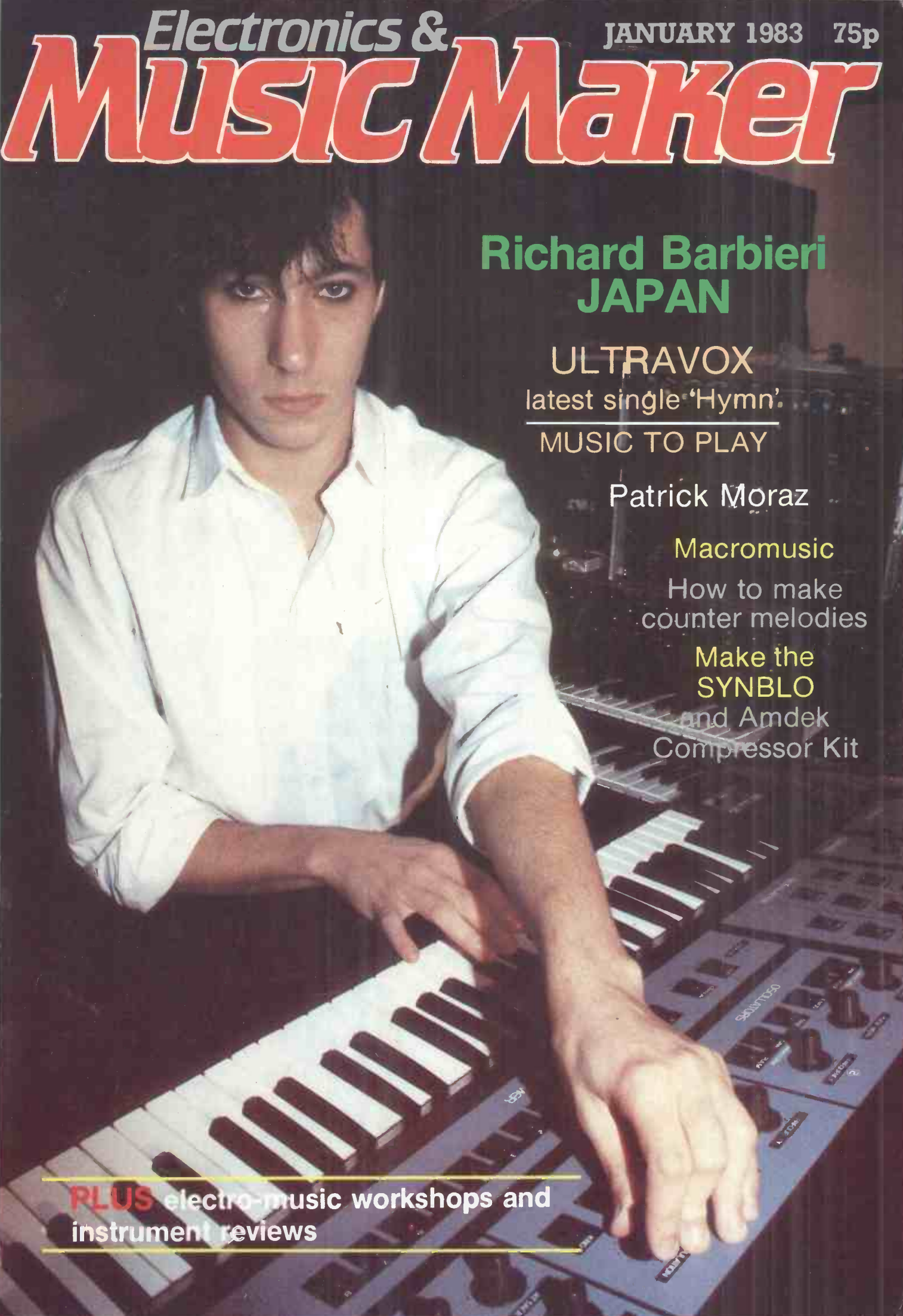
Electronics &
Music Maker
JANUARY 1983 75p



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MUSIC TO PLAY

Patrick Moraz

Macromusic

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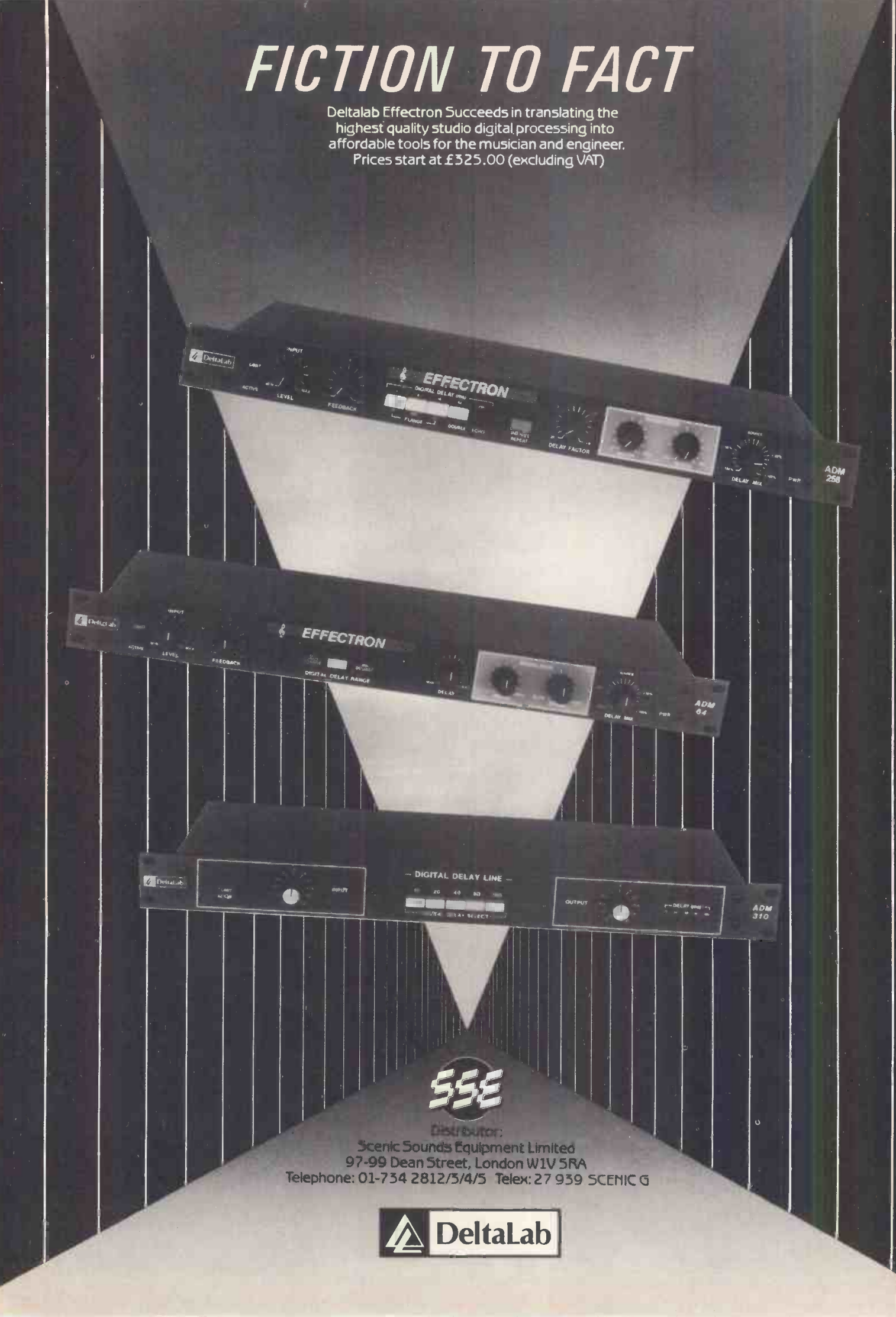

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Electronics & Music Maker

January 1983 Volume 2 Number 11

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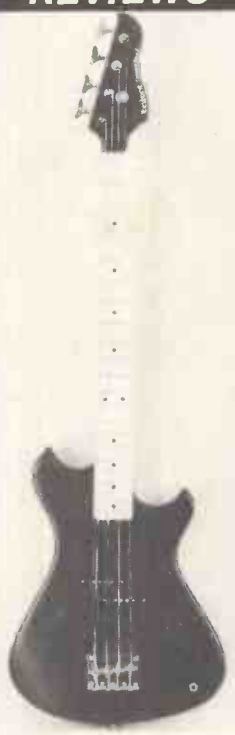

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Publishers Glidecastle Publishing Ltd., 282, London Road, Westcliff-on-Sea, Essex SS0 7JG.
Distributors Spotlight International, Spotlight House, near 1 Benwell Road, London N7 7AX. Tel: 01-607 6411.
Printers Thomas Reed Printers Limited (Sunderland and London).

Typesetters Quillset (Southend)
Subscriptions Rates for 12 issues: UK £12.00: Europe & Overseas (Surface) £12.90; Airmail (including Europe) £27.20.
Binders £3.95 inc. p&p Overseas add 11p extra covered by bankers draft in pounds sterling.

Editorial

The staff and publishers of E&MM wish all their readers a prosperous New Year filled with music making.

1983 promises to be a year that puts micro-based music as an important growth area for the music industry. The continuous outpouring of keyboard instruments from a wide spectrum of manufacturers, including major hi-fi companies as well as micro VDU software using keyboard displays, will prompt different types of instruments to appear so that the techniques of wind, string, percussion players and vocalists can be utilised. Low cost sound sampling will be the next big step forward — not to put any musician out of work, but to enable the use of any sound as a compositional tool.

