)
2490 LOCAL pitch, pitch$
2500 pitch=par?pn
2510 pitch$=" "+MID$(notes$, pitch MOD 12 + 1, 1)+MID$(sharps$, pitch MOD 12 + 1, 1)+STR$((pitch-15) DIV 12)
2520 IF pitch-3 >= 0 THEN pitch$=pitch$+" "
2530 =pitch$
2540
2550 DEF FNcurve(pgn)=MID$(curves$, par?pgn*2+1, 2)
```



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If you generally have your DX7 on a different channel, say number 4, then you should alter the check for the third byte (line 1280) to &03 – don't forget that MIDI thinks of external channels 1 to 16 as internal channels 0 to 15.

If the header sequence is OK, then the rest of the 162 bytes are received and stored (by lines 1330 to 1350) in the buffer area called (ie. addressed by) pg0, which is in the machine code RAM area before the actual code. The 162 bytes consist of the four header bytes above, followed by two bytes counting the number of data bytes in the message, followed by the 155 voice data bytes, followed by 1 checksum byte(!)

The dxsnd routine simply sends the current voice's 162 data bytes (ie. the data in pg0) back to the DX7.

Checksum

This byte seems to be a source of anguish for an awful lot of would be MIDI programmers, but the chksum routine should solve all your problems. All you have to do is add up all the data bytes whilst happily ignoring an overflow. The checksum byte sent over by the DX7 was calculated in the same way and then negated before transmission, so when you add it in, your overall result should be zero if the data (and checksum) made it across OK. Note that since only seven checksum bits were sent across, your result need only be zero in its least significant seven bits – see line 1480, which chops off the unwanted bit.

Conversion Techniques

This is where you have to do some work!

The BBC BASIC functions in lines 2270 onwards of the main program are responsible for the conversion and formatting of MIDI data. The symbol 'par' is used to address the start of the 155 voice data bytes, and these bytes are 'peeked' as required. For example, the main formatting function, FNpg0, line 2290, simply 'peeks' the data byte asked for by the parameter pgn, passed into the function by doing 'par?pgn', and then ensures that the format is always exactly two characters long by using STR$ and RIGHT$.

You should find the methods employed in FNpitch using MID$ and MOD and the predefined strings notes$ and sharps$ particularly edifying, and have a good look also at FNfreq, for the secrets of fixed frequency parameter conversion. In case you're wondering where the magic number 1·023293 comes from, I can tell you it's not given in any of the DX7/MIDI documentation I've seen. It's *actually* the 99th root of 9·772 to exactly the right degree of accuracy – see if you can work out where it comes from.

Jay Chapman **E&MM**

Software on Cassette

For those readers unwilling – or unable – to spend long hours keying in the dump program, E&MM is offering this software on cassette, price £7.95. Send cheques/POs (payable to Music Maker Publications Ltd.) to EmmSoft, Alexander House, 1 Milton Road, Cambridge CB4 1UY. Please allow 28 days for delivery.

```
1000  REM 6502 Assembler Source - BBC Micro DX7 Single Voice MIDI Dump
1010
1020 control_reg  =&FCFC:status_reg   =&FCFC
1030 transmit_reg =&FCFD:receive_reg  =&FCFD
1040
1050 FOR opt=0 TO 3 STEP 3:pg0=&C00:P%=pg0+163
1060 [ OPT opt
1070
1080 \ rx_midi - receives one byte from MIDI IN and places it pg0?X%
1090
1100 .rx_midi  LDA status_reg    \get MIDI status register contents
1110           AND #&01          \isolate Receive Register Full bit
1120           BEQ rx_midi       \not yet arrived - try again
1130           LDA receive_reg   \get byte received
1140           STA pg0,X         \byte HAS arrived - put it where told
1150           INX               \ready for next byte
1160           RTS               \that's all folks
1170
1180 \dx7dmp - receives a dump of one voice sent from DX7
1190
1200 .dx7dmp  LDX #0            \start from front of buffer
1210          JSR rx_midi       \get a byte
1220          CMP #&F0          \check whether it's System Exclusive
1230          BNE dx7dmp        \it isn't so start again
1240          JSR rx_midi       \get it
1250          CMP #67           \is it Yamaha?
1260          BNE dx7dmp        \nope - start all over again
1270          JSR rx_midi       \get it
1280          CMP #&00          \status=0;channel=0
1290          BNE dx7dmp        \if status and channel not both 0 - try again
1300          JSR rx_midi       \go get it - should be format num=0
1310          CMP #&00          \format=0
1320          BNE dx7dmp        \nope - start all over again
1330 .dx7dmp1 JSR rx_midi       \go get next byte
1340          CPX #162          \was it the last?
1350          BNE dx7dmp1       \no - so go round again
1360 .dx7dmpX RTS               \that's all folks
1370
1380 \.chksum - total bytes including (negated) chksum sent over
1390 \          result should be 0 ignoring sign bit
1400
1410 .chksum  LDX #6            \start from the start of the data
1420          LDA #0            \start with chksum=0
1430 .chksum1 CLC               \make sure the ADC is really and ADD
1440          ADC pg0,X         \sum the data bytes
1450          INX               \one more done
1460          CPX #162          \just done the last (including negated chksum)?
1470          BNE chksum1       \nope - do some more
1480          AND #&7F          \only 7 checksum bits came over ...
1490          STA pg0+162       \result should be zero - we'll see!
1500          RTS               \that's all folks
1510
1520 \.dx7snd - send a voice to the dx7
1530
1540 .dx7snd  LDX #0            \send from start of pg0 buffer area
1550 .dx7snd1 LDA status_reg    \pick up and
1560          AND #&02          \isolate Tx Register Empty bit
1570          BEQ dx7snd1       \if last byte not yet gone go round again
1580          LDA pg0,X         \get byte to send
1590          STA transmit_reg  \and send it
1600          INX               \count one more gone
1610          CPX #162          \check if all done INCLUDING original chksum
1620          BNE dx7snd1       \nope - go do the next one
1630          RTS               \that's all folks
1640 ]
1650 NEXT opt
```

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MODULAR SYNTHESIS

Using Sequencers with Modular Systems

This month sees a change of emphasis as Steve Howell **turns his attention away from generating specific sounds and begins a look at the possible applications of sequencers in a modular context.**

Although the use of sequencers has received a fair amount of coverage in these hallowed pages of late, their application in the context of a modular system involves techniques that are not really practicable on a smaller, prewired synthesiser, and a modular synth offers considerably more in the way of sequencing possibilities, even if its use is still something of a specialist subject.

A modular instrument gives the user control not only of pitch but also of tone, amplitude, pulse width, modulation level, and in some cases, envelope shape, and all these parameters can, if desired, be manipulated by a sequencer. Before we go any further into the world of sequencer application, however, let's first take a look at the various types of unit available.

Analogue

Analogue sequencers were the first type to be produced, and almost all such models feature a row of potentiometers which are tuned to whichever control voltage levels are necessary to produce a short sequence of programmed events. Most commonly, these events are then applied to one or more VCOs for melodic sequences, though as with any CV, they can also be used in conjunction with any voltage-controllable module.

There are two main problems with these units. First, they are inordinately cumbersome to program, and second, they have only a limited storage capacity – usually in the region of 24 events, depending on the make and model. However, more often than not these can be split into three channels of eight events each, with the result that each channel can be used to control separate VCOs (for melodic counterpart) or routed to a VCF and/or VCA for tonal and amplitude changes. A further alternative is to use one channel to control the tempo of the sequencer's voltage controlled clock, facilitating the construction of more intricate rhythm patterns.

It's also possible to interact with the sequencer as it's running, switching notes in and out and varying the pre-programmed CV levels so that a degree of improvisation can be introduced into what may otherwise be a short and rather repetitive sequence. The normal mode of operation, however, is to feed each channel to a separate set of voice modules (comprising VCO(s), a VCF, a VCA and associated EGs) so that the various layers of sound can be cross-faded to give the effect of longer sequences.

Nowadays, analogue sequencers can seem a bit limited, but they do offer some possibilities not available on the latest microprocessor-based units, and there's no reason why they can't be usefully employed even in today's microcomposed music.

Digital

The next stage in technological dev-

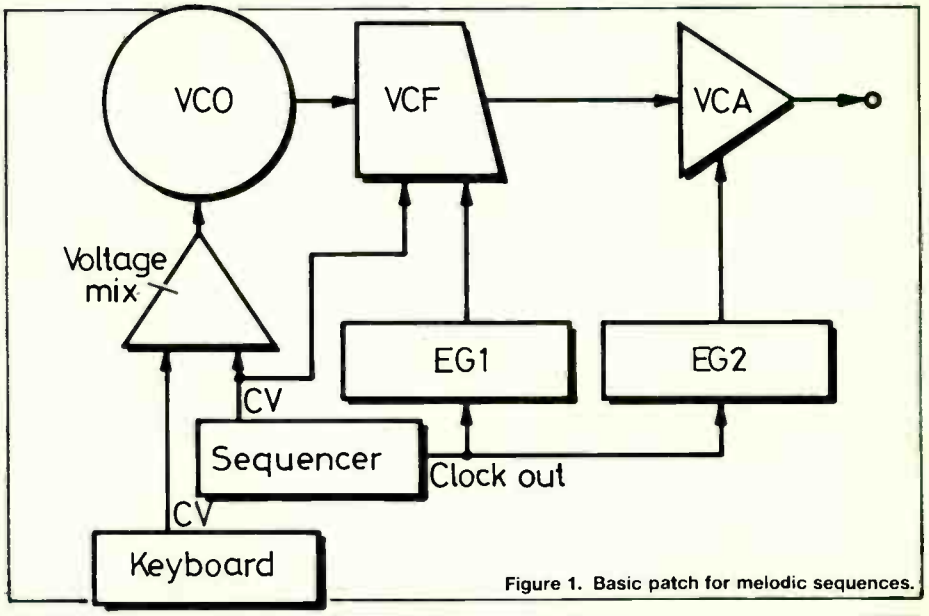


Figure 1. Basic patch for melodic sequences.

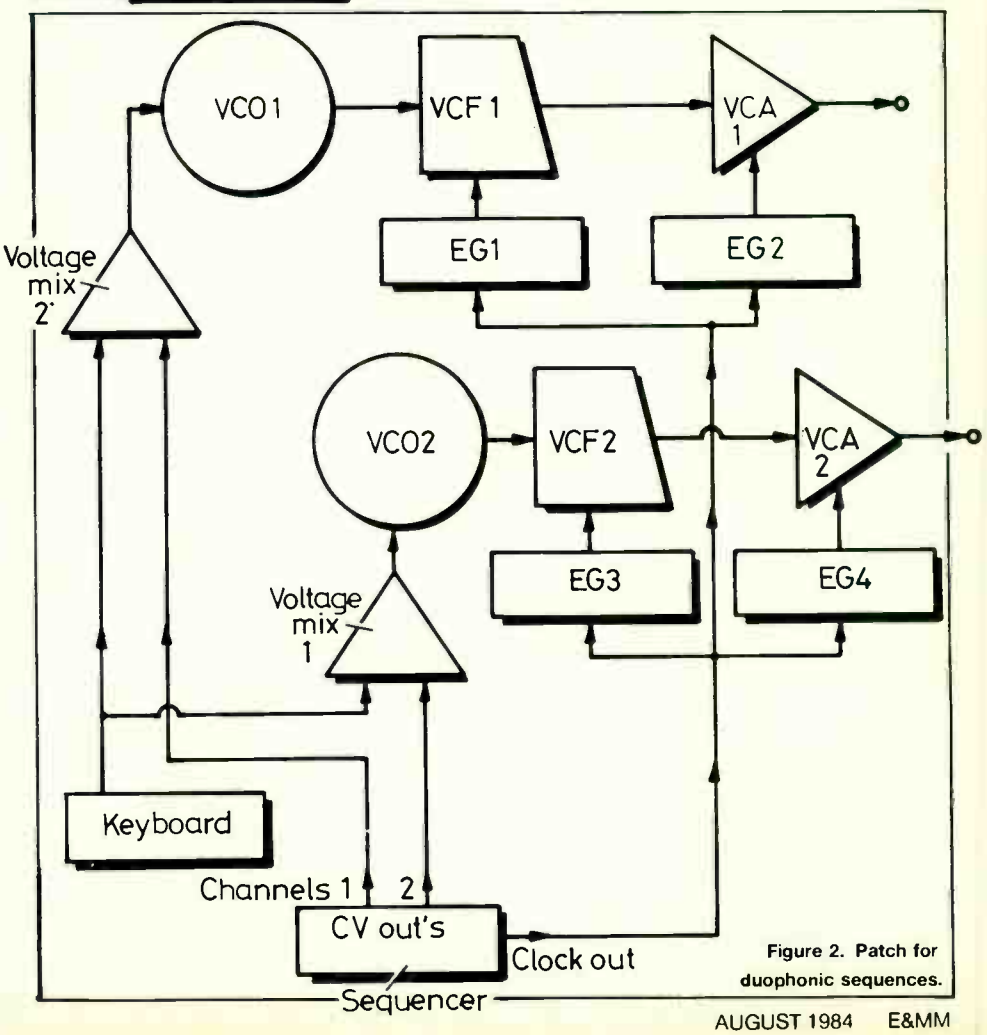


Figure 2. Patch for duophonic sequences.

elopment was the digital sequencer which had a greater storage capacity but lacked the multiple channels of its analogue predecessor. Hence a number of synthesists (ie. those who couldn't afford to buy more than one digital device) remained unimpressed by the new machines and stuck with their existing instruments. However, it's often possible to split the digital memory into two or four smaller sections which can then be used to store different sequences.

On the other hand, digital sequencers did improve storage matters considerably, a typical memory capacity being about five times as much as that of an analogue counterpart.

Ideally, the next step of evolution would have been a multi-channel device that would have combined the control possibilities of the original analogue sequencers with the greater event storage made possible by the use of digital techniques. Sadly, this never came about, and instead the synth world saw the arrival of the microcomposer, a device of considerably greater flexibility but rather less in the way of operational simplicity. It's for this reason that I still feel 'old-style' analogue and digital sequencers can still be of use to the modern synthesist, because although they can't equal microcomposers' editing facilities and multiple output flexibility, they are at least fairly straightforward to use.

Patches

Figure 1 shows the most basic use of a sequencer – to play one or more VCOs for a melodic sequence: of course, the voice modules can be set up for any sound you wish (if you're really stuck, use one of the patches from previous articles in this series!). The keyboard is also connected so that the sequence can be transposed up or down, though if you're using a digital model it'll most likely have this facility as a switchable function.

Figure 2 is essentially the same, except that it uses two control channels to play a two-part sequence. This technique is more suited to use with an analogue sequencer, but if you're lucky enough to own more than one digital device you could doubtless achieve the same result. The number of channels can be multiplied as many times as you wish – assuming you have enough hardware at your disposal – and you can then mix each channel, cross-fading them in and out and adding EQ and effects as desired. This technique lends itself particularly well to the dreamy 'floating' music pioneered by Tangerine Dream and copied (with varying degrees of success) by so many others. Be careful you don't get too carried away with this technique, however: it's an easy mistake to make in these circumstances.

One adaptation of this patch is to use the other channels' CV outputs to control some other voltage-controllable device.

The first one that springs to mind is the VCF, which you can modify so that each note has a different tone colour. This can certainly make an otherwise repetitive sequence sound considerably more interesting, especially if you mess around with the channel controlling the VCF – again, a technique more suited to analogue sequencing. A further option is to use a third CV channel to control the gain of a VCA, thereby giving you dynamic as well as tonal control.

The patches for these alternatives are given in Figures 3a and 3b. Note that in the latter diagram, the third CV channel is routed to a second VCA, as this should give you more control over the final output level than you'd have if the sequencer's CV output was mixed with that of the EG. This is because the EG's CV output will always be at the same level unless you program a higher voltage into the sequencer, and if you do this, you may well find the VCA 'overshoots', causing distortion. So, if you have a second VCA, it's best to use it since the sound will then respond to the slightest voltage change.

If you don't have a second VCA to play with, you may be able to get round the problem by setting the VCA's EG modulation level fairly low so that the sequencer's output determines the final level, though as I say, the degree of control you'll have probably won't be as great.

These patches should provide quite some variation over the simple note-playing sequencer-and-prewired-synthesiser array. If you don't have access to a modular synth but *do* possess a multi-channel sequencer, you should be able to do some of the things I've outlined if you can get hold of a couple of monophonic synthesisers along the lines of the Pro One, Minimoog, Prodigy, ARP Axxe or Odyssey, which have separate CV inputs for the VCF and, in the case of the Minimoog, a second VCA.

Steve Howell **E&MM**

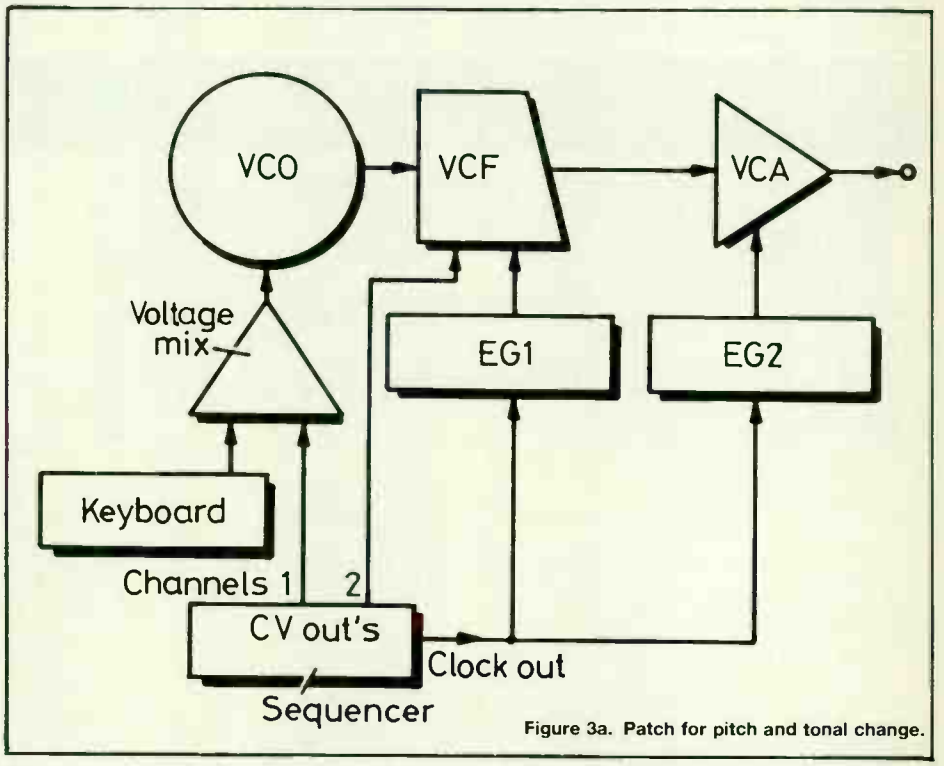


Figure 3a. Patch for pitch and tonal change.

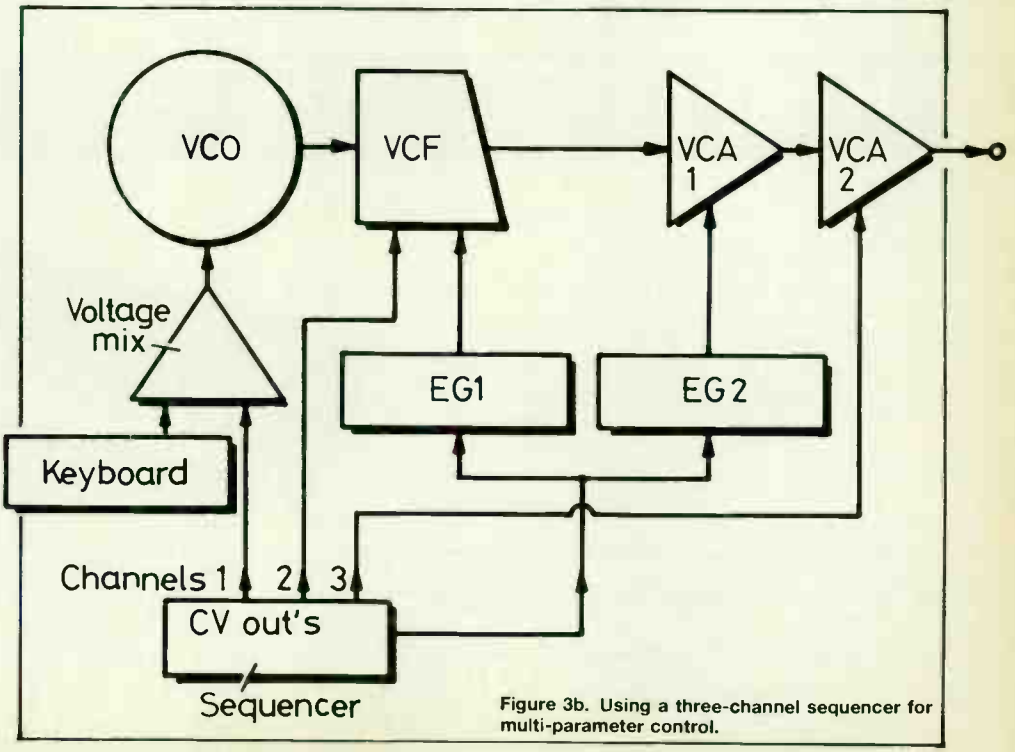
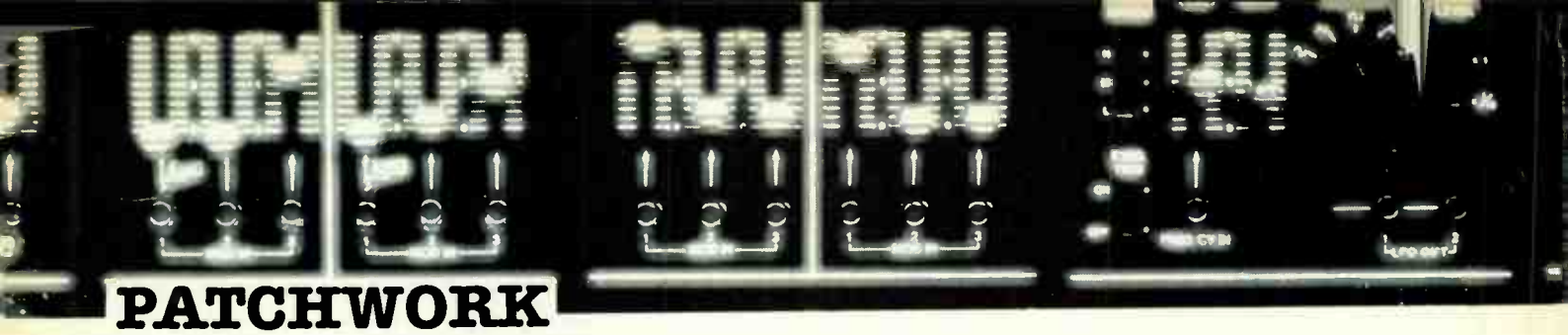


Figure 3b. Using a three-channel sequencer for multi-parameter control.



PATCHWORK

This is where E&MM hands over the controls. Although we continue to receive a great many different patches for a variety of synths, we are definitely missing a few (eg. the OSCar, SCI Pro One and Six Trak, Korg Polysix, Kawai SX210, Yamaha CS5/10/30, etc), so if you're the proud owner of one of these synths (or indeed any of the more regularly featured models), send your favourite patch (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. Meanwhile, back at the ranch. . .

ROLAND JX3P — 'Marimba' — Steve Clarke, Surrey

This patch can be entered by the JX3P's internal edit A & B buttons, allowing the instrument to be programmed without the aid of the PG200 programmer. Steve says he finds this sound particularly useful for arpeggio-type patterns and that, as always, you should feel free to experiment with the settings given.

			PG-200	JX3-P Edit	
				Element	Indicator
DCO-1	Range			A-1	A
	Waveform			A-2	C
	Freq Mod	LFO		A-3	A
		ENV		A-4	A
DCO-2	Range			A-5	C
	Waveform			A-6	C
	Cross Mod			A-7	B
	Tune			A-8	16
	Fine Tune			A-9	B
	Freq Mod	LFO		A-10	A
		ENV		A-11	A
Freq Mod	LFO Depth			A-12	6
	ENV Depth			A-13	1
	ENV Polarity			A-14	B

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

KORG POLY 61 — 'Steel Drums' — Derek Kelly, Stockport

Although the Poly 61 has recently been to some extent overshadowed by the 800 in Korg's polysynth range, it's still a popular synth and should be around for some time to come. We found this 'Steel Drums' patch to be reasonably metallic, but at the same time it's 'musical' enough to double as a useful synth sound. It's worth experimenting with the envelope values (we quite liked an ADSR setting of, say, 6/11/6/12). Finally, Derek suggests playing the keyboard as if you were using sticks on the real thing!

NAME	DCO I			DCO II				VCF				EG				VCA	MG			
	11	12	13	21	22	23	24	31	32	33	34	41	42	43	44	51	61	62	63	64
Steel Drums	16'	3	3	8'	1	1	4	25	2	1	3	8	9	12	11	1	1	0	0	4

KORG POLY 800

'Synthe Bass IV'

'String Duet'

Petras Saduikis
Nottingham
Robert Crozier
Lancs

The first settings list below (#1) is derived from the Poly 800 factory preset 'Synthe Bass III', and provides a sharper bass sound that Petras considers especially suited for use with the Korg's built-in sequencer. Robert's patch (#2) simulates two stringed instruments (violin and celio) in 'duet', and a more dramatic effect can be achieved by altering the interval between the two DCOs.

	DCO 1						MODE	DCO 2							NOISE	VCF					CHORUS	DEG 1					DEG 2					DEG 3					MG			MIDI		
	OCTAVE	WAVEFORM	16'	8'	4'	2'	LEVEL	DCO	OCTAVE	WAVEFORM	16'	8'	4'	2'	LEVEL	INTERVAL	DETUNE	LEVEL	CUTOFF	RESONANCE	KBD TRACK	POLARITY	EG INT	TRIGGER	ON/OFF	ATTACK	DECAY	BREAK P	SLOPE	SUSTAIN	RELEASE	ATTACK	DECAY	BREAK P	SLOPE	SUSTAIN	RELEASE	ATTACK	DECAY	BREAK P	SLOPE	SUSTAIN	RELEASE	FREQ	DELAY	DCO	VCF	RCV CH	PROG CHANGE	SEQ CLK
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
#1	3	2	1	1	1	1	12	2	3	2	1	1	1	0	12	7	2	2	40	5	0	2	8	2	1	0	26	23	26	0	20	0	15	16	19	0	20	0	17	17	25	0	20	8	4	0	0	-	-	-
#2	3	2	1	1	1	1	20	2	1	2	1	1	1	0	31	7	1	0	48	7	1	2	0	1	1	23	18	26	13	31	26	27	0	27	13	31	26	-	-	-	-	-	-	7	6	2	0	-	-	-

YAMAHA DX7

'Funkmaster'

Martin Russ
Ipswich

Martin describes 'Funkmaster' as a 'fast, funky-feel twang with lots of thump'. (Quite.) The timbre has some of the elements of a detuned clavinet combined with a plucked bass sound, and some touch-sensitivity is included to give a brighter sound when pressing the keys faster.

Algorithm 16 is used in this voice. Operator 1 is the only carrier and is modulated by three sources. Operator 2 is used as a low frequency vibrato oscillator, and serves to give some movement within the sound. Operators 3 and 4 give the main thump/twang sound as well as giving a heavy bass bump. The velocity sensitivity of Operator 4 gives a brighter metallic sound with increasing key velocity.