Always the trend in cost is downwards so that the general consumer market can join in selling music making for all. The commercial pop world reflects the successful use of inexpensive portable instruments to make chart hits. Nevertheless, the general eagerness of musicians (and dealers in instruments) to keep up-to-date has meant that acquiring knowledge and learning skills of the practical and technical side of instruments is of increasing importance. This is overwhelmingly confirmed by the strong growth of our readership, not just in the UK, but in major countries, notably USA, Australia and W. Germany.

Looking back on our projects, there is no doubt that many of E&MM's designs put ideas for creative music making into practice — such as the Syntom, Synwave, Synclock, Hexadrum, Wordmaker, Electric Drummer, Panolo, Transpozer and Micromusic series. We continue to bring low cost designs with this month's exciting Synblo breath controller for any electronic instrument, and we'll be expanding our contents to include our music workshops and features more regularly.

NEXT MONTH you'll find an 'exclusive' interview with Tomita from Japan, an in-depth review of the Synclavier, discussions with the PPG designers, and projects that include Synbal, Caltune and Amdek's stereo 6-channel mixer.

STOP PRESS!

A complete kit for E&MM's ElectroMix 842 Mixer featured in Oct/Nov '82 issues is now available direct from Digisound Ltd., 14/16 Queen Street, Blackpool, Lancs FY1 1PQ. This includes all the parts, excluding the front panel and PCB's, required to complete the project. The price of the kit is £115 including VAT & P&P.

News & Events

Custom Sound and Trucker Amplification are back after a long absence. All products are available from stock at the same prices which applied when the company ceased trading some 18 months ago; the new backers are Audio Fidelity and further details are available from Barry Phillips on Leeds 0532 561949 . . . plans for the **Frankfurt Music Fair** continue apace and the associated yearly Music Prize is to be awarded on the eve of the event, 4th February, to well-known classical organist, harpsichordist and music teacher Prof. Edgar Krapp of Frankfurt Academy . . . **Polaroid's** Polaproof labelling system is beginning to catch out videotape priates who cannot reproduce the complex optical properties of the unusual thin polyester film involved . . . **RCA** have announced that their first releases on the digital Compact Disc system will be a selection of the highest quality digital recordings from their extensive classical music catalogue . . . **Computerland** stores intend to follow up their recent opening in Southampton with 25 franchises in the UK by the end of 1984. With 300 franchises in 21 countries they already claim to be the world's largest independent network of computer stores . . . The **British Music Fair** will again be a trade only affair from July 31st to August 3rd 1983. Plans are under way to make the 1984 show part of a completely new leisure exhibition capable of attracting very large numbers of visitors and extensive media coverage . . . **MASH** is the Musician's Association of Surrey and Hampshire and publishes a regular paper including local gig lists, meetings, articles, events and reviews. Contact 49 York Road, Aldershot, Hants . . . **Philips** are hoping to use the suspension of the VHD video disc system to establish their LaserVision system as a world standard, with high hopes for increased sales over the Christmas and New Year period . . . London based **Fidelity Radio** has received a £1 million order from British Telecom for the design, development and supply of a cordless telephone system using Home Office approved radio frequencies. Further information from MBP, 25 Heddon St., London. Tel. 01-437 4115

CORRIGENDA

Oct '82 ElectroMix 842: Page 76, Figure 2. The value of C11 should be 100uF.
Nov '82 ElectoMix 842: Page 69, Figure 2. Capacitors C3 and C8 are shown the wrong way round, refer to circuit diagram in Oct '82 Page 76, Figure 3.
Dec '82 Christmas Bazaar: Page 16. The E&MM Guitar Buddy, priced at £19.75, is a kit as featured in the Aug '82 edition.

Amdek Percussion Synth Page 71, Figure 2. The BC107 Transistor should have collector and base leads interchanged, i.e. collector should be left unconnected and base connected to earth.

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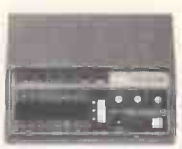

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PATRICK MORAZ

This month, in the third and final part of our series on our keyboard consultant Patrick Moraz, we look at Patrick's stage equipment with The Moody Blues through the eyes of his road manager Pat Buckley, and at his approach to live improvisation and musical philosophy in his own words.

A typical Moody Blues concert will use three sound desks, for PA, foldback monitors, and keyboards. Pat Buckley usually balances the keyboard sound on headphones, dealing with around twelve keyboards which use five channels on the main PA mixer. The keyboards are almost entirely in mono, with each one needing slight volume adjustments at different points in the set.

Since Patrick has too many keyboards to allow him to do his own mixing, and the Yamaha CS80 in particular needs close attention due to the wide variation in volume of its different programmes, Pat Buckley needs to stay on his toes. Sometimes, however, everything takes care of itself; "some gigs I'd virtually touch nothing all night, maybe making a couple of adjustments".

The situation depends largely on the position of the 40,000 watts of PA speakers supplied by Claire Brothers of Pennsylvania. Many of these are 'flown' above the stage and can tend to drown out Patrick's 1,000 watts of monitors. The monitor amps are two Crown PS2's, the bottom one in mono for two bass drivers and the top one split between two mids and two trebles, with a passive crossover to a pair of tweeters and the whole assembly mounted in two large cabinets.

The keyboards and monitors take about three hours to set up with the help of a wiring harness divided into four or five sections. The keyboards are always set up in a circle, although their numbers are being reduced of late; during a recent Moody Blues tour three keyboards, including the Polymoog and a Minimoog, were replaced by a Jupiter 8.

In addition, there's a dual manual Mellotron needed for the older Moodies numbers, a Yamaha CS80, a special dual manual Oberheim 8-voice for strings on numbers such as 'Nights in White Satin', a Novatron loaded with special effects tapes, a Roland Vocoder Plus, and a Roland Jupiter 4.

Additional effects are provided by a Roland CSQ 600 sequencer linked to a CR78 rhythm unit and Roland SH2 synthesiser, a set of Moog Taurus bass pedals, and a Clavitar with an Oberheim 4-voice module. The guitar-like Clavitar allows Patrick to move about on stage, and he now has two, the older duophonic version and the newer monophonic which is simpler to set up and use on stage.

Discography

Solo	
Future Memories I	Carrere
Out in the Sun	Charisma
Patrick Moraz (Primitivisation)	Charisma
The Story of i	Charisma
Yes	
Relayer	Atlantic
Yesshows	Atlantic
Moody Blues	
Long Distance Voyager	Polygram
Others	
Coexistence (with Syrinx)	Carrere
Lifetimes (with Diana Hubbard)	Deleted
Refugee (with Refugee)	Deleted

All the keyboards are DI'd through special Claire Brothers 48V phantom powered DI/splitter boxes and fed to the PA mixer and/or Pat Buckley's keyboard mixer. On stage the keyboards are only lightly treated with echo, usually an AKG Echo Tower or a Master Room echo plate on the mixer.

Gene Claire, who has engineered for the Moodies since 1968, takes charge of the PA sound, which although it isn't necessarily very complex has to reflect the symphonic style of the band.

Justin Hayward on guitars uses three SE30 amps, John Lodge uses two Hiwatt amps for his bass and a Roland Combo for his amplified acoustic guitar, and the band is completed by Graeme Edge on drums and Ray Thomas on flutes. Patrick doesn't need any kind of synchronising pulse from the other members of the band for his keyboards, although he does sometimes fill in for the bass guitar using foot pedals.

Usually this is during the more subdued tracks in the set, which give him his only chance to sit down! The set typically opens with a sequencer effect on the Jupiter 4 faded in on the keyboard mixer as the band take to the stage, with Patrick's CS80 mounted on a rolling riser at the front of the keyboard stacks to give him access. The Oberheim 8-voice is mounted on top of the left-hand stack to give access to the tuning controls of its sixteen oscillators. Normally the channel for the Roland Vocoder Plus, CR78, Jupiter 4 and SH2 is left open on the main desk and for tracks such as 'Gemini Dream' from 'Long Distance Voyager' Pat Buckley is responsible for bringing up the volume of these instruments on his mixer at the appropriate times.

The Moodies

Patrick explains that he doesn't take many solos during a typical Moody Blues set because his job is more to fit in with the

production of an overall symphonic sound. "The Moodies music is simple enough, but some of it is very symphonic. I write most of my parts down, or the producer does it, but usually only after it's all on tape because during rehearsals I can memorize the keyboards parts. I discuss lines with the producer and come into the studio with various improvisations or various options, like a kaleidoscope of tone colours and echoes — although it's important not to let echoes take the place of inspiration."

"I'm writing music down more now, but don't have to, because I'm used to picking it up by ear. I did an interview in America and the guy took fifteen days to transcribe a piece of my music, so there's no point for me, when I can remember it. I don't think it's vital to be able to read or write any music."

"The next Moody Blues album should be out by March. 'Long Distance Voyager' was a magical album for me, but I think this one will be even better; I'm more used to working with the band now, and it's a winning team in the musical sense, and at least in the USA in the commercial sense as well."

"The institutional policy is that anyone can write songs, although John Lodge and Justin Hayward tend to produce most. For instance, I've got fifty songs I could offer now, but that doesn't mean one of them has to go on the album. We come along with chords, a melody line and words, which we then all help to orchestrate. In the studio I'm using the Yamaha GS1 with doubled, tripled or quadrupled programmes to get the sort of rich orchestral sounds the Moodies need."

"Some strategic points in the set need a string or a choir sound, but I'm trying to move away from those; I'm like a mirror, if I hear a sound I will reflect it and respond by putting my own contribution to it. I also did thirty-five film scores, including the Cannes Film Festival prizewinner 'The Invitation', and found I got a feeling from an image or from the words which told me what should go with them."

Future Memories I and II

"My improvisations often work in the same way. The trigger is often a picture, a thought or a fantasy, such as a rose unfolding and growing, which would give something very simple but orchestral (illustrated on Demo Cassette 9 using Yamaha GS1, CS70M and other synthesisers); or a lizard, an iguana, which would give something more percussive and menacing, with fast swirling 'cello sounds to represent the heat of the desert and mirages" (illustrated on the cassette using GS1, sequencer and keyboards).

"On Future Memories, my set of live improvisations for Swiss TV, I didn't see the video, which was superimposed on blue-painted parts of the scenery by Chroma-key. So I partly took ideas from the clothes I was wearing for each section, mediaeval, or futuristic, and so on. We had six TV cameras in my studio, which has one enormous room and one small one for mixdown and overdubs, and we had all the TV trucks outside in the street, sometimes from nine o' clock in the morning."

"All the tracks on the first Future Memories LP (still available as part of E&MM's November 82 special offer) were totally improvised, although some of the others were based on backing tracks already on the 24 track tape which were synchronised to the video pictures."

"I use a lot more keyboards in the studio than on tour with the Moodies, and sometimes two drum machines running simultaneously, an ARP sequencer linked to a set of Simmons drum pads, and most importantly the Yamaha GS1. We told Yamaha about the Future Memories idea and they immediately said we could have one on loan,

and asked where we wanted it!"

"We shot Future Memories in four days, and now we're hoping to have it shown on Channel Four — Yamaha are interested too. Each improvisation is based around a certain riff or melody, some of it is in a jazz or boogie style, but I don't want to be classified as a jazz musician. I love jazz, but I play in a classical style as well, I improvise, I play with the Moodies and so on."

Songs and Influences

"Also in the last year I've written fifty pieces of music including a piano concerto and a ballet. The School of Ballet in Senegal are going to produce my third album, Primitivisation, and I've started to write more songs and sing myself now."

"People don't know that I sing, but I always did harmony vocals on my solo albums, sometimes using the Vocoder after Herbie Hancock first showed me how to use it. I have a special way of writing lyrics in English even though it isn't my first language; I use a glossary of words for each song just as I'd use a selection of sounds for an instrumental, so for instance a song like 'How Basic Can You Get?' will use all the terminology of computers."

"In that song (also part of November's special offer) I talk about the 'Basic' computer language, and my 'Pet' computer and so on. Some of the vocals are done with a Vocoder, although the overall sound isn't intended to be mechanical."

"I also write songs in French and other languages; I've always been interested in a trans-cultural approach, using Brazilian drummers or Rumanian panpipes (as on Coexistence, the remaining LP in the special offer pack). It's only now that the UK record industry is becoming transcultural, but I've always has this approach because of my travels. I've been to Africa about fifty times, I lived in Brazil for five years, and I've played jazz festivals from Sao Paulo to Montreux. I love travelling, and I play with the local musicians whenever I can, or just listen to them. I don't notate their music, I just get the feel of it."

"I play percussion, vibes, saxophone, trumpet, trombone and alpenhorn as well as keyboards, and sometimes I end up playing all the Latin American percussion on a track as I did on some parts of Coexistence. Some of the time signatures and rhythms I use are quite involved, giving a jazzy fell or sometimes an Eastern feel, and I've been influenced by Japanese and Chinese music."

"In school and when I studied under classical musicians like Clara Haskil I had to learn to write music and study in a formal way, but I soon realised the academic approach would put me in a kind of bondage which would inhibit me from crossing musical boundaries. If you want to write music down you can even do it with a machine like the new Yamaha now, but there's still no substitute for listening to and playing as much music as you can from as many different cultures as possible."

"You should learn first to copy any kind of music you like, from the Beatles to Miles Davis, Chick Corea, Led Zeppelin, The Police or the Human League. Learn all the parameters, the sounds, the production methods; it's not like twenty years ago when you just had a Hammond organ and a piano, now you have to understand each different sound of a synthesiser, each different waveshape and so on. Machines can be programmed to make playing more instant, but you still need to know the chords in the first place!"

Instruments and Music

"I love the Yamaha GS1, which is all digital, but I don't have the Fairlight or Synclavier yet. I've seen them both, but at the moment I'm happy with the Novatron with one of my own effects tapes on each key; it's practical, cheap, and an integral part of my improvisations."

"Obviously we're entering a time of new technology, a new era for music, but I think even with machines to help you it's important to have a musical mind. I'm very lucky in this way; I have a sort of photographic memory for music which lets me reproduce my improvisations at once as soon as I've played them, or I could do an instant transcription."

"I don't think about particular keys when I'm improvising, about major or minor, because you could have a very menacing feeling played in a minor key or a major key; it's not important whether I play a cluster or an augmented seventeenth or whatever, it's the shape or the intensity of the sound, or even the spacing of a single note, which produces the feeling."

"I've had to put back a new studio album because of commitments with the Moody Blues, but I've got Future Memories II to put out, and then I'll just keep on working and composing. However much I use a particular style, like rock or jazz or reggae, or a particular keyboard like the Jupiter 8 or the GS1 or the Clavitar, I won't become cliched, I won't stick to a particular style or keyboard or formula. For me, it's important always to be creative; my music is an escape, it helps to keep me in balance." **E&MM**

Future Memories 1, Coexistence and the single 'How Basic Can You Get' are still available at the special offer price of £6.99 (inc. p&p, add 90p overseas).

Micromusic

Analogue to Spectrum to Analogue

The prototype casing and controls.

In the November Micromusic article we described a circuit which allowed the Spectrum computer to control a 1V/octave synthesiser. However, after a few hours of laborious note programming into the sequencer program, it was obvious that some other method of note entry was required — enter the A/D.

Adding the circuitry shown in Figure 1 to the previous controller (November '82, page 16, Figure 1) allows the Spectrum sequencer to store notes entered directly from an analogue keyboard, again with a 1V/Octave span.

Circuitry

The main component in the additional circuitry is obviously the Analogue to Digital Converter (ADC0804). This device is shown connected in its 'free-running' mode, ie it is converting continuously. The IC has an internal clock circuit based around a Schmitt trigger requiring only an external capacitor and resistor (across pins 4 and 19) to operate. The free running mode requires a 'kick-start' to begin converting, this is provided by the transistor connected to pins 3 and 5, $\overline{WR}$ and $\overline{INT}$ respectively. When the circuit is first powered up a short pulse is generated by the capacitor/resistor network across the logic supply rails. This pulse turns on the transistor pulling $\overline{WR}$ low and starting conversion.

The 'power-on reset' pulse is also used to reset the INS 8255 (pin 35), this sets up all the ports as inputs — a necessary step since the tri-state option of the A/D is not used.

To allow a 1V/Octave system to be used the scale of the A/D must be set to 5.33V. (Each semi-tone raises the voltage by 1/12th of a volt and since the system can accommodate 64 semi-tones — 64 × 1/12 = 5.33V).

To allow for differing keyboard offsets a preset voltage is applied to pin 7 input. This is subtracted from the CV input (pin 6). Therefore if the lowest key on the keyboard gives an output of 1V and the highest 4V, the preset should be set to 1V to trim out the offset. The CV input now appears to be 0-3V which would allow notes from 1C to 3C to be displayed from the program.

The other input is the gate signal which requires an input of 6-15V. This signal tells the computer to load the analogue data and move to the next step.

Programme

The small section of programme shown in Figure 2 is a direct replacement for the 'write' routine in the previous sequencer programme (November 82, page 72, Figure 2 lines 1000 to 1670).

The first new lines (1080-1100) interrogate port C. If bit 0 is set, ie a key has been pressed (gate high) then the programme jumps out of the loop and onto line 1110. If bit 1 is set then a 'rest' is required. This high level is provided by the switch used 'reset' in the play mode. A dummy 'rest' note is set and the programme jumps to 1120. If bit 2 is set then 'break' is required. This high level is

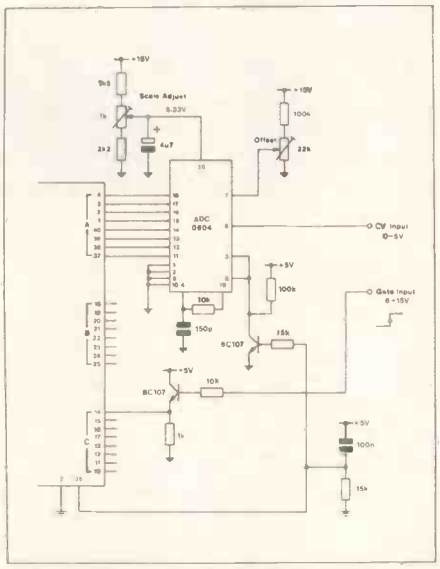

Figure 1. Additions to the Synth Controller.

provided by the switch used as 'break' in the play mode. If none of the above then the programme loops back to line 1080. The data from the A/D is read in with line 1110 and converted to one of 64 steps. If this input is greater than 47, ie more than 4 octaves, then the program returns for another input, otherwise the input is stored in the memory location pointed to by s+a (base address plus displacement). The list subroutine is then called to display the entry. If all inputs are 0, ie all keys and switches released, the programme returns for another note — this prevents multiple entries when a key or switch is held down.