Operators 5 and 6 give an additional bright fill effect which can sound like reverb at certain settings of Operator 5's output level. For an output level of 73 there is almost no effect on the final sound, at 83 the twang is brighter and at 93 has a hard cutting edge, but by 99 the contribution from Operators 5 and 6 is not only very marked but also quite intolerable!

In performance the touch-sensitivity resolves into two levels: soft = muted sound, hard = bright. Staccato playing brings out the percussive nature of the sound, and heavy left-hand octaves emphasise the bass thump. Legato playing reveals an unexpected sustain, giving away the non-acoustic nature of the instrument. In fact, the combination of heavy click/twang and a silky sustain sound gives a sort of manic Hammond organ!

(Well, he did try to keep it brief.)

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	OP
16	3	~	11	0	16	0	OFF	2	0	6
									0	5
									0	4
									0	3
									0	2
									0	1

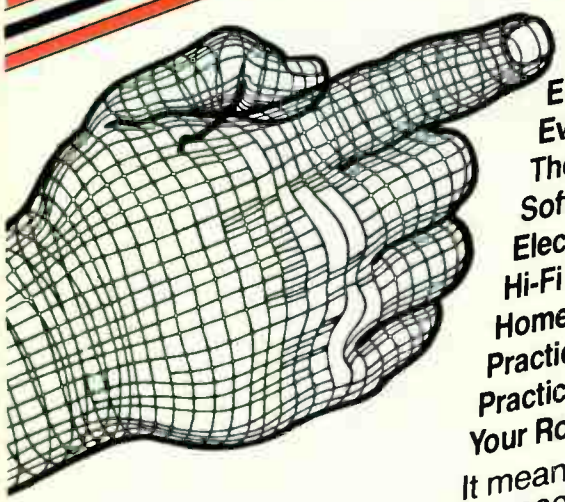
POLY/MONO	PITCH BEND RANGE	PITCH BEND STEP	PORTAMENTO MODE	PORTAMENTO GLISSANDO	PORTAMENTO TIME

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	KEYBOARD LEVEL SCALING BREAK POINT	KEYBOARD LEVEL SCALING CURVE L	KEYBOARD LEVEL SCALING CURVE R	KEYBOARD LEVEL SCALING DEPTH L	KEYBOARD LEVEL SCALING DEPTH R	KBOARD 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	30	45	99	81	63	0	A-1	-LIN	+LIN	0	0	3	99	1											
5	Hz		7.5	86 Hz	+3	99	74	0	0	99	99	0	0	D3	-LIN	-EXP	0	0	1	72	1											
4	R		0	50	-3	99	67	42	23	99	72	59	0	A-1	-LIN	-EXP	0	0	3	99	2	99	99	99	60	50	50	50	50	C3		
3	R		1	00	0	99	32	32	39	99	81	76	0	A-1	-LIN	+EXP	0	0	3	99	2											
2	R		0	51	0	99	46	26	19	99	0	0	0	F6	+LIN	-EXP	0	0	0	73	2											
1	R		0	51		98	47	26	27	98	0	0	0	C♯6	-LIN	+EXP	0	0	3	73	2											

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

LOOK WHO'S BACKING

LEISURE TRONICS



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COMPUTER MUSICIAN

On average, I get three phone calls a week from people asking me what micro they should buy for music: one of the penalties for appearing on the box now and again, I guess. Unfortunately, there's really no cut-and-dried answer, and I usually fall back on the cliché of wait and see what happens, which you could say is tantamount to a cop-out of the first order.

The problem is that the micro business is a veritable battle-ground of conflicting standards and expectations. On the one hand, you have the Sinclair cohorts with the advance party of the 32-bit (alternatively, 16- or 8-bit, depending on your viewpoint of the 68008 processor) QL finally making it to the shore for a small number of less than entirely satisfied customers.

On the other, there's Acorn, whose Cambridge empire has grown by leaps and bounds into a mighty oak tree with branches going off in all directions of entrepreneurial endeavours.

Finally, there's the new boy on the block, MSX, embodying the collective might of multiple Japanese companies, about which it could be said there's more confusion than enlightment.

But, I hear you cry, what about the CX5? Well, unlike other magazines, we're adopting a cautious stance on this. Yes, it looks exciting. But let's not be seduced by all the hype that's surrounded it. The CX5 is merely a fairly standard Z80-based micro with a none-too-brilliant QWERTY keyboard and enough space in its belly for an FM synthesis module. And, of course, it's unlikely to be in the shops until late autumn at the earliest.

So, at present, the one clear favourite is still the BBC Model B Micro. Mind you, it's not cheap – the version with disk interface won't leave much change from £500 – but if you're after a machine that's expandable and with lots of software support, there's no two ways about it, really. And even more so now, since there are not one but three companies working on digital synthesis add-ons for it – namely, Hybrid Technology, Clef Products, and Digitalent.

In addition to getting their add-on past the prototype stage, Hybrid Technology have been doing some interesting work in the field of digital-synthesis-on-a-chip, and there's every indication that future computers will pip quite a few other manufacturers to the post in the sound department, courtesy of Hybrid Technology's developments – Yamaha or no Yamaha.

Clef Products, of course, are behind the PDSG project that's been running for the past few months in CM under the guise of 'E&MM Digital Music'. Well, not quite 'running' as yet: more like eagerly waiting to spring off the starting block. Apparently, everything's working just as nature intended, but gearing up of the production line is being held until field testing has been completed. That explains why we haven't been able to quote any firm prices or delivery dates. As they say, watch this space for developments.

And Digitalent? Well, this is a Government-sponsored company centred around the excellent Nottingdale Technology Centre in London. Original plans were for a cheap, analogue polysynth that interfaced with the BBC Micro, but all this has changed in the direction of a system that's more akin to the PPG approach but intended to sell for under £500.

So, given all these developments, who could blame us for sticking with the BBC Micro? Maybe it's a touch jingoistic, but if it means that we end up with a synthesis system that can rank with the world's finest, who'll be complaining? Not I.

After all, isn't that the benefit of waiting to see what happens rather than jumping on the bandwagon?

David Ellis

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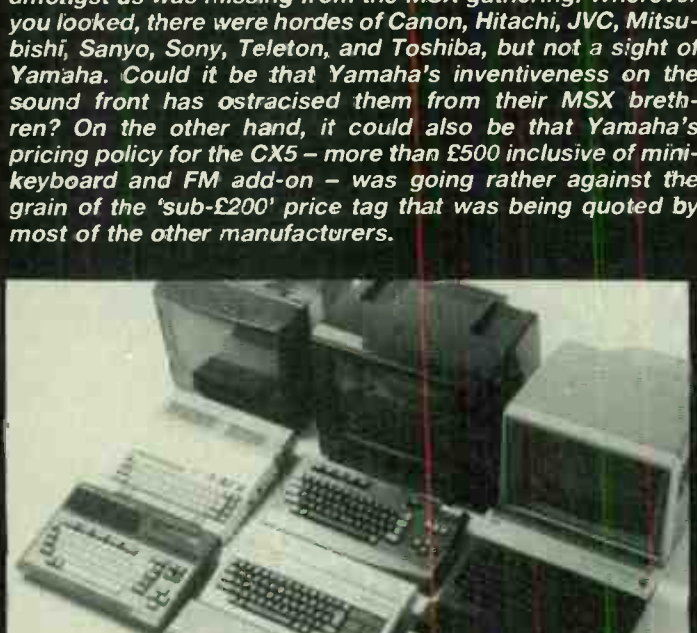
RUMBLINGS

May 17 saw a massive shindig in a London hotel to launch the MSX range of home micros. 'Launch' is quite an apt description, as there was enough champers doing the rounds of journalists' gullets to launch a fleet of battleships. If the truth be known, all that alcohol was really for an honest medicinal purpose, as being faced with a round-up of so many micros doing virtually the same thing was a bit like being hit with an oriental sledgehammer.

Which brings us to Sony's 'Hit Bit'. If that isn't the silliest name for a micro, I don't know what is. Methinks some Sony employee was availing himself of a colloquial English dictionary and got his knickers in a proverbial twist. . .

Curiously, the one micro of any interst to the more musical amongst us was missing from the MSX gathering. Wherever you looked, there were hordes of Canon, Hitachi, JVC, Mitsubishi, Sanyo, Sony, Teleton, and Toshiba, but not a sight of Yamaha. Could it be that Yamaha's inventiveness on the sound front has ostracised them from their MSX brethren? On the other hand, it could also be that Yamaha's pricing policy for the CX5 – more than £500 inclusive of mini-keyboard and FM add-on – was going rather against the grain of the 'sub-£200' price tag that was being quoted by most of the other manufacturers.



The problem, of course, is that faced with such a muddle of MSX machines ('a gaggle of geese', 'a muddle of MSX' – you know, that sort of thing), my heart rather goes out to the High Street punter who'll be obliged to choose between micros with standardised specifications. In the end, I suppose cosmetic details will be a deciding factor, and from what I've seen so far, I'd say that Sony's 'Hit Bit' is a pretty strong contender in that respect, silly name or not.

International MIDI

The International MIDI Association, a 'clearing-house organisation for users of instruments equipped with MIDI', held the first of what's likely to be an annual jamboree from May 25-26 at the Mark Hopkins Hotel in San Francisco. This MIDISOFT conference was aimed at getting together people involved with MIDI software development, publishing, and vending. The aim is to establish a MIDI Software Group and discuss the current state of MIDI software development.

We hope to have a further report on this in a future issue, but in the meantime, the IMA also produce a very useful monthly bulletin containing the latest MIDI news and views from around the world. To receive this and join the IMA at the same time costs $15 if you're in the US or Canada, or $20 elsewhere. For more info, contact Kathy Wright or Roger Clay at 8426 Vine Valley Drive, Sun Valley, CA 91352, USA (☎ 818-768-7448).

DX1 Update

No, not the Yamaha DX1, but the Decillionix DX1 sound sampling system for the Apple. I bet Yamaha love Decillionix for that bit of confusion! Dan Retzinger of the aforesaid company has told us that that they've just released a new version of the software reviewed in CM in December '83, which apparently takes our criticisms to heart and updates the system accordingly.

The major changes are that an external sync facility is now provided (via the game port), and playback pitching can be varied in real time by attaching either an alphaSyntauri or Passport keyboard and playing away to your heart's content.

Other improvements include using the extra sound storage of a 16K RAM card, an easier-to-use autosequencer, a sequence record facility, variable scale tuning, and easier loading and saving of sounds. Unfortunately, the price of the DX1 has gone up somewhat (to $295), which makes it a mite uncompetitive against the £300 or so of Mainframe's much-exposed, but four-voice, sound-sampling system. For more information about the new incarnation of the DX1, contact Computer Music Studios, 62 Blenheim Crescent, London W11 (☎ 01-221 0192), or Decillionix, PO Box 70985, Sunnyvale, CA 94086, USA (☎ 408-732-7758).

Kurzweil Kudos

Precisely when and where the Kurzweil 250 digital keyboard will materialise must be one of the great unanswered questions of the century. According to Don Byrd, a company spokesman, about 30 ROM-based sounds will be available in the first-release model, including 23 orchestral instruments and grand piano. The real interest in the system centres around their proprietary technique of 'contoured sound modelling', whereby sounds are digitised, analysed, and coded, taking into account timbre changes that are both pitch- and amplitude-dependent.

It's intended that the instrument will have an 88-note keyboard, with a proper Pratt & Reed action. And aside from actually feeling like a real piano keyboard, there's every likelihood that the 250 will also sound convincing as far as pianistic emulation goes. Not only is the spectral content of the sound modified over the pitch range, but different degrees of dynamics alter the brightness of the sound – an effect achieved by having something like half-a-dozen amplitude-dependent timbres for each note.

Of course, if the 250's synthetic abilities were all ROM-based, there'd be groans galore, so what eventually rolls off the production line will also have provision for sampling (up to five seconds in length). The multitracking facilities also look pretty exciting, with 12 tracks holding up to 15,000 events plus the option of having your own favourite micro do the dirty work. Other sensible features include MIDI and an eight-bit parallel interface.

Which brings us to the question of when it'll appear and what it'll cost.

Well, 'under $10,000' is what's still being quoted by those supposedly in the know, and the 1984 NAMM Summer Market in Chicago should have given some proof to all this pudding, while in the UK, we've learnt that Rupert Hine, Peter Gabriel, and Sting are high on the list for 250s. If it's any comfort for those impatient of developments on the Kurzweil production front, we're informed that Kurzweil Music Systems have just moved to new headquarters ('in anticipation of expansion throughout 1984') at 411 Waverley Oaks Road, Waltham, MA 02154, USA, and that Syco Systems will eventually be marketing the keyboard in the UK.

David Ellis

Electromusic Research MIDI Software and Hardware

for the BBC Micro

David Ellis **takes a look at the first commercially-available software package for the BBC Model B, distributed in the UK by Rose Morris.**

Electromusic Research is, of course, Mike Beecher, the ex-Editor of E&MM, whose sterling efforts at informing the world about MIDI must by now be obvious to just about any reader. He's still very much involved in journalism, but EMR represents his move into the commercial side of the business. It's always interesting to see what emerges when an acknowledged commentator in the field steps into the limelight of the commercial arena, but I don't envy Mike his invidious position of being a manufacturer and a reviewer at one and the same time.

For their first MIDI software release, EMR have concentrated on the BBC Micro and produced a six-track step-time sequencer along with an interface box. From an objective viewpoint, I'd say that the BBC Micro is a good choice for a MIDI controller because of its flexible interfacing options, fast(er) processor, and good operating system. But against these positive virtues, it should be recognised that clever graphics (a display of notes, for instance) are virtually out of the question if a reasonable amount of note storage is required. There are ways around this compromise, however, and I'll go into these at a later stage of the review.

Impressions

The EMR package looks pretty good on first acquaintance. Everything is well-boxed, albeit with a little over-indulgence as far as Letraset typefaces are concerned. The interface is housed in a small white plastic box with DIN sockets at the rear for clock start/stop, MIDI In, MIDI Out 1, and MIDI Out 2, and ribbon cables at the front for connecting to the BBC Micro's User I/O and 1MHz bus. The doubling of MIDI Outs is a welcome sign after the austerity of SCI's Model 64 sequencer, so hats off to EMR for that. If two MIDI Outs aren't enough (greedy lot), there's always Roland's MM4 box of tricks or EMR's own MIDILINK, which turns one MIDI In into no less than *six* MIDI Thrus! Also at the front of the box, there's a couple of LEDs which tap into the incoming or outgoing bit stream to signify that MIDI data is streaming along the highway. Another thoughtful touch.

What's not quite so thoughtful is the shortness of the ribbon cables to the BBC Micro. Many complaints have been made about the positioning of the Beeb's I/O connectors (underneath the machine), and EMR's cables are marginally too short to enable the siting of the interface box at both the right and left sides of the micro comfortably. These connectors also need a bit of care to make sure that they're going where they're intended. Still, as the manual says, 'with fingertip pressure it should slide in. . . ' (Well, this is an adult magazine.) Inside the interface box, everything looks well-constructed (like the Music Editor), but EMR's insistence on scrubbing off the chip numbers is somewhat childish bearing in mind that their respective IDs are as inevitable as one day following the next.

The EMR software is available on 40-track (80-track to special order) disk or cassette, and comes with eight photocopied pages by way of a manual – a bit on the mean side considering the total cost of the package (£159 inclusive of VAT). The first page of this is an introduction to the software and the MIDI in general, and it's here that I found more than a few bones of contention.

For instance, the introduction to the MIDItrack software says that 'traditional note input is entered from the BBC keyboard in order to avoid coding unfamiliar to the musician.' I don't quite understand this. Surely playing a keyboard is what one would rightly call 'familiar coding' for a musician, and anything else (including a BBC or any other micro keyboard) would appear unfamiliar?

Another point of disagreement is EMR's assertion that 'only the degree of MIDI control on a keyboard, for example, limits the number of notes played, the amount of manipulation of the instrument's parameters, voice presets, and other important setting-up functions like Mono/Poly, sequencer stop/start, etc.' The bald fact of the matter is that the speed of the MIDI itself restricts the number of notes that can be sent in a musically meaningful way, and EMR's further suggestion that 'your home computer (can) become a major 'control centre' capable of playing . . . even a full orchestra of MIDI instruments' is patently lacking in realism if a full orchestra means the same to you as it does to me – especially if you've only got six monophonic tracks to play around with.

Pages

The MIDItrack program loads up automatically using the Beeb's 'turnkey' option, ie. by pressing the SHIFT and BREAK keys together. Cataloguing the disk indicates the usual !BOOT exec file for this operation, but, aside from a couple of demo files (YESTERD and

CARNIVL – note the limited file name length of Acorn's DFS!), all else is obscured from the user's eyes. Indeed, attempts to list the program merely resulted in a 'Bad program' error message. Considering that the BBC Micro is such a popular educational machine, I'd say that EMR have been over-enthusiastic in preventing their customers from seeing what's going on in the program. What they should also remember is that REM statements informing the nosy user that 'It is illegal to copy software produced by Mike Beecher' are a) incorrect (there is no legislation as yet), and b) merely conducive to people nosing even further.

The starting point of MIDItrack is a series of 'pages' for setting up the essential ins and outs of the system.

Page 1 (Track Assignment) is used to set the number of tracks (1–6). This has important repercussions when it comes to entering events, because unlike more intelligent software that makes use of dynamic memory assignment, this program simply divides up available memory according to the number of tracks being used. Thus, a single track has space for 6909 events, whereas six tracks can cope with only 1150 on each. From my own viewpoint of micro-based composing tools, I'd say this is being more than a little inflexible about it all. In fact, EMR would do well to take a leaf out of JMS' copy book (see review in E&MM July) and allow stealing from a fairly inactive track to one that's more in the thick of musical activity.

The next page (MIDI Channel Mode) concerns the setting up of the receiving ends of EMR's output so that they respond in one of four possible modes, ie. 1 = Omni on/Poly, 2 = Omni on/Mono, 3 = Omni off/Poly, 4 = Omni off/Mono. At least, I think that's the intention. The problem is that the manual doesn't make it entirely clear whether this page is just for setting up the receiving status or whether there's also an element of transmission mode selection involved as well. What makes the latter unlikely is the observation that the program also allows different modes to be assigned to each of the 16 possible MIDI channels, which isn't exactly what the MIDI transmission protocol would call cricket. So, if Page 2 is just setting up the receiving end of the MIDI link, that begs the question of how the user goes about setting the transmitting mode specifically. All a bit confusing, really. Oh for a simple life. . .

Pages 3 and 4 are less controversial and, respectively, allow each of the six monophonic tracks to be assigned to a particular MIDI channel (and, potentially, a different keyboard) and internal or external sync to be used. As the manual says, this can also be achieved by connecting one of the interface's MIDI Outs to the MIDI In of a MIDI-compatible drum machine – that's if you're fortunate enough to have one of those beasts, of course.

Page 5 is the Main Menu, which gives access to disk utilities (catalogue, load and save music files), scrubbing memory (Create MIDItrack), and note entry itself (MIDItrack Composer). Finally, Page 6 (Memory Free) tells you how much space is left on each track in use and Page 7 (Select Play Tracks) switches particular tracks on or off.

Composing

The crux of the matter with any step-time sequencer is how easy it is to use when entering a long and complex piece. Bearing this in mind, I put the composing page through a fairly strenuous assault course of various musical styles, just to see how much truth there is in EMR's assertion that it 'can be quickly applied to any kind of music style, from rock to classical'.

Let's start by looking at the way events appear on the screen for the first couple of phrases from Lennon and McCartney's 'Yesterday'

Figure 1.

TRACK	EVENT	VALUE	DYNAM	LENGTH	STYLE
1	1	F3	F	36	3
1	2	D#3	MP	12	4
1	3	D#3	MF	48	3
1	4	R		24	
1	5	G3	MF	12	3
1	6	A3	MF	12	3
1	7	B3	F	12	3
1	8	C4	MF	12	3
1	9	D4	MF	12	3
1	10	D#4	MF	12	3
1	11	D4	F	36	3
1	12	C4	MP	12	4
1	13	C4	MF	48	3
1	14	R		24	

The first two columns are more or less self-explanatory. 'Value', on the other hand, can include voice changes, modulation control, rests, an end marker to signify the completion of a particular track, or actual notes. In the case of the latter, that requires individual specification of note name, octave (where C3 is middle C), and accidental (if used). Next, a dynamic value from *ppp* to *fff* (or 1–8) has to be entered using the function keys. 'Length' sets the duration of that event (from a demisemiquaver to a dotted semibreve) again using the function keys, and 'Style' sets the gate on time as a proportion of the event length.

Editing functions include 'I' (which inserts an event on a specified track in a specified position), 'D' (which deletes an event), 'R' (which replaces one event with another), 'C' (which copies sequences from one location to another, either on the same or a different track, and with or without transposition), 'L' (which lists a block of events on a particular track), and 'H' (which allows you to hear each event in turn). Finally, there's 'B' (Beat/Bar Count – for checking the length of notes and so on), 'T' (for setting the tempo of playback) and 'P' (for playing tracks back with a certain number of repeats).

This is all pretty standard stuff. Lots of rows and lots of columns all trying to make their way into your consciousness in MODE 7 graphics. Certainly all the features work well enough, but there's absolutely no way that you can compare what's happening on one track with the events on another on-screen. As far as I'm concerned, multitrack composing stands or falls on the way in which it helps you to organise your ideas – and that includes letting you see how events on one track fit in with those on another. That needs really efficient and imaginative use of the available screen space, which regrettably isn't the case with MIDItrack. EMR would do well to look at some of the remarkable overlapping page displays in programs like 'The Incredible Jack' and 'Appleworks' for an inkling of what can be done.

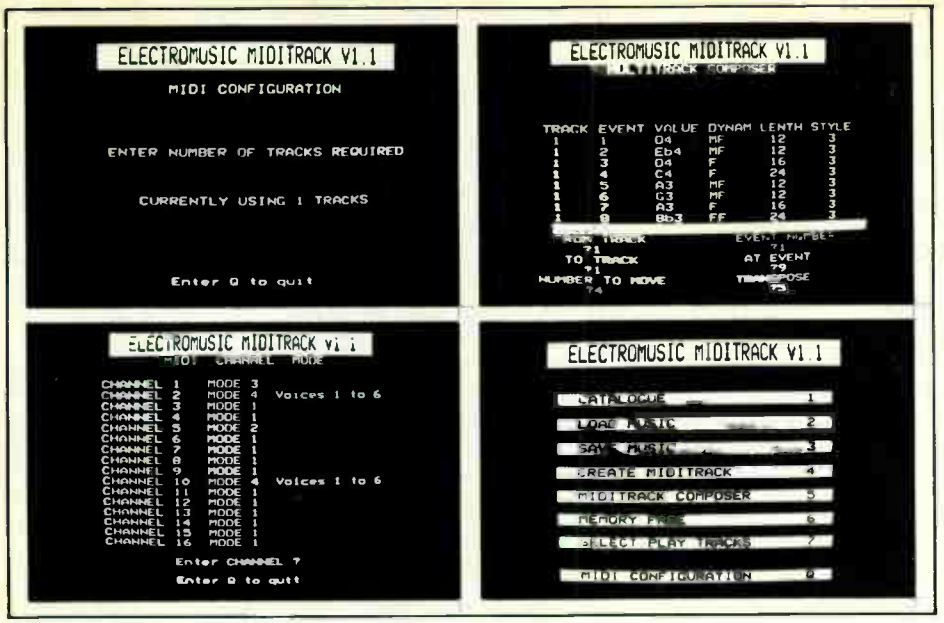
The problem is that MODE 7 graphics can't cope with more than about 20 rows of MIDItrack events, which means that you're forever scrolling notes in and out of vision. Of course, there's nothing to stop you using a higher-resolution graph mode in this sort of application, but this immediately swallows up a large proportion of the BBC Micro's meagre 32K memory. The solution is to add on something like the Aries-B20 RAM board (which allows the programmer to use all the graphics modes and still retain memory) and use MODE 3 graphics in combination with fashionable 'windowing' techniques to make more efficient use of the micro's display capabilities.

Conclusions

So, the bottom line is that EMR's step-time sequencer is really no worse nor better than any of the others around. Personally, I think that the distinction between real-time and step-time sequencing is utterly bogus, and that we should now be moving on to a form of note input that's simply designed for maximum speed and efficiency.

For instance, why not provide the user the option of using a MIDI keyboard to enter the pitches, thereby reducing the three keystrokes needed to specify the pitch, octave, and accidental down to just a single keypress? One thing is clear: the 'column and row' approach so beloved of EMR, Roland (the CMU800 software), JMS (the Spectrum and Commodore 64 software reviewed last month), and PPG (the Waveterm) makes life very difficult for the user once event streams are stretching into the thousands.

My other complaint on this basic 'user interface' front is the total lack of defaults for event entry. The only way this sort of program can really be made efficient is for the previous key entry for a particular column to be 'remembered', so that



MIDItrack software screen display examples.

keying RETURN (or whatever) for the next event automatically inputs that default value. For instance, applying that approach to the Lennon and McCartney example would have reduced the number of key entries required to input the 14 events from around 80 to half that number.

As things stand, EMR's software does automatically increment the event number but that's as far as it goes in the way of a helping hand. The infuriating thing is that the user even has to enter in separate values for dynamics. Why, oh why, doesn't the program ask whether or not you're using a velocity-sensing keyboard and apply a default accordingly?

What we really need to be able to do is enter the notes in a rough and ready fashion, getting the notes approximately oriented in time and space, see how the parts gel together both visually and aurally and then fine tune the parts, adding dynamics, modulation, gate duration (what EMR calls 'style'), and all the other command goodies that should make the MIDI more musical than regurgitative. To do all that, you need a damn good editor – a utility that'll let you get to where you want to make a change, edit, or whatever with the minimum of fuss and bother. The editing functions in EMR's MIDItrack program work fine, but they're fussy, slow, and rather unimaginative in execution.

In sum, I'd say that the MIDItrack program is OK as a starter, but it needs a good deal more work to turn it into a main coruse suitable for the more professional user. Looking at the home or educational end of the market, it's clear that there's vast scope for MIDI programs on the BBC Micro, but it's also likely that that market may not take too kindly to the high price of EMR's package when viewed alongside the excellent cost/performance ratio of so much BBC software. Still, at £159, MIDItrack isn't exactly a king's ransom for the average musician who expects to pay more for his musical tools. Indeed, the price falls bang in the middle between that for JMS' Spectrum package and the SCI Model 64 Sequencer.

So, provided that EMR improve the software and adopt a reasonable attitude towards software updates (ie. make them cheap), I'd give MIDItrack a cautious thumbs up.

David Ellis **CM**

Availability: from most synth retailers, or direct from EMR's distributors, Rose Morris, 32–34 Gordon House Road, London NW5. ☎ 01-267 5151.