Calibration

The calibration procedure is as follows: Measure the output voltage from the keyboard when the lowest C is pressed — this voltage should be noted and set on the 'offset' preset, then set the 'scale adjust' to give 5.33V at pin 20. To check calibration type in the following line.

```
10 PRINT INT (IN 159/4); " "; AT 0,0:GO TO 10
```

This gives an output of the keyboard in decimal numbers at the top of the screen. The lowest C should give 0 increasing by 1 with each semi-tone, 12 with each Octave. Minor adjustments of 'scale adjust' and 'offset' should be made to prevent jitter between numbers.

Operation

The basic sequencer operation is similar to previous explanations except for the 'write' selection. After entering the number of notes, the entries are made directly from the synthesiser keyboard. The 'reset' button is pressed for a Rest and the 'break' button to clear the selection if a mistakle has been made.

Housing

The prototype was housed in the plastic box shown in the photo. A small power supply was included for the ±15V rails with a +5V regulator supplying the logic from the 9V Sinclair supply. All synthesiser connections are made to the top panel with 3.5mm jacks, while the computer is connected with a suitable edge connector.

Kenneth McAlpine **E&MM**

```
1000 REM Write Sequence
1010 CLS : PRINT "WRITE MODE"''" "
SEQUENCE ";y
1020 PRINT AT 4,0;"STEP";AT 4,8;
"OCTAVE";AT 4,16;"NOTE"
1030 INPUT "Enter No. of Notes "
;b: IF b<0 OR b>64 THEN GO TO 10
30
1040 IF b=0 THEN GO TO 30
1050 LET step=0
1060 POKE s,b
1070 FOR a=1 TO b
1080 IF IN 223=1 THEN GO TO 1110
1090 IF IN 223=2 THEN LET note=5
0: GO TO 1120
1095 IF IN 223=4 THEN GO TO 1000
1100 GO TO 1080
1110 LET note=INT (IN 159/4)
1115 IF note>47 THEN LET a=a-1:
GO TO 1140
1120 POKE s+a,note*4
1130 GO SUB 3170
1135 IF IN 223<>0 THEN GO TO 113
5
1140 NEXT a
1240 INPUT "Play-P or Menu-M ";w
$
1250 IF w$="P" THEN GO TO 2000
1260 IF w$="M" THEN GO TO 30
1270 GO TO 1000
```

Figure 2. New 'Write' section to allow keyboard entry.

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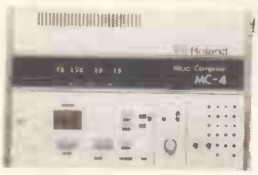

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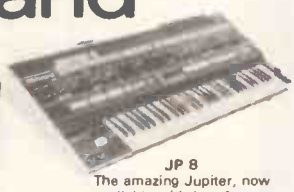

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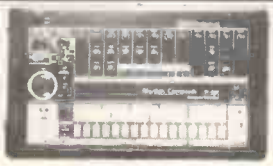

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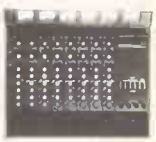

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VIDEO TECH

Completing our look at a typical TV music programme recording session.

After last month's introduction to the TV South studio in Gillingham we can now look in more detail at the technical equipment involved in a typical studio set-up, and the way it was used in the recording of Thomas Dolby's first concert with his three-piece band.

The recording was being made using four video channels. Two related to portable shoulder mounted cameras, one at each side of the stage, which were occasionally taken onto the stage for close-ups of the performers, keyboards or projection screens. The third was a podium-mounted camera in front of the stage for two shots, and the fourth a rostrum-mounted unit about 12 feet above floor level at the back of the studio floor.

Live sound mixing can become complicated, and in addition to the onstage foldback mixer there was a PA mixer next to the rostrum camera, and a TV sound mixer in one of the sealed control rooms. With more conventional bands, each mike on stage would be fed to a splitter box so differing mixes can be made. In the case of a largely synthesised band direct injection is the order of the day, and so the danger of feedback is removed and problems are generally simplified.

The other control room is, of course, for vision control. The basic staff are a director and a vision mixing engineer, although increasingly there's a need for a vision effects engineer capable of using the QUANTEL and other sophisticated MPU controlled effects generators. The vision mixing engineer's job can be likened to that of a sound engineer, although in most cases the desired result is the correct *choice* of output channel rather than a correct *balance* between several outputs.

Although the vision mixing engineer has in the past had control of basic effects such as superimposition of two pictures, cross-fade (where one picture becomes brighter as another fades out) or fade to black, the position is no longer so simple. There are scores of different types of cross-fade, including diagonal, fan wipe, box inserts, standard key and chroma key and highly specialised digital techniques (such as used on Top of the Pops of Kenny Everett's show) and so the exact requirements of the job will depend on the technology available (a point which has not escaped the attention of the broadcasting trade unions). 'Off the Record' specialises in various types of wipes and inserts boxed in by a glowing, neon-like surround, an effect which can add an air of high technology to the most basic of techniques.

The band got as far as the end of the first song before having to re-start it due to a technical problem apparently in the TV sound mix. Frantic consultations between the stage managers and control room staff were facilitated by radio mike/headphone sets, basically a headphone/microphone combination attached to a walkie-talkie which avoids all the old problems of walking across the studio floor while attached to the wall by 20 yards of cable.

The second song had been underway for all of a minute before everything ground to a halt again. After a certain amount of cursing and some glib padding from the floor manager, everything got under way again and, to everyone's credit, the whole event was very enjoyable both as a concert and as an exercise in TV production. Dolby's echoed vocals blended smoothly with the overall sound mix, and the emphasis on deep bass rhythms from the Simmonds kit and Micromoog produced a powerful impression.

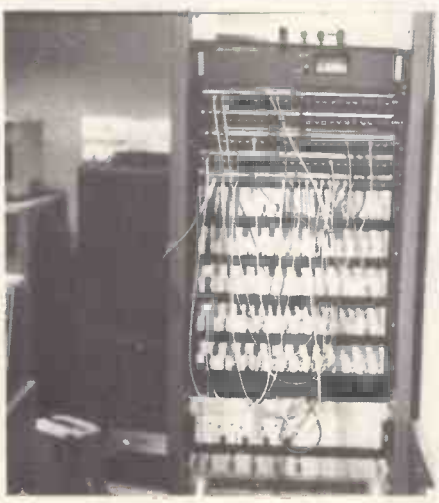
The Jupiter 8 and Simmonds pads were shared between two keyboard players (often at the same time!) and Dolby was able to make setting changes on the PPG's Volker-Craig VDU between numbers. The slide projectors were also synchronised to one of the PPG's 8 channels, but a definite human feel was preserved despite the high technology approach. The final number before an encore of 'Science' emphasised this, with a long 'drum solo' on computer and electronic drums and unusual percussive settings on the Jupiter 4.

The final number before an encore of 'Science' emphasised this; Dolby had chosen to cover Joni Mitchell's 'Jungle Line', complete with a lengthy African drum solo on the computer and suitably tribal percussive presets on the JP4.

While Dolby's computer 'Henry' provides much of the interest of his performances, it has been and continues to be somewhat erratic under stage conditions - witness the problems during the recent Marquee concert. However, the richness it can give to a live performance without resorting to backing tapes makes a Dolby concert ideal television material.

In the future musicians will have to think long and hard whether they, too, are ideal television material. Video as a medium is still relatively young but developing fast, and to neglect its potential as an artistic and a commercial tool is to severely limit the possible appeal of your music, whatever its style.

Mark Jenkins **E&MM**



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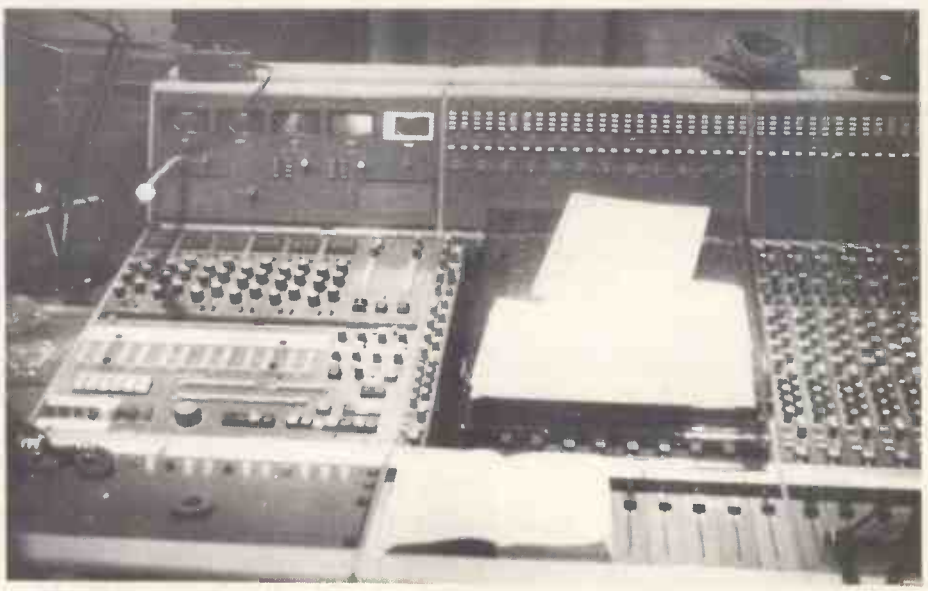

TV sound desk.

Talking SHOP

Capital Keyboard Centre

Opening ceremony: Rio Takahasi (Korg), Neil Carter (UFO), Robert Castle and Peter J. Clarke (Rose-Morris).

London now has another specialist keyboard shop for the aspiring synthesist to eye up the latest technology, and yet there has been no sign of frantic building work, no time-consuming shopfitting, and above all no soul-destroying search for new premises in Central London.