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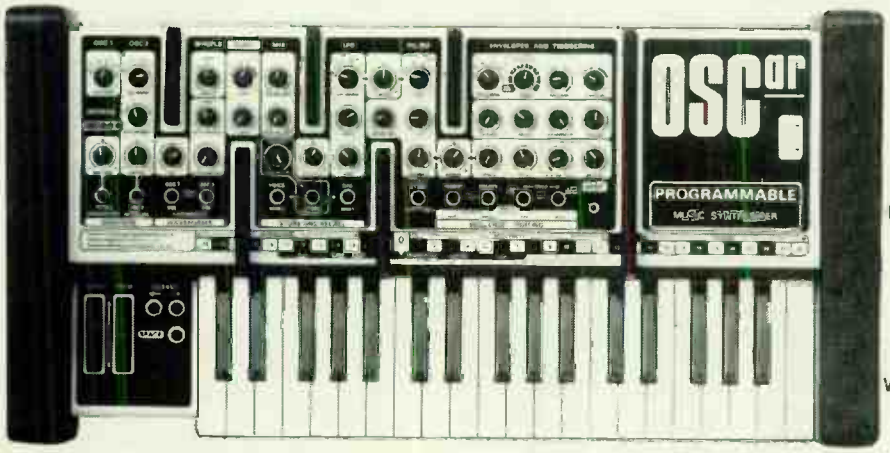

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DO-IT-YOURSELF

The Syndrom

Part 3 Fun and Frolics

With over 100 PCBs already sold, the Syndrom is proving to be one of our most popular constructional projects ever. This month, David Ellis **introduces some brief design modifications and a double triggering circuit.**

This month, we kick off with a few (very minor) component changes to improve a) the triggerability of the Syndrom at slower than usual clock rates, and b) the range of the clock rate pot. These modifications go as follows:

C1 – change from .01μF to .0047μF.

C2 – change from .02μF to .033μF.

R3 – change from 2K2 to 1K.

Note also that a couple of the components shown in the PCB overlay in Part 2 weren't quite where nature (ie. the author) intended them. C4 managed to be in two places at once, pushing C7 out of the picture. In fact, what's shown as C4 next to pin 9 of IC3 should actually be C7, and its value should be 0.1μF rather than 0.01μF. Next, there's R3 (next to IC1) under the mistaken impression that it's resistive value is 4K7. This gets changed as per the above.

On the triggering side, we've discovered that the Syndrom triggers very happily direct from a piezo transducer. These *objets de ceramique* normally get made to beep for the purpose of gratifying Spectrum owners, but used the other way, ie. striking them as if you were hitting a micro running a seemingly undebuggable program, they generate a voltage that can be used for a variety of (perhaps somewhat dubious) pleasures. Maplin Electronics are a convenient source for the piezo transducer (cat. no. QY13P, price 30p), and they also sell a rubber disc which sticks onto the transducer (cat. no. QY16S, 5p), which helps when it comes to attaching the transducer to something that's going to be hit.

You'll need to use a bit of care when soldering a screened lead to the transducer – screen to the brass edge, live to the centre – but you'll find that plugging the other end into the Syndrom *via* a jack plug gives you an effective physical means of triggering the board. After you've bashed around with it for a bit and driven cat and wife out of house and home, it's time to experiment with attaching it to the underside of a practice pad. Remember that you can also use it to augment the sound of a normal drum kit by means of some Gaffa tape and judicious positioning – we found the combination of a bass drum and David's burp to be particularly effective. (What's all this 'we' nonsense? – **Music Ed.**)

One further point on the triggering side: re-triggering whilst the trigger pulse stays high can occur if your particular drum machine or sequencer is too generous with its pulse lengths. Fiddling around with the values of C1 and C2 will help, but an alternative is simply to disable the re-triggering feature of the Syndrom by short-circuiting C2.

Pitch Variations

One good thing about the Syndrom is that it gives you a very wide range of pitches. Admittedly, as you turn the pot way down low, you'll hear the inevitable aliasings creeping into the background, but provided you use a bit of imagination and commonsense, a single sound can be used in all manner of worthy ways.

The trouble, of course, is that triggering only yanks out the sound at the current setting of R2. So if you were after high, medium, and low toms (say), you'd be obliged to use three boards with individual sound EPROMs on each. That's a bit on the tough side, money-wise, though you should remember that having the three boards in parallel does mean that all three toms can be played together. The alternative to multiplying the hardware bill is to pursue the time-sharing principle by adding some circuitry that permits multiple pitch triggering from a single EPROM. In fact, this is the solidly economic basis behind most of the digital drum machines on the market.

The circuit in Figure 1 provides the means of adding a double trigger to the basic board. Again, it's all down to using gates to let the right pulses through into the digital farmyard. The gating may look on the complicated side, but in fact there are just two flip-flops (IC10a/b and IC10c/d), a couple of NOR gates (IC11b/c) to lock out the opposite flip-flop, and a further gate (IC11d) to deliver the necessary 'clear' state to the three counters on the Syndrom board. Finally, the clock pulses are combined at IC11a, and the appropriate Q output of the counters is differentiated to reset the flip-flops. This time, the trigger inputs are differentiated before being applied to their respective sections of IC11, so that repeated cycling of the sound is avoided.

The only major hassle in implementing this circuit is that there's no PCB available, which means that it's very much a question of getting out the old veroboard. The new circuit then has to be latched into that of the Syndrom.

First, the original 555 (IC1) should be removed and the clock output (from IC11a) from the double trigger circuit taken to pin 3 of the empty IC1 socket. Next, the 'clear' output of the double trigger goes to the original trigger input of the Syndrom, and a connection should then be made between pin 1 of IC2a and the 'reset' input of the new circuit. Finally, don't forget that the double trigger will also need its share of the Syndrom's +5V supply and ground.

New Sounds for Old

Various sounds have been added to the Syndrom library, and the new goodies to delight (or assault, depending on your percussive tendencies) your lugholes include:

Snare (4K) – lots of snare, plenty of bounce.

Bass Guitar (4K) – the slapped bass to end all thumb twangers.

Hi-hat (open) (4K) – a good metallic sound.

Hi-hat (closed) (4K) – good in conjunction with its open counterpart.

Low tom (4K) – nothing wimpy about this.

Rimshot (4K) – for those after a slice of military action.

Tambourine (2K) – eat your heart out, Sally Army.

Cowbell (2K) – snow-capped mountains, Gruyere cheese. . .

So, adding these to the original 21 gives the following list:

2716: Kick drum, Snare, Hi-hat (closed), High tom, Low tom, High bongo, Low bongo, Cabasa, Guiro, Tambourine, Cowbell, Handclap, Explosive finger click, Dog bark, David's aaah, Door slam, David's burp.

2732: Hi-hat (closed), Hi-hat (open), Crash cymbal, Snare, Rimshot, Low tom, Bass guitar, Orchestral thump, Brassy, Squawk 1, Squawk 2.

As before, these sound EPROMs are available from Silicon Sound, 20 Bolton Street, Swanwick, Derbyshire DE55 1BU, and the prices remain at £6.75 for a 2K 2716 and £7.75 for a 4K 2732. Because of reader demand, Silicon Sound are now also offering a custom programming service, whereby EPROMs can be programmed with Syndrom users' own sounds. This costs an extra £5 on top of the price of the 2716 or 2732 EPROM. If you're interested in pursuing this, here are a few guidelines:

1 Record the sounds on a high quality

cassette so that the tape is well-saturated. A modicum of compression may not come amiss.

2 Record the sounds several times in succession and make sure the sounds are really clean.

3 Keep the sounds as short as possible. We can sample longer sounds at a slower sampling rate, but do remember that there'll be a fairly drastic trade-off in quality in this instance. For the record, we usually sample at around 20kHz, which gives a fairly good compromise between quality and sample length.

Help!

Getting hold of four of the components used by the Syndrom is proving a major headache for some readers. The objects of this frustration are the 74LS163s and the DAC0800. Like most TTL chips, the 74LS163 has zoomed up in price over the past few months, and most places are quoting £1.20 or more. So, if you read in the Maplin catalogue that they're just 49p, take that with a pinch of salt! In fact, Maplin's current prices for the 74LS163 and DAC0801 are £1.22 and £4.45 respectively.

However, E&MM is now able to offer – for a limited period, we suspect – a package of the four chips (three 74LS163s and one 0800) at a special price of £5.50 including VAT and p&p. Send your orders in to the editorial address (cheques/POs payable to Music Maker Publications Ltd) and allow the usual 28 days for delivery. But be quick!

One extra component that's worth investing in if you've plans to change EPROMs regularly is a Zero Insertion Force socket for IC6. The problem (as you'll soon discover) is that 24-pin ICs don't take kindly to being levered out of tight sockets with a great deal of monotonous regularity, and the easiest way around bent and broken legs (the IC's, not yours) is to invest £4.42 in something like Maplin's 24-pin ZIF socket (order no. YX50E). The best way of using this is just to plug it into the 24-pin DIL socket that's already on the board. That way, the ZIF socket will be raised above the various jumpers and so on that wend their way across the PCB. On the other hand, if you're contemplating turning the Syndrom into a rack-mounted unit with multiple boards and a decent power supply, it's worth thinking about mounting the ZIF socket on the front panel, taking a ribbon cable from this to a 24-pin DIL header that plugs into the EPROM socket. The beauty of this approach is that changing a sound on a particular channel becomes a one-second operation.

A considerable number of readers have contacted us about using the Syndrom EPROMs in other digital drum machines. And since the Linn and MXR replacement drum chips cost in excess of £30 each, that's hardly surprising. The problem is that their manufacturers code the sounds into the ROMs in some wonderfully devious way, which means that they're both mutually incompatible and Syndrom-incompatible. Shame. Still, we're looking into this, and we may have an answer for Linn and MXR users in the near future.

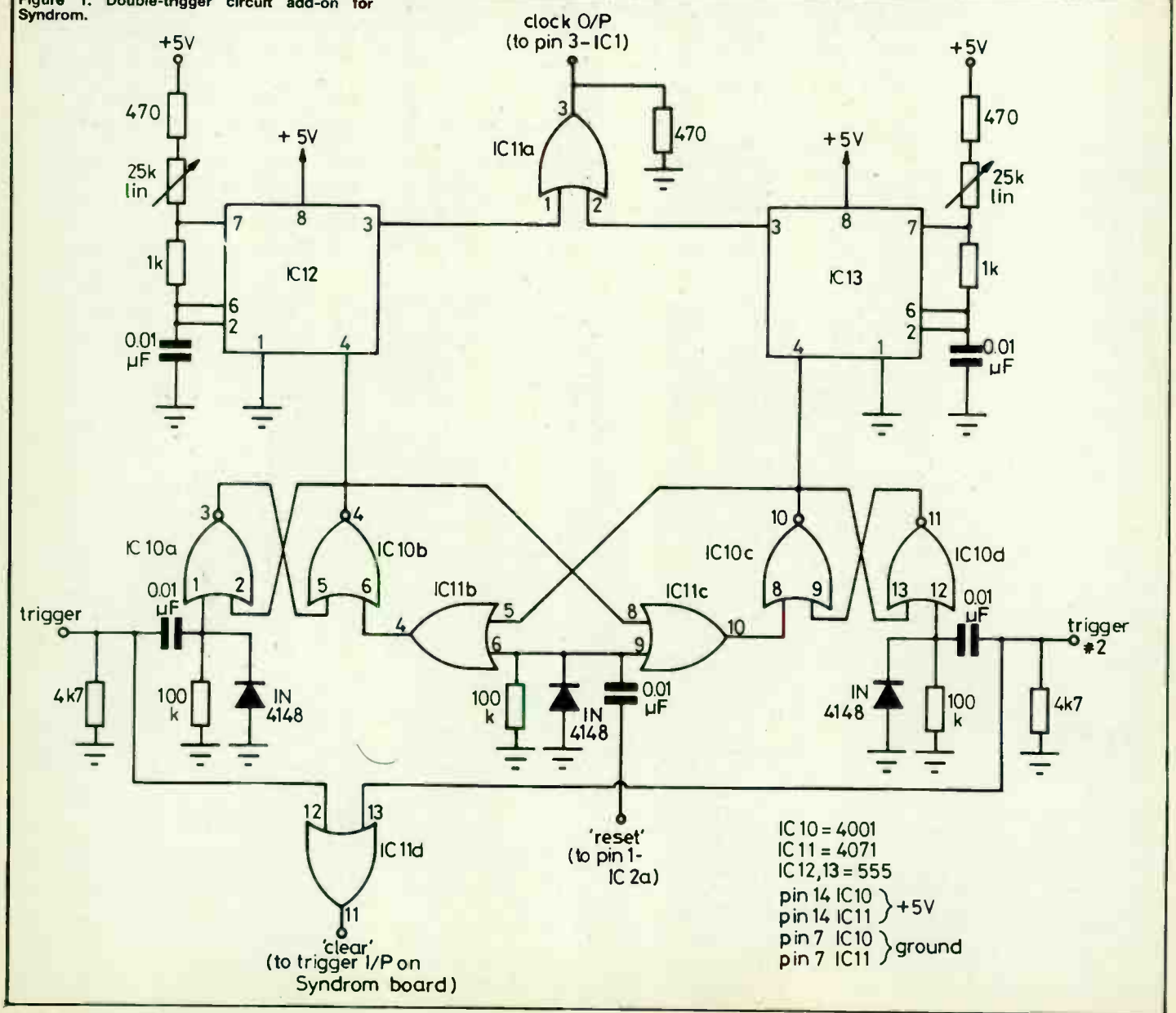
David Ellis **E&MM**

Syndrom Demo Cassette

A demo cassette containing examples of sounds being generated by the Syndrom is still available from E&MM at the new price of £1.50 including VAT and p&p. Orders should be sent to the editorial address (cheques/POs payable to Music Maker Publications Ltd) and you should allow 28 days for delivery.