The solution to the conundrum lies in the re-organisation of the Rose-Morris store at 81 Shaftesbury Avenue. While long established as a music shop specialising in Korg and Roland equipment, the store will increasingly in the future become divided into two parts, the Rose-Morris shop on the ground floor and the Capital Keyboard Centre on the first floor. Rose-Morris like to describe the first floor as "an 'Aladdin's Cave' for the synthesiser player, with more than a hundred synthesisers always in stock", and have made sure not only that much more than the complete Korg and Roland catalogue is there, but also that a wide range of keyboard accessories are available.

Accordingly at the top of the stairs sits a large display of PA and combo amplification, including Laney, Vox and Carlsbro. Many of these amps are suitable for keyboards, but the display really belongs with the guitar department and should find its way downstairs eventually. Rose-Morris have a franchise for the Laney products and manufacture Vox equipment themselves, also importing Ovation, Eko and Guyatone quite apart from their keyboard lines. Clearly the shop intends to offer a wide choice of products both within and outside the range of Rose-Morris specialties.

Manager and keyboard specialist Bernard Jones explained that the shop had to compete with other specialist keyboard centres in London, but felt they could also win out by stocking other equipment such as studio effects, rhythm machines and recording equipment. From an original stock of eighteen keyboards to the opening of the Centre at the end of October 1982, Rose-Morris have always been associated with Korg, Roland and Casio, and even with Teisco in the days when they used the brand name Kawai.

This direct association with individual manufacturers has paid off, for instance in the availability of Korg's EPS-1 piano and SDD 3000 Delay for the opening day some months ahead of their official release on a commercial basis. Another novelty from Korg at the opening ceremony was a giant MS20, one of only four in the world, intended for educational use and hung on the wall complete with its built-in speaker and amplifier.

Korg, Roland and much more at Capital.

Among other more conventional keyboards, the Capital Keyboard Centre stocks the best-selling Roland Juno 6, Juno 60 and SH-101, and the flagship Jupiter 8; Teisco's monophonic 601 and 1107 and four-note polyphonic, and old favourites such as the Korg Lambda and Sigma. Additionally there's the Korg MS10, MS20 and Sequencer, and all the useful accessories such as Foot Controllers and Interfaces.

Preset synths such as the Korg Micro Preset are also well represented, as well as a wide range of pianos from Korg's new Symphonic range to Hohner Pianets. All the latest Casio equipment is neatly displayed on multiple stands, while a glass cabinet at the rear of the shop contains much of the studio equipment which helps to make Capital more than just a keyboard centre.

Heavily featured over the next few months will be RSD's Studio 4 products, which Rose-Morris feel will give Teac and Fostex a run for their money. RSD's range includes a rackable 8;4 keyboard mixer and a mixer/cassette multitrack combination claimed to be more flexible than the Portastudio.

Also present are effects such as the MXR Auto Phaser and Flanger, again rack mounting, digital delays, the Amdek range as featured in E&MM, and The Kit together with its percussion accessories. Other percussion includes the TR606 Drumatix, the TR808, and the TB303 Bassline for a little automatic backing.

The future seems bright for Capital. Rose-Morris have a long tradition of supplying prestigious names, from Adamas guitars for Cliff Richard to synthesisers for Jim Davidson and for The Moody Blues and equipment for Status Quo, Dexy's Midnight Runners and The Clash. Business seems good, with twenty SH-101's selling in two days, a turnover of twenty thousand pounds a week around Christmas and further space being cleared for keyboards as fast as possible.

The next phase in the plan is to introduce some form of education scheme running over a few evenings, which without being a full-scale 'synthesiser school' (an idea which has been tried in the past with limited success) will at least provide hands-on experience for only a small cover charge. Bernard Jones and Rob Castle will handle the playing side, while Dave Peterson will deal more with the technical aspects.

With such varied stock and unusual plans for the future, the Capital Keyboard Centre seems certain to establish itself as a major force in keyboard merchandising almost immediately. **E&MM**

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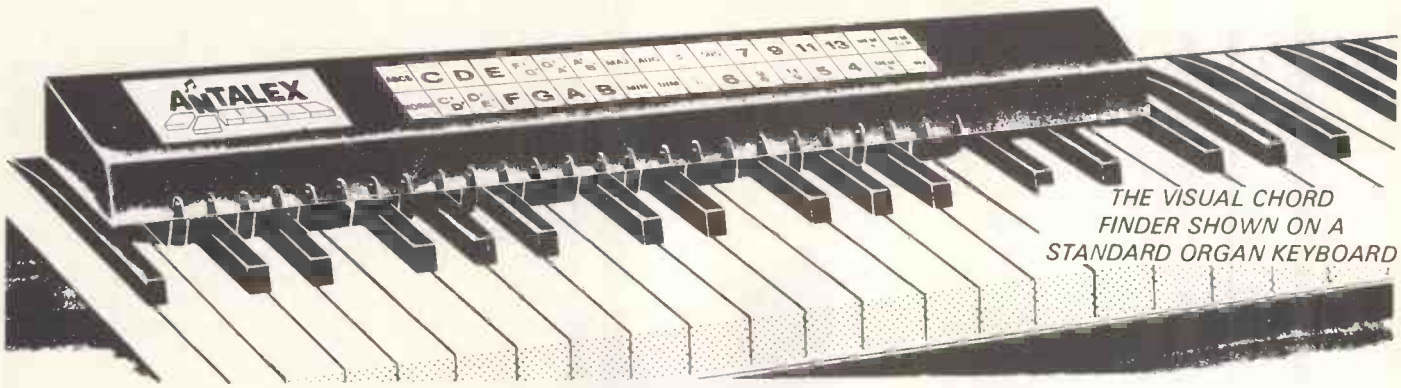

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Westone Concord Bass 1

If you were a wily Japanese guitar maker who wanted to project a good image in a market still prejudiced in favour of Western instruments, would you call your guitars Matsumoku, or Westone? No prizes for guessing, but I'm afraid the game is up, Mr Matsumoku; the neck plate of this Westone bass has your name stamped on it. Not to worry, though. I don't know much about Westone, but I do know what I like, and I like the Concord. It makes me wish I needed a bass so I could buy one for myself!

First Impressions

When my friend and I were photographing the Concord, we also took my Precision and Jazz basses for present and forthcoming "Hot Wiring" articles. Now, I'd always thought that the Precision was a pretty good-looking instrument, and the Jazz even more so, but this neat slimline Westone made them both look quite lumpy, somehow! You can judge for yourselves, anyway, from the appropriate photograph.

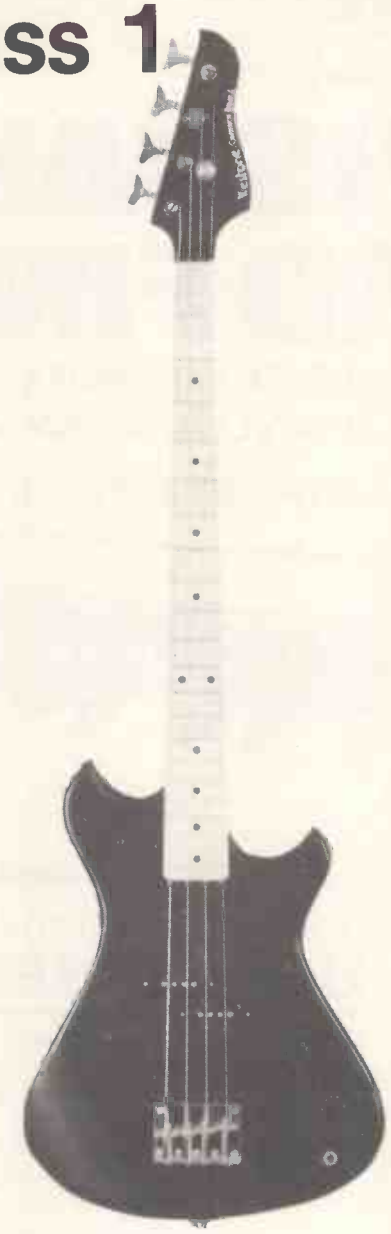
The good impressions start earlier than this, in fact; the bass came in an exceedingly smart well-fitting shaped case (not included in the price) which contained a selection of freebies to further reward the lucky purchaser. There was an Allen key for adjusting the truss rod (although you shouldn't, really); there were two plectrums of different weights, and there was a connecting lead.

Quite simply, this is the best free lead I've yet seen with an instrument: I've paid actual *money* for worse leads than this, much worse. To begin with, it doesn't have nasty moulded plugs that break inside and force you to chuck the whole lead out; neither does it have crunchy plastic plugs that split when you step on them. No, it has proper metal plugs with strain relief springs, *and* it's made up with low noise cable. When you bend it, ordinary screened cable often makes a crinkling noise that is actually induced in the cable itself and reproduced through the amplifier. Low noise cable can be distinguished by the layer of black conducting plastic between the screen and the inner insulator.

On the debit side, this lead is a bright yellow colour (so you won't lose it, I suppose) and in a perfect world it would be a bit longer than three metres; say twice as long to allow for some energetic leaping about. Still, who's going to look a gift horse in the mouth? I make no apology for going on at such length about a mere lead; let's hope such thoughtfulness has been lavished on the instrument as well.

On first playing, without plugging in, the Concord felt quite stiff — unrefined, if you like — but it soon loosened up and was very pleasant to play from that point on. In particular the strings felt quite flexible, but not floppy, and playing with the fingers was especially rewarding. A little investigation with a tape measure showed that this was due in part to the scale length — the vibrating length of the string between the nut and bridge.

There are two scale lengths in common use on basses — 34", which is what Fender Precision and Jazz basses use, along with most other modern basses. The Gibson EB series, and Fender Mustangs and Musicmasters (among others) are short scale, 30", which makes them easier to play (especially when using string bending techniques) but their strings aren't taut enough to give that snappy sound that's so popular nowadays. Also, accuracy of intonation is worsened as the ratio of a string's length to its diameter gets smaller, and short scale basses can sound 'soggy' because of this; essentially, the notes' harmonics tend to be slightly out of tune with their fundamentals.



The Westone uses a 32" scale length, which is far more than a numerical compromise. Intonation, ease of playing, ease of string bending, and sound were all very good. The strings play a part in this too; the free plectrums have GHS stamped on them, and I don't get any points for concluding that this bass is fitted with their strings. They are certainly a worthy opponent for the ubiquitous Rotosound roundwounds. Thankfully, imported basses no longer appear in the shops with horrible flatwound strings fitted to them; not surprising, really, for uncounted prospective purchasers must have been severely discouraged by the dead clunk that was all that could be obtained when trying out one of these instruments.

Construction

The neck feels smooth, pleasant and easy, and is made of a single piece of maple with a separate maple fingerboard, plus a couple of extra little bits laminated on to the head to make up the width. I'm not too sure about the use of a single piece of wood for the neck; unless the timber used is very carefully selected — and it probably wasn't on an instrument the price of this one — warping could occur as time goes by, or if the guitar is subjected to a change of temperature and/or humidity. Maybe the fingerboard will hold things steady, but most manufacturers seem to use laminated necks nowadays. I'm probably being alarmist, since the neck has certainly survived the journey from Japan, but I wouldn't take the Concord to any rain forests if I were you.

The truss rod is adjusted from the body end of the neck via a cut-out which allows the Allen key in. I didn't try it to see if it worked, and neither should you unless you absolutely know what you're doing (despite the tool for the job being provided). The fret and dot inlay work is first class, but the nut is a grotty plastic item; I don't expect brass, or even favour it, but a bit more craftsmanship wouldn't go amiss. The open G string is a bit loose in its slot, and rattles if you 'whang' it too hard.

All maple fingerboards need to be protected from the player's grubby fingers — and some have exceptionally grubby fingers, no names, no pack drill. . . One guitar I renovated had *green* marks which had sunk into the fingerboard and really had to be scraped hard to remove them. A Martian rock star, perhaps? The protection usually takes the form of a glossy lacquer which needs to get a little 'worn in' before it feels right — to my fingers at least — but Westone have used a smooth matt finish which is much more pleasant and feels good straight away, with no apparent stickiness. The coating seems a little thin, however, so I hope it isn't going to wear off too soon.

The neck has 21 frets instead of the more normal 20, making the top note E. This is a lot more use than Eb in the keys commonly used in rock, and I found myself playing it quite a lot, since it's easy to get to and the accurate intonation and good strings really make the top notes sing out. Some reservations about the neck, then, but it's doing its job at the moment.

The body is contoured in all the places you hadn't previously realised you had a bulge, and is very light and comfortable; you could take this bass on stage for a long stretch without wearing a groove in your shoulder. The lack of weight doesn't seem to have had a detrimental effect on the sound, either, which is reassuring.

The Hardware

The hardware is mostly standard — the all-in-line machine heads look a lot like Schallers, but aren't. The bridge is Fender

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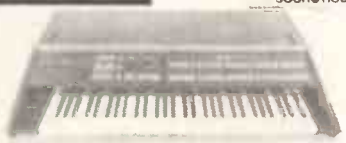

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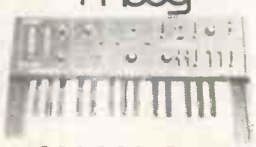

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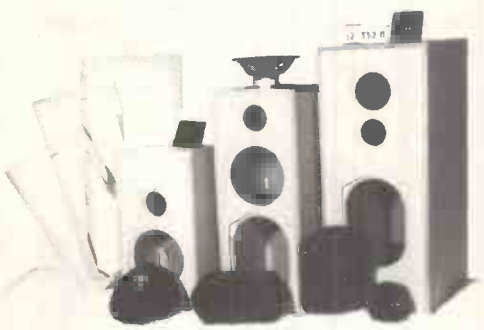

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style, with individual string length and action adjustments, although no Allen key is provided for this. The pickup, again, is Fender Precision style, split into two halves picking up two strings each. In fact, the pickup looked a bit like a DiMarzio model P in a black casing, complete with adjustable pole pieces (no Allen key again) but I think I said the wrong thing when I suggested this to Andy Glover, F, C & N's demo engineer. They're probably still laughing about me in the Fletcher, Coppock and Newman canteen, because the pickup is Westone through and through. Very good it is too.

A beneficial side effect of all this look-alike business is that if after a while you decide you don't like some part of your Westone bass, it's easy to change it for something you do like from the vast range of replacement parts now available, most of which seem to be Fender style. There should be no reason to do this straight away, though; all the bits supplied as standard do their jobs properly. The machine heads worked smoothly, and retuning wasn't constantly necessary during the three weeks or so I had the bass at home — during which time the temperature fluctuated quite a bit.

The bridge may not be the heftiest I've ever seen, but if the Concord sounds this good with this flimsy piece of bent metal, what is it going to do with one of those massive brass items you can buy now? And perhaps Superwound strings as well? On the subject of strings, most manufacturers do string sets for 30" and 34" scale lengths, but none specifically for 32"; this bass is fitted with a long scale set, and the wound portions of the E and A strings (rather than their coloured bindings) are wrapped round the machine head posts. Apparently this can put a strain on the string's core and sometimes fracture it; this has never happened to me, but string makers don't guarantee their strings under such circumstances.

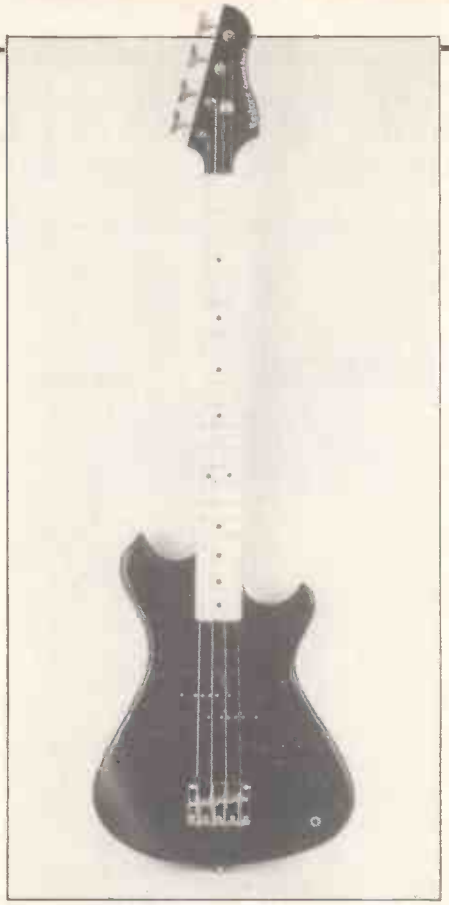


Photo by Chris Richardson.

The action was set quite high — or at least it seemed high at first, but some flash playing soon proved possible despite this. Appearances can be deceptive sometimes. As high an action as you can comfortably get away with is an advantage on any sort of guitar, but especially on bass with the violent playing styles that are currently in vogue.

The pickup is pretty good, as I mentioned, and I can't imagine that you'd be in a hurry to swap it for something else, except perhaps as an experiment. The rest of the circuitry is also standard; a volume control (which tends to come on suddenly at the end of its travel), a tone control with a decent range and a smooth action, and a jack socket on the front where you can see it, hurrah!

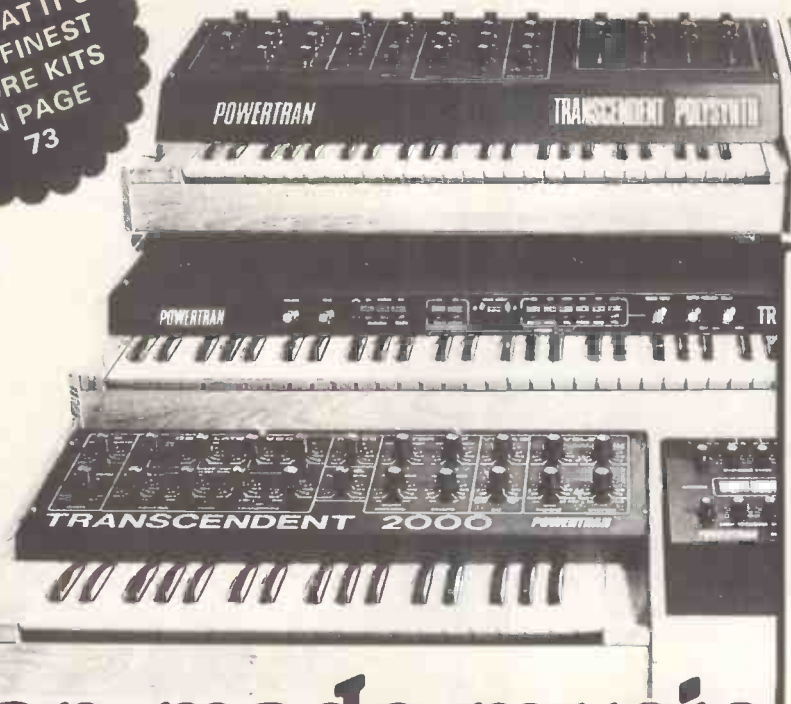
Put all this together, and what have you got? Quite a persuasive instrument, in fact. A bass which sounds good if you're a beginner, and will sound the way you want it to if you're more experienced; a bass which sounds good whether you play with fingers, thumb, plectrum or a big stick. The best news is that it won't break the bank; the Westone Concord I costs just £199.95. The case is extra to keep the basic price to a minimum, and that will set you back £39.50 extra.