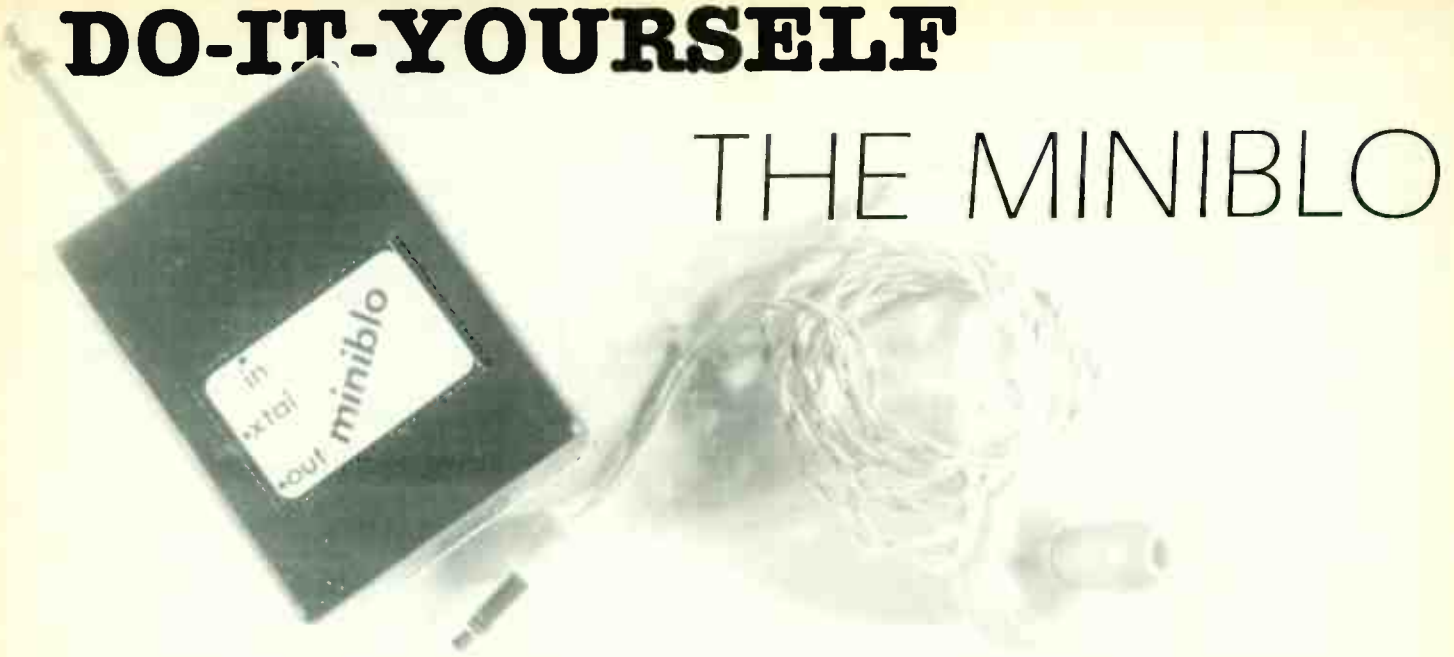
The Syndrom itself is, of course, still available in kit form or as a ready-built item, prices being £24.95 and £29.95 respectively. PCBs are also available from E&MM, price £4.95.

Figure 1. Double-trigger circuit add-on for Syndrom.



DO-IT-YOURSELF

THE MINIBLO



Designer Paul Williams **introduces a unique breath controller project that can be applied to either guitar or synthesiser, with a complete kit of parts available from E&MM.**

Performance controls have become very much a selling feature on modern synthesisers, allowing the musician to impress more of his/her personal 'feel' onto the music. Breath control is particularly attractive, since by using the tongue to articulate the flow of air, very fast and varied envelopes can be produced without losing the freedom of a hand.

Some synthesisers come ready-equipped with a breath controller, typically allowing amplitude and filter frequency to be controlled either by blowing into a tube which disappears into the back of the instrument, or by means of a special mouthpiece unit with onboard electronics, connected *via* a cable to the synthesiser. If you've had the pleasure of witnessing Dave Bristow demonstrate the Yamaha breath-controlled synths, then you'll appreciate just how exciting breath control can be.

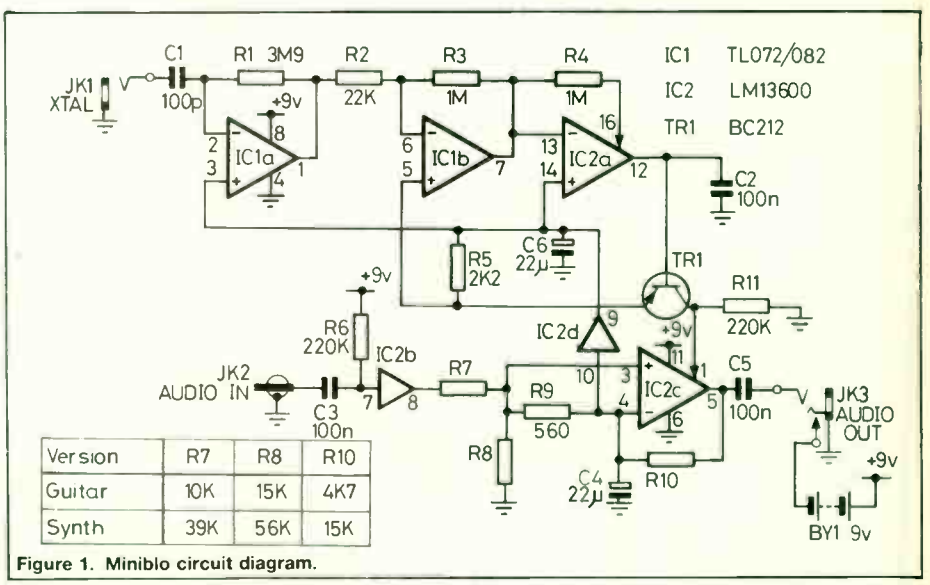
E&MM's Miniblo project gives you full high-spec breath control over amplitude on any electric or electronic instrument, be it synthesiser, guitar, organ or even mixer output. The battery and all the electronics are contained within the body of a 'chunky' jack plug, which is inserted directly into the instrument output socket. A modified crystal earpiece is used as the mouthpiece, and this controls the amplitude of the signal appearing at the output socket of the Miniblo. Special techniques are used to ensure that the speed of response is adequate while still keeping the breath noise breakthrough at a minimum. Everything except the battery is mounted on the (tiny) PCB, so construction really couldn't be simpler.

Circuit

The circuit diagram shown in Figure 1 reveals yet again the author's fetish for the LM13600 dual Operational Transconductance Amplifier (OTA). One half of this device, IC2c, is used as a current controlled amplifier to vary the gain of the unit, while the other half, IC2a, is used to produce the attack and decay slopes. To reduce the tendancy for noise from the crystal mouthpiece to break through by modulating the instrument signal, and yet still retain a good fast response, linear rather than the more usual exponential envelope slopes were chosen.

IC2a ramps the voltage on C2 up and down in sympathy with the amplitude of the mouthpiece signal on IC1 pin 1. IC1b compares this signal amplitude with the voltage developed across TR1's emitter resistor R5, and controls the direction of ramping so that balance is always achieved.

The crystal mouthpiece is a perfectly standard earpiece, apart from an exhaust port which the constructor must cut to allow the air to escape. When the mouthpiece is held between the lips and blown into, the air passes by the diaphragm on its way to the exhaust port, causing the air turbulence to vibrate the diaphragm and thus produce an AC voltage proportional to how hard the mouthpiece is blown. Since the output from the crystals is quite consistent, no sensitivity control has been provided. If the sensitivity doesn't seem to be right, then the value of R1 can be changed.



Version	R7	R8	R10
Guitar	10K	15K	4K7
Synth	39K	56K	15K

Figure 1. Miniblo circuit diagram.

The alert reader will have noticed that there are no diodes to rectify the crystal signal to DC. Rectification is in fact produced as a by-product of the asymmetrical ramping on C2 caused by R4. During an attack ramp when IC1 pin 7 is high, the current injected into IC2 pin 16 *via* R4 causes the transconductance of IC2a to be high, resulting in a fast negative ramp on C2. When IC1 pin 7 swings low, however, the reduced current *via* R4 produces a slower positive decay ramp in C2. TR1 drives a current proportional to the negative voltage on C2 into the current controlled amplifier IC2c. R11 bleeds off any leakage current, and also helps to prevent ambient noises from gating the unit.

The instrument input on JK2 is buffered by IC2b, which also provides a mid-rail reference voltage for IC2c on C4. R7 and R9 together attenuate the instrument signal to the appropriate level for IC2c. R10 sets the maximum gain of IC2c, and thus the output level. IC2d is used to produce another, isolated reference voltage on C6 for the control circuitry. To minimise both noise and distortion, R7, 8 and 10 are selected from one of two classifications – guitar or synthesiser/ line – so that performance is optimised for the signal levels being used.

Construction

Cramming all these gubbins into such a tiny box means that you'll have to follow these constructional notes carefully, just in case it won't all go in.

Armed with a fine-tipped soldering iron and fine solder (22 SWG or thereabouts), assembly of the PCB starts by inserting and soldering all the resistors, which are all mounted vertically except R6. The values of R7, R8 and

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Also, too, as well; everyone seems to be forgetting the Prophet 600 synth – to us the perfect match when married to a Yamaha DX9 – the Ballsy and the Clinical for under £2000? (who needs touch sensors anyway!).

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R10 can be chosen from the table depending on whether you wish to build the guitar or synthesiser optimised version. It may be helpful to form the component leads out at 45 degrees prior to soldering to secure them: trim the leads off nice and close to the joint.

Next, insert and solder the capacitors in a similar manner, checking the polarity of the electrolytic types. The transistor and integrated circuits come next, again checking orientation. There isn't sufficient room for IC sockets in this project, but with a little care, no problems should be encountered in soldering the chips directly onto the PCB. If some of the IC pins refuse to find their way into the PCB holes, then the blade of a small screwdriver should persuade them.

The 3·5mm jack socket should then be soldered in position, holding it firmly down onto the PCB whilst doing so. Attach the ¼" socket similarly. After trimming all the joints as close as possible, check the assembly thoroughly (particularly on the track side) using a magnifying glass or, preferably, an eyeglass: be on the lookout for solder splashes, bridged tracks and dry joints.

The case should be prepared as shown in Figure 3, by drilling the three holes and removing the ribs. Accuracy in marking out and drilling will pay dividends when it comes to the final assembly, due to the compactness of construction. Before installing the jack probe into the end of the case, trim the earth tag level with the end of the 'hot' tag, and solder a pair of 60mm-long insulated wires onto the two. The probe must be installed so that the tags lie one under the other when viewed from the open side of the case. Persuade the probe nut to come to rest in a position which presents one of the flats towards the PCB, and cover this flat with a few layers of sellotape, trimmed as necessary. These measures will prevent the nut from piercing the coating on R6, which could otherwise cause a short circuit and a flat battery. Yes, this is experience talking!

Trim the battery clip leads to 60mm length and solder the bared ends onto the track side of the PCB, as shown in Figure 2. The probe wires can then be inserted into the PCB from the component side and soldered in place: remember to ensure that the polarity is as shown in Figure 2.

Feed the PCB assembly into the case, manoeuvring it carefully to avoid the probe tags, so that the jack socket bushes locate into the appropriate case holes. Once secured, the jack socket nuts should hold the assembly tightly in place. Make sure that none of the resistors are touching the jack probe tags: ease any offending resistor over with the end of a screwdriver.

Once the unit has been tested thoroughly, a piece of thin insulating material must be affixed to the track side of the PCB using silicone rubber sealant or epoxy adhesive, to prevent the battery casing from shorting out any of the joints.

The crystal earpiece is modified by first separating the two halves of the moulding by working around the seam with a small blade such as a watchmaker's screwdriver. Be very careful that the foil diaphragm remains attached to the rear moulding. The exhaust port can then be cut into the rim of the front moulding (as shown in Figure 4) using a file. The port should be about 10mm wide and extend the full depth of the rim. The two halves can then be re-united, with the port adjacent to the cable entry point, using 'super glue' or epoxy adhesive to secure them.

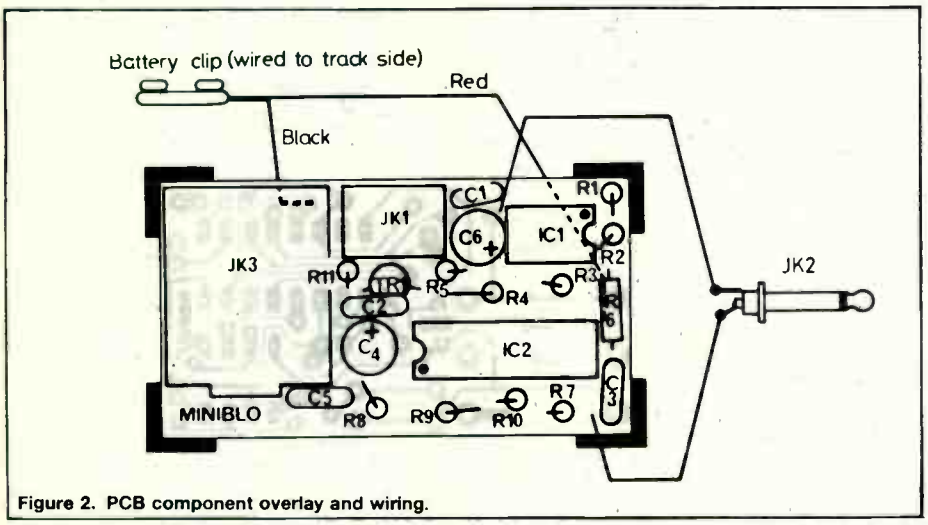
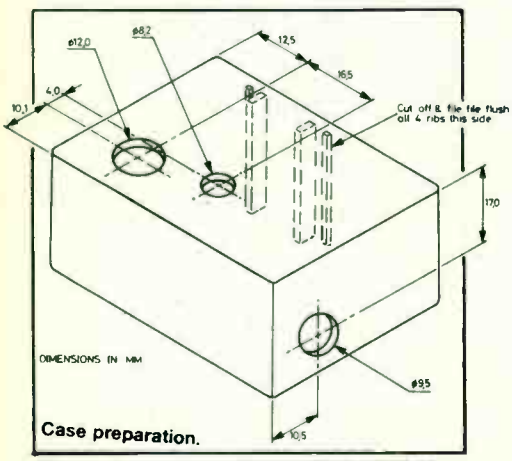


Figure 2. PCB component overlay and wiring.



Case preparation.

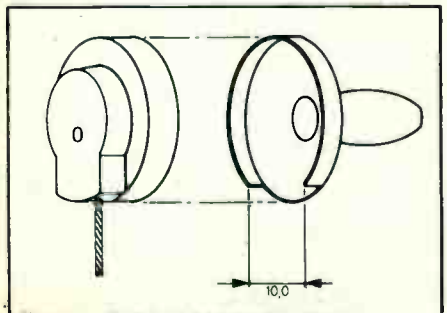


Figure 4. Earpiece and modifications.

Take a Breath . . .

Using your newly constructed Miniblo couldn't be simpler; after all, there are no controls to set up. Once you've popped in a fresh PP3 battery, screwed on the lid and plugged in the earpiece, the lead to your amplifier can be plugged into the Miniblo jack socket, which will switch the battery into circuit. The jack probe can then be plugged into your instrument output socket. If your instrument is cursed with a recessed or otherwise inaccessible output socket, then you can a) make up a short lead with a plug one end and an inline socket the other to make the link or b) replace the Miniblo probe with a cable-mounted plug.

Blowing into the mouthpiece whilst holding it either between the lips, or probably more comfortably between the teeth, you should find that the volume of your amplified instrument signal will be controlled by how hard you blow. Your newly acquired method of performance control will probably take a little time to get used to, but it'll be worth it. You should find that by using the brass player's technique of tonguing or 'spitting' air into the aperture of the mouthpiece, fast envelopes are quite easy to produce. Slow envelopes are achieved by using normal, untongued breath control.

Synthesiser envelope shapers are best bypassed so that the Miniblo has full control over the envelope, though to avoid pitch hiccups it's then a good idea to key each note a fraction before it is actually blown.

The meagre power requirements of your Miniblo should mean that the battery lasts for ages, but don't forget to unplug the output when the unit is not in use, or you'll drain the battery. You will find that as with any blown instrument, saliva tends to collect in the mouthpiece, but this should clear through the exhaust port, which has been positioned specifically with this in mind. After all, as Dave Bristow says, why shouldn't the synthesist expend some bodily fluids in putting expression into a performance?

Paul Williams **E&MM**

A complete kit of parts for the Miniblo is available direct from E&MM, price £16.95 including VAT and postage and packing. Send your cheque/PO, payable to Music Maker Publications Ltd., to Mail Order Department, E&MM, Alexander House, 1 Milton Road, Cambridge CB4 1UY. Please allow 28 days for delivery.

Miniblo Parts List

Resistors
All ⅓W 5% carbon

R1	3M9
R2	22K
R3, 4	1M (2 off)
R5	2K2
R6, 11	220K (2 off)
R7	10K/39K see text
R8	15K/56K see text
R9	560
R10	4K7/15K see text

Capacitors

C1	100pF ceramic
C2, 3, 5	100nF min. ceramic (3 off)
C4, 6	22uF 16V radial electrolytic (2 off)

Semiconductors

TR1	BC212
IC1	TL082/072
IC2	LM13600

Miscellaneous

X1	Crystal earpiece
JK1	3·5mm PC jack socket
JK2	¼" jack probe & nut
JK3	¼" PC jack socket with make contact
	PP3 battery clip
	Nylon case
	PCB
	Insulating strip
	Wire

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The SynthMix

Part 1 Preliminary Details

The SynthMix is a major new constructional project we'll be running over two issues. It's a six-channel stereo keyboard mixer featuring basic EQ facilities and three auxiliary sends per channel, and is therefore unique in offering a specification designed with modern keyboard players' needs in mind. Designer Paul White **takes us through the project's design philosophy and how it's been implemented.**

In a multikeyboard set-up, the musician often resorts to a PA-type mixer to fulfil his needs but it's rapidly becoming clear that this solution is less than ideal. Modern keyboard instruments generally require little in the way of EQ but, because of the number of effects units at the disposal of today's musician, more than one effects channel is often essential. A typical PA mixer does not meet these requirements, as it generally has a very comprehensive EQ system but only one effects channel.

The SynthMix, on the other hand, is designed with the keyboardist's specific requirements in mind, and so each input channel is fitted with three auxiliary sends. This enables three different effects units to be connected, their outputs being linked to the auxiliary master section, which permits control over effects return levels and pan positioning.

EQ was originally considered to be virtually unnecessary, but the single control incorporated into the final design gives a surprisingly wide range of control, and is therefore more than adequate for most normal requirements.

The prototype was built in a seven inch deep 19" rack-mounting case, all connections being brought out to the rear panel in order to keep the front clear, an arrangement that should be quite satisfactory in everyday use.

A stereo headphone output is incorporated for private practice or pre-gig tuning, and the choice of case means that the unit may be mounted in a standard rack along with the power amps or fitted into a simple wooden sleeve for protection.

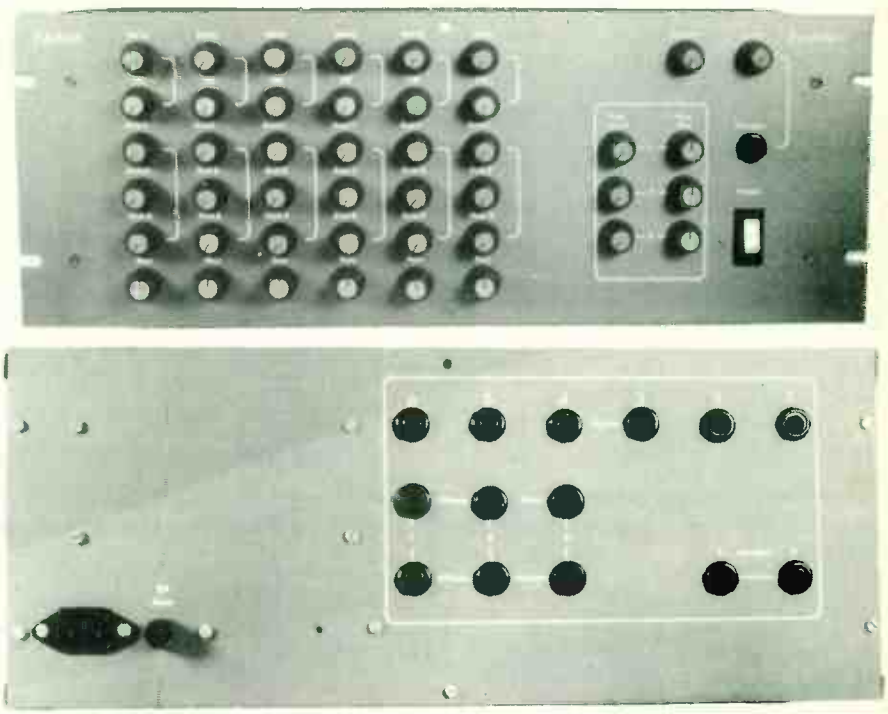
Design

The SynthMix circuitry is designed to be built on ten PCBs, consisting of six identical input channels, an auxiliary PCB, a master PCB, a headphone amp PCB and a power supply board. All these boards are easy to assemble and wiring is kept to a minimum in order to simplify construction. The power supply PCB is the same as that used for the RackPack project published in E&MM July, while the headphone amp PCB is the same as that used in the headphone amp project featured in the July issue of *Home Studio Recording*.

If the unit is built in the rack case as suggested, there's room to fit two E&MM 75W MOSFET power amplifier modules and a suitable power supply which are sold in kit form by Maplin, thus producing a self-contained 150W stereo system of exceptional quality and reliability.

Circuitry

The design makes extensive use of operational amplifier ICs, making construction simple whilst keeping the cost down. There is no need to describe the power supply PCB as this was fully covered in the July issue but, just in case you missed it, the layout will be printed in the concluding part of this project next month.



Channel PCB

The input is first amplified by IC1 which is configured as a non-inverting amplifier with a fixed gain of around five, this being independent of source impedance. IC2 forms the variable gain stage, and this is followed directly by the passive EQ control RV2, which provides treble boost with bass cut at one extreme, and top cut with bass boost at the other, this range being more than adequate for just about any foreseeable requirement.

The EQ stage is followed by another non-inverting gain stage (IC3), which presents a very high input to the EQ network, and the gain is set to about five in order to overcome losses in the passive EQ circuitry. After this

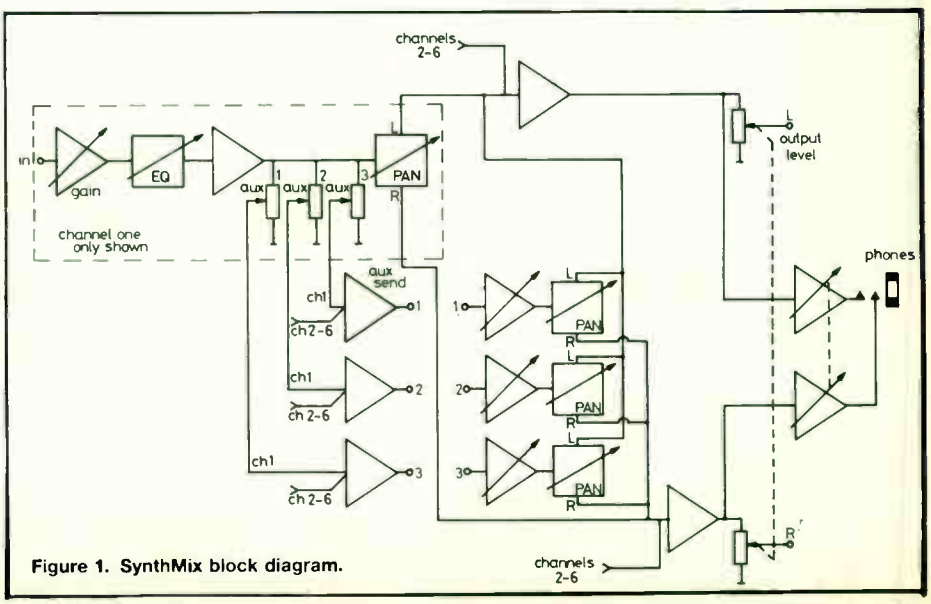


Figure 1. SynthMix block diagram.

amplifier come the auxiliary send controls RV3, 4 and 5, and the panning components, all outputs being fed to bus lines for connection to virtual earth mixing stages on the Auxiliary and Main PCBs.

Auxiliary PCB

This PCB contains three operational amplifiers (IC1, 2, and 3) configured as non-inverting, virtual earth mixers. Here the auxiliary sends from each channel are summed and fed to the three auxiliary send sockets on the rear panel *via* decoupling capacitors.

Also on the rear panel are the three auxiliary return sockets, which are buffered by the three inverting amplifiers (IC4, 5 and 6) before being connected to the auxiliary pan controls on the master PCB.

Master PCB

This is a straightforward, virtual earth summing arrangement, there being one amplifier for each of the left and right outputs.

All three auxiliary returns are brought in *via* pan circuits so that the effects signals may be positioned at any point in the mix, and the overall output level is controlled by a ganged log pot wired into the feedback loop of both op-amps.

Headphone Amp

Built on a separate PCB, this module may be omitted if not required. Designed around the popular LM380 amplifier IC, the headphone output is independent of the master gain control and is capable of supplying a very high sound level into headphones of any reasonable impedance.

The PCB is the same as that featured in the Home Studio Recording headphone amplifier project (July '84) in which several boards were mounted in a rack case for studio monitoring purposes.

Next month, we'll be printing the concluding part of this project which will describe the PCB layouts and give full constructional details.

Paul White **E&MM**

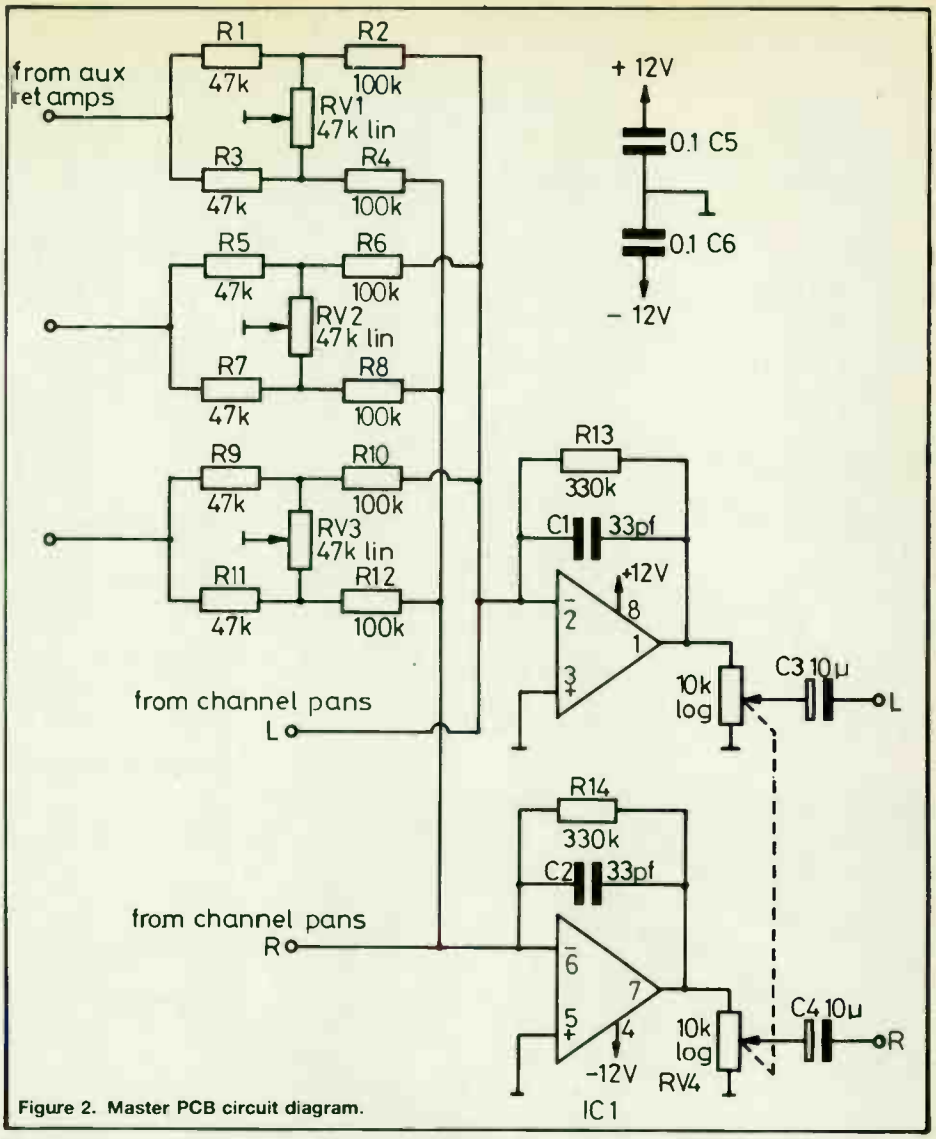


Figure 2. Master PCB circuit diagram.