All right, the Concord doesn't have the sheer *authority* that the best basses have, but I'd recommend almost anyone looking for a new instrument to at least try it out; you could end up with more change than you'd expected! I wonder what the other Westone guitars are like?

Peter Maydew **E&MM**

The Westone Concord Bass I is distributed in the U.K. by FCN Music, Morley Road, Tonbridge, Kent. Tel: 0732 366421.

MAN-MADE MUSIC AT IT'S VERY FINEST —MORE KITS ON PAGE 73



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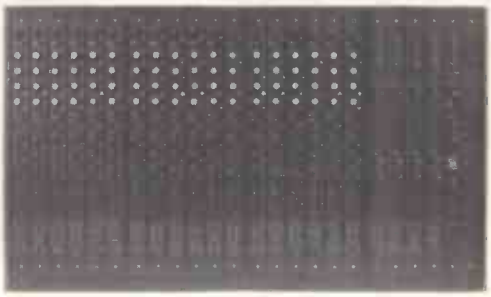

This versatile modular mixer, featured as a constructional article in Practical Electronics can be built up to a maximum of 24 inputs, 4 outputs and an auxiliary channel. Each input channel has Mic and Line inputs, variable gain, bass and treble controls and a parametric middle frequency equaliser. There are send and return jacks, auxiliary, pan and fader controls and output group switching. The output channels have PPM displays and record and studio outputs. The auxiliary channel also has a PPM display and there is a headphone monitor jack and a built-in talk-back microphone. The mixer modules plug into base units each of which takes up to 6 channels. To eliminate hum, the power supply is in a separate cabinet.

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How many of you are working on a revolutionary piece of electronic hardware in your 'garden shed' workshop, hoping that one day your labours will come to fruition and you'll be running your own design and manufacturing company whose success is based on your backroom invention? Well keep at it — because that's exactly how Sequential Circuits Inc started life.

Dave Smith is the brains behind SCI. He started his career in the music industry from the palatial surroundings of a large cupboard in his bedroom where he designed and made sequencers. This was in 1974, and the exact designation of the product was the Model 600 Digital Sequencer, a device that didn't exactly make him rich, but served as an entree into the synthesiser world. In 1976, he released an updated version of his sequencer — the Model 800, which did start to bring in the bucks, enough for him to invest in some more sophisticated test equipment, to leave his job at Diablo Systems and to concentrate solely on his company — Sequential Circuits Inc.

His next product was a programmer for a synthesiser (the Model 700) which appeared in 1977. Now this was something really new — it enabled owners of instruments such as Minimoogs, ARP Odysseys, 2600s, and modular synths to be able to predetermine the settings of various parameters and to call them back at a touch of a button. The programmer of 1977 was very similar to those we see incorporated in the synths of today save that the older synths didn't have many voltage controlled parameter settings (i.e. you couldn't vary the resonance of the filter (say) with a CV). This programmer was therefore a bit limited, nevertheless, in order to give it as much control as possible over the final patch, Smith built two voltage controlled ASDR envelopes into the programmer thus by-passing the synth's envelopes but enabling their parameters to be stored in memory — a neat solution.

The programmer brought in even more money, and this was enough to get him started on his main ambition — to build a programmable polyphonic synthesiser that would not be a compromise. In July 1977, Dave Smith first revealed the Model 1000 Prophet synthesiser, which was available in five and ten voice format. Unfortunately it was soon realised that the ten voice module was inherently unstable, as there just wasn't enough room in the instrument's elegant casework to house the extra voices and to maintain an adequate circulation of air. The original Prophet 10 was therefore withdrawn, however there are a handful of these instruments still around, most of which have been 'modified' (at some expense) to maintain their stability.

The Prophet 5 was a winner from the word go. It was, and still is, a brilliantly designed instrument, and this is proved by the fact that even after five years it is still one of the best selling polyphonic instruments in production. The instrument features many unique design concepts. It is fully programmable; offers auto tuning (almost unheard of in 1977); and is a true voice assignable polyphonic offering two oscillators per voice. Although the instrument was an instant success story, this didn't mean that SCI didn't have their problems. As any production engineer will tell you, every component in your product must be second, third and even fourth sourced, i.e. if you can't get parts from your usual supplier then have a couple of other back-up distributors readily on hand. Alas, the Prophet was one of the first instruments to use the SSM (solid state logic) synthesiser voice chip set, and inevitably there was a hold up in supplies, and there was only one source!

This put SCI in a most embarrassing situation — they had geared up production to meet the enormous demand for the instrument, then had been let down on a vital part; consequently they were sitting on large numbers of 99% finished units, ready to be shipped, apart from this one (actually the instrument used five) chip. Lessons were learnt from this, and eventually, both for supply and reliability reasons SCI went over to using the Curtis chip set in the Prophet — which they still do.

Two other products were soon to be added to the SCI catalogue — the Prophet 10, a dual manual version this time, with ten voices, a larger programmer and several other rather interesting features; and the Pro-One, a monophonic synth based on a single voice of the Prophet 5. The Prophet 10 wasn't as big a success story as the '5, it isn't as attractive to look at and doesn't really offer the musician (especially the recording musician) enough extra to justify the extra expenditure. The Pro-One, however, has become one of the most popular monophonics around, confounding all the sceptics who said, on its arrival, that the market wasn't big enough to support another monophonic.

More recently, SCI have released the Pro-fx system — a programmable rack mounted effects and audio processing unit. In fact these should just be arriving in the stores as you read this; but the one that everyone has been waiting for since it was initially revealed at the Winter NAMM show in California last January is the Prophet-t8.

Designer and President Dave Smith.

Sequential Circuits products have been handled in the UK, up until the beginning of this year, only by Rod Argent's Keyboards in Denmark Street, London. They initially saw the potential that the Prophet offered as far back as 1977, and were responsible for importing them directly from the Californian factory. Incidentally, their American Head of Sales is a certain Bob Styles, who was the original manager of Rod Argent Keyboards — not only did he recognise a good product, but also a good company, and he left the UK

Prophet 5.

INDUSTRY PROFILE

Pro-Ones under testing.

to work in sunnier climes at the US company HQ. At the beginning of 1982, SCI set up their European headquarters in Mijdrecht (pronounced My-drecked) in Holland. There was hope that the European operation could be based in London, but the Dutch authorities made it financially more attractive to move to Holland. Nevertheless, SCI Europe is run almost exclusively by people from the UK, so if ever you find you need to contact SCI you won't be assaulted by a burst of incomprehensible Dutch — double or otherwise.

SCI's European team is led by Tim Oake, Manager of European Operations, and Tim Salthouse, European Sales Manager (ex. of Rose Morris and Casio). The servicing side is run by two ex-Argents men Steve Garth, European Service Manager, and Paul Tebbut, the resident electronics engineer. Jan Van Leeuwen looks after the accounting side of things, which is quite a task when dealing with US products being imported then re-exported throughout Europe.

The Mijdrecht facility is most impressive, the warehouse is enormous, and one can only deduce that SCI will be adding dramatically to their product catalogue in the near future in order to maximise the potential that such a European base offers. In fact certain 'tie-ups' with other US manufacturers have already been discussed, and we envisage that some news will be forthcoming at the Frankfurt Music Fair in February. In the meantime, perhaps we should finish this profile by taking a close look at the current products.

The SCI Catalogue

The Pro-One: (rrp £450.00) An excellent monophonic (see review E&MM March 82) with two oscillators, noise generator, mixer, 24dB/octave LP filter, 2 × ADSR envelope generator, comprehensive modulation and cross modulation section, 3 octave C scale keyboard, 40 note sequencer, arpeggiator, and a useful selection of interface jacks.

The Prophet 5: (rrp £2,992) This programmable polyphonic has undergone several updates since its inception. Rev 1 Prophets with the power switch on the front are s/nos 0001 to 0182 — these have no cassette interface. Rev 2s (s/nos 0183 to 1301) have the power switch on the back and tune and edit buttons on the front panel in its place. Rev 3s (s/no 1301 to 2469) utilise the Curtis Chips fully, and offer voice defeat and adjustable scaling facilities. Rev 3.2 (s/no 2470 upwards) feature analogue and digital jacks for interfacing the Prophet to a Poly-Sequencer. In addition more recent Prophets have 120 memories as standard as opposed to the original 40.

The Prophet's main features include: 5 voices consisting of 2 × VCOs, Noise, Audio mixer, 24dB/octave LF VCF, 2 × ADSR envelopes, LFO, comprehensive Poly and Mono modulation; programmer; interface facilities, cassette interface; and five octave C keyboard.

The Prophet 10: (rrp £6,185) Essentially a dual manual ten voice version of the Prophet 5, but with additional keyboard assignment modes enabling doubling, alternate and normal voice routing; a programmable equalization section; and an onboard cassette unit with poly sequencer (optional).

The Pro-fx System: A unique rack mounting modular system which enables the musician to preprogram his signal processing. The system consists of Model 500 Mainframe; the 510 Phase Shifter; the 512 Distortion Sustainer; the 514 Mixer; the 516 Parametric Equalizer; and the 518 Reverb Unit. The modules can be combined as desired in the six slot rack; prices range from £170 to £626 for the System Controller.

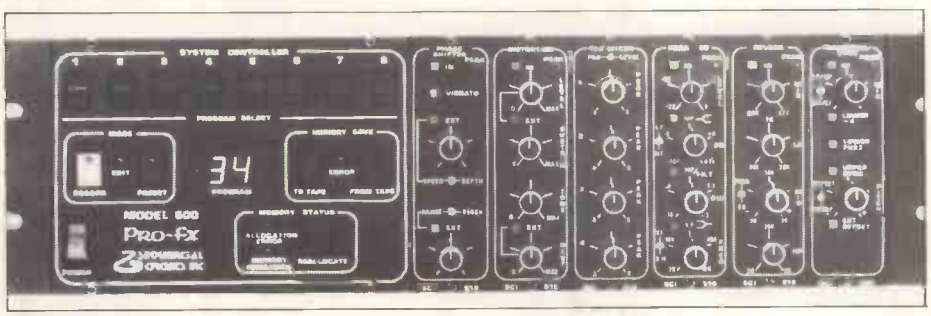
The Prophet t8: The instrument that is going to take SCI into 1983 with a bang. The t8 features a touch responsive (both velocity and pressure) 6 octave keyboard; it is fully programmable with eight voices which can be layered and split as desired. Final details of the instrument aren't available yet, but it looks as though the t8 is going to be one of the most important new instruments on the market for many years.

The Poly Sequencer: (rrp £925) This is a remarkable multi channel digital sequencer with 10,000 notes storage which can be used in real or step time. It incorporates a built in digital tape recorder for storing program and sequencing information.

The Remote Keyboard: (rrp £638) For those wishing to move around on stage SCI have developed this remote keyboard controller for use with the Prophet 5 or 10. It features a four octave keyboard with conveniently located program selection switches. Also, in the 'neck' of the controller are pitch, modulation and volume performance wheels for expression. All these are housed in a unit weighing less than 10lbs. The Remote Keyboard is linked to the main instrument via a twenty foot multiway cable.

E&MM

Prophet t8.



SCI Pro-FX.

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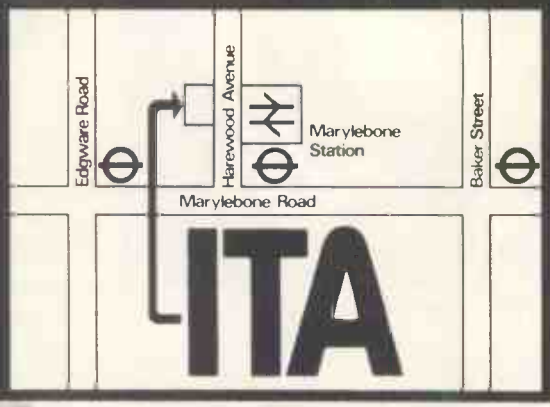

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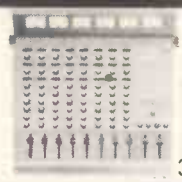
A-8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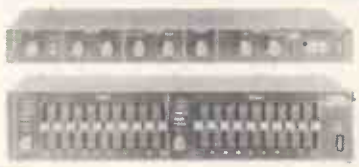
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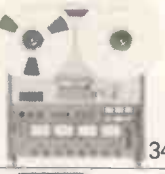
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Model 3
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16 channel one inch

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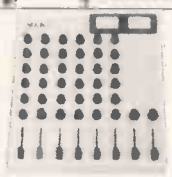
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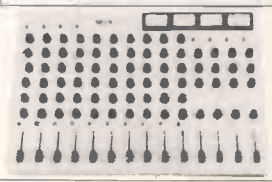
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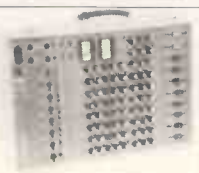

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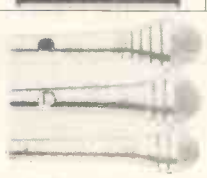


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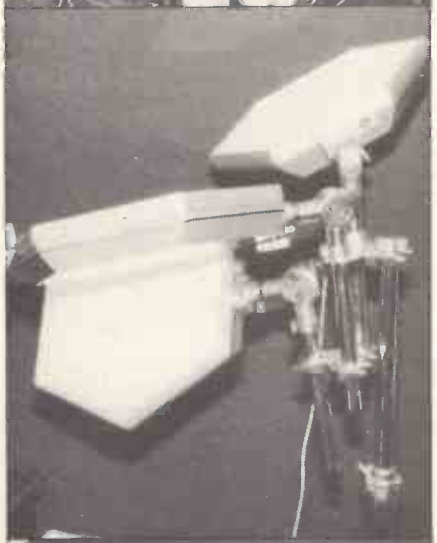
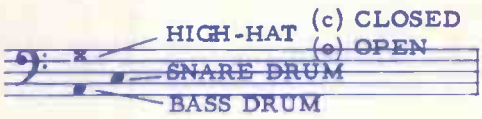
WARREN CANN'S
Electro-Drum Column Part 4

Part Four of our electro-drum column, written by our consultant drummer Warren Cann of Ultravox, continues with some more examples of beats useful to the modern percussionist. As always in this series, the patterns shown are suitable for both the acoustic kit player and the programmer.

"This month I'm introducing far more variation into the high-hat part by using both closed and open positions. In the last two examples the bass drum part becomes more demanding for acoustic players, and the hi-hat can be at any speed you like. It's all a matter of practice for the acoustic player, or for the programmer a case of developing a feel for rhythmic pattern which will stand you in good stead throughout your musical career."

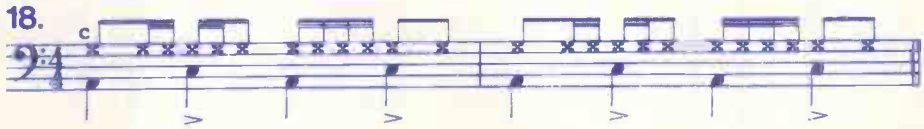




17.

17. 2 & 4 on the snare drum, syncopated bass drum, and a high-hat part that departs from the usual 'closed' mode and opens up.

18.



18. 2 & 4 on the snare, 1 & 3 on the bass drum, and syncopated 16th on the high-hat.

19.

19. Off-beat ¼ notes on the high-hat with a quick 16th sneaking in near the end of the measure. 2 & 4 on the snare drum, bass drum on the down-beat (the '1') and on the '2and' and '3'.

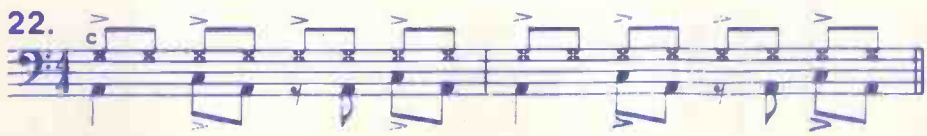
20.

20. A variation of 18.

21.

21. High-hat can be ¼ notes, ⅛ notes or if you're feeling energetic try 1/16ths. The snare is on 2 & 4, the bass drum a bit busy compared to the beats scored so far, but a very good rhythm and one with many uses.

22.



22. A variation of 21.

RECORD REVIEWS

Divided Alien Playbax 80 Daevid Allen Charly CR 30218

The best single word to sum up this album is 'difficult'. From the founder of Gong and the world's best known hippy you may expect 'unusual', 'bizarre', or 'weird'. This goes some way beyond. This is 'difficult'.

Playbax 80 consists of rhythm tracks from the 'New York Gong' LP cut into multiples of bar lengths and spliced into loops which are played back in semi-organised 'loop constructs' intended to suggest fresh themes and treatments.

The rhythm tracks are almost subliminal as regards content — they are too blurred to be separated into individual instruments, into drums or bass, they are simply pure rhythm. While repetitive, such a backing can become hypnotic, and Allen's task in overdubbing guitars and voices is largely in choosing whether to break the trance or preserve it.

The guitar is usually heavily treated with chorus, flanger and echo. Sometimes it's reversed — unless that's Michael Brainhorn's synthesiser on the backing track — and sometimes the vocals are reversed — unless they were sung that way? Allen would enjoy the listener's puzzlement. The solution lies in one of the lyrics — 'Just enjoy yourself'. The musical details aren't as important as the overall effect.

This message paradoxically applies to the lyrical content as well. Chanted syllables and titles such as 'when', 'bell' and 'dab' cease to have independent significance and become simply part of the music. Isn't this how it should be? Allen puts the question into perspective in the sleeve notes; 'There is one main condition to all of our daily lives; that we should not remember why we are really here'.

Black Forest Gateau Neu! Cherry Red B RED 37 Another archive release from Cherry Red, this time a compilation from the seminal 70's German band whose family tree links them with Kraftwerk, Can, Harmonia, La Dusseldorf or almost anyone else you could name. Lengthy tracks such as the classic 'E-Music', 'Isi' and 'Hallogallo' introduce Klaus Dinger's robotic 4/4 drumming overlaid with Michael Rother's imaginative treated guitars, piano and electronics.

Having anticipated the Kraftwerk rhythm by a few years they then move into raucous punk ('After Eight') and gentle concrete music ('Leb Wohl') in a display of versatility which makes their passing much to be lamented. Authoritative sleeve notes by Dave Elliot of (appropriately) Neumusik Magazine complete a package which is both nostalgic and totally up-to-date.

Saints and Sinners Whitesnake Liberty LBG 30354 The new Whitesnake line-up again features David Coverdale on vocals, now with ex-MSG drummer Cozy Powell, Micky Moody and Mel Galley on guitars and vocals, Colin Hodgkinson on bass and Jon Lord on keyboards.

The ten tracks