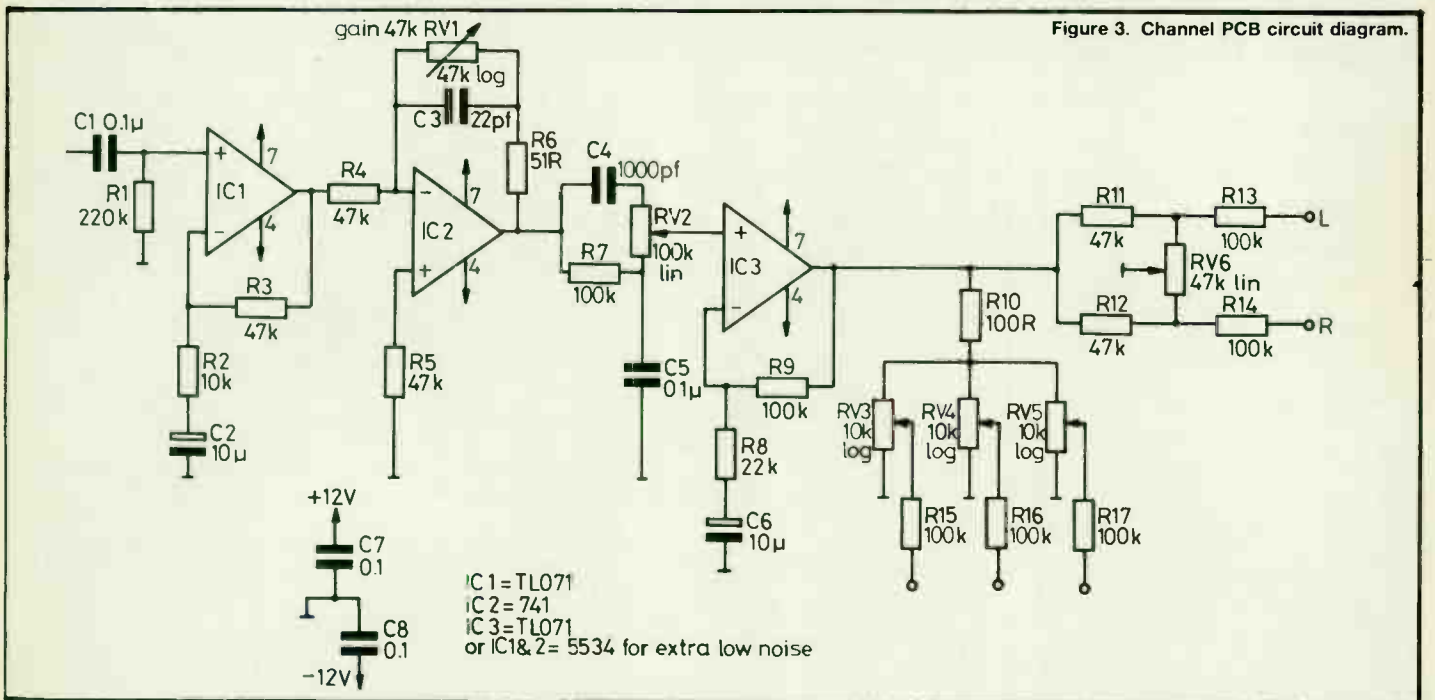
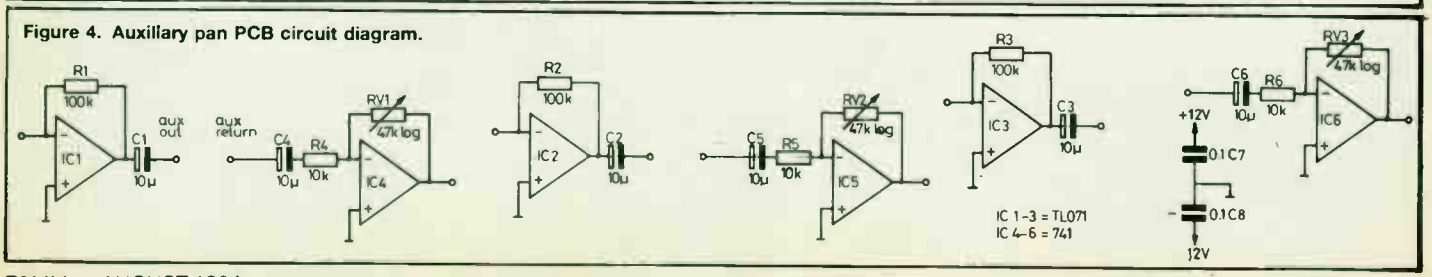


Figure 3. Channel PCB circuit diagram.



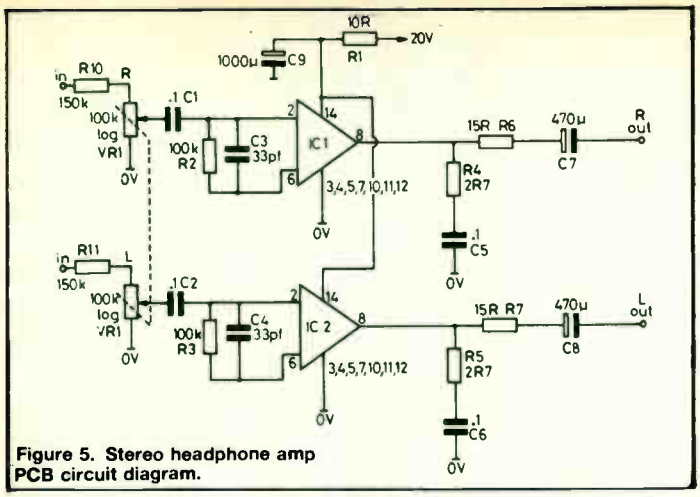


Figure 5. Stereo headphone amp PCB circuit diagram.

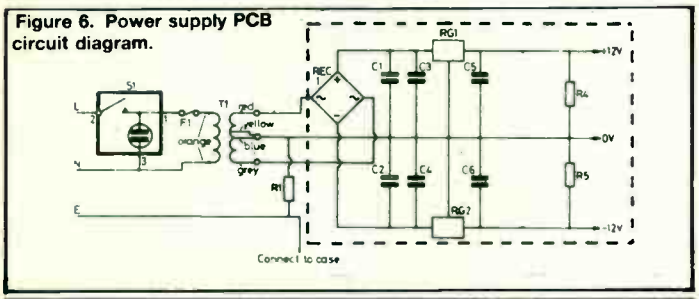
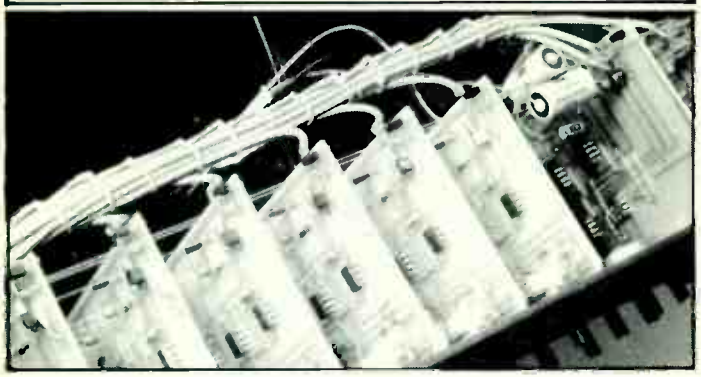


Figure 6. Power supply PCB circuit diagram.



Headphone Amp PCB

Resistors

R1	10R
R2, 3	100K
R4, 5	2R7
R6, 7	15R
R8	1K
R9	10R 3W wirewound
R10, 11	150K
VR1	100K log dual gang

Capacitors

C1, 2, 5,6	0·1µF
C3, 4	33pF
C7, 8	470µF 25V
C9	1000µF 25V
C10	4700µF 63V

Power Supply PCB

Resistors

R1, 2	4K7

Capacitors

C1–4	0·1µF
C5, 6	2200µF 63V

Semiconductors

IC1	7912
IC2	7812
REC1	2A bridge rectifier 100V

PCB

Auxiliary PCB

Resistors

R1, 2, 3	100K
R4, 5, 6	10K
VR1, 2, 3	47K log

Capacitors

C1–6	10µF 35V
C7, 8	0·1µF

Semiconductors

IC1, 2, 3	47K log
IC4, 5, 6	741

PCB

Master PCB

Resistors

R1, 3, 5, 7, 9, 11	47K
R2, 4, 6, 8, 10, 12	100K
R13, 14	330K

Capacitors

C1, 2	33pF
C3, 4	10µF 35V
C5, 6	0·1µF

Semiconductor

IC1	5532

PCB

Miscellaneous Parts

7" deep rack-mounting case
12-0-12 0·5A transformer
Fuseholder and fuse
IEC mains socket
Illuminated rocker switch
Mono jack sockets (14 off)
Control knobs (44 off)
Miscellaneous nuts and bolts

Readers will be pleased to know that the SynthMix is to be made available as a complete kit of parts from Powertran Cybernetics Ltd., Portway Industrial Estate, Andover, Hants SP10 3EM. Price should be under the £200 mark, so watch this space for details!

SynthMix Parts List

Channel PCB (six required)

Resistors

(all ½W metal film)

R1	220K
R2	10K
R3, 11, 12	47K
R4, 5	4K7
R6	51R
R7, 9, 13, 14, 15, 16, 17	100K
R8	22K
R10	100R
VR1	47K log
VR2	100K log
VR3, 4, 5	10K log
VR6	47K lin

Capacitors

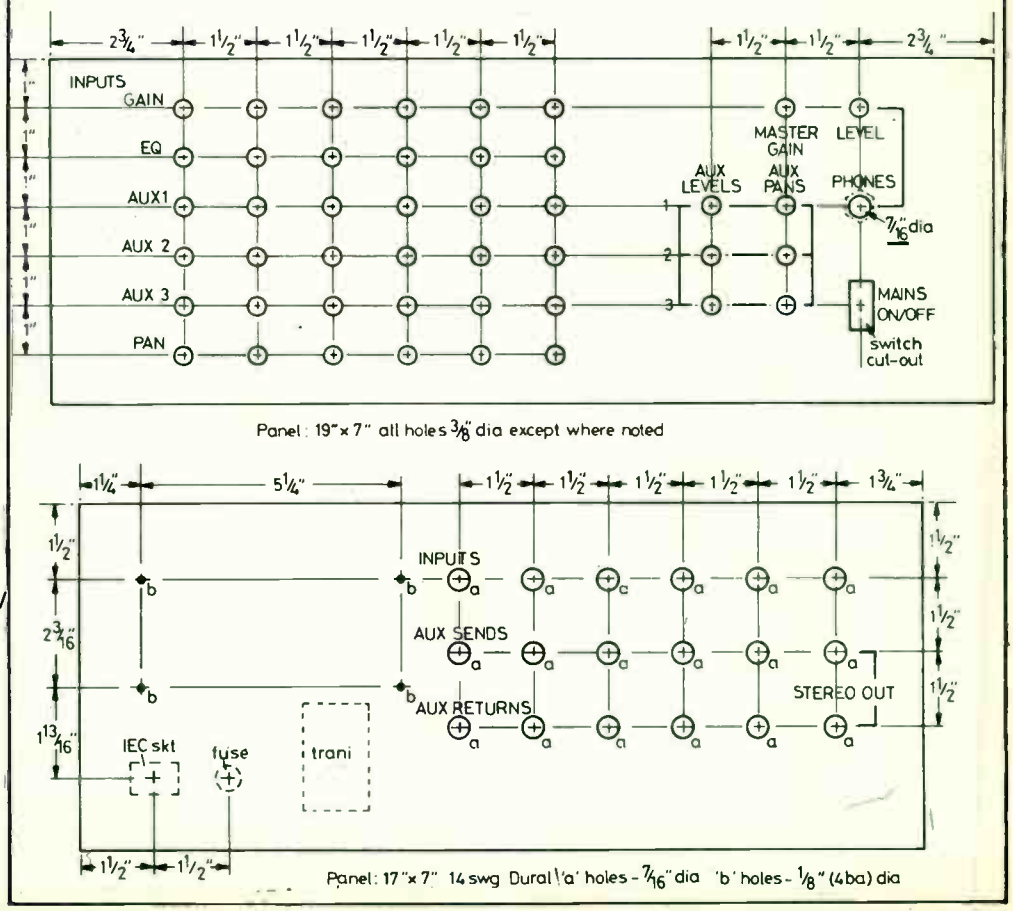
C1, 5, 7, 8	0·1µF
C2, 6	10µF 35V
C3	22pF
C4	1000pF

Semiconductors

IC1	TL071 (or 5534 for extra low noise)
IC2	741 (or 5534 for extra low noise)
IC3	TL071

PCB
Mono jack socket

Figure 7. Front and rear panel dimensions.



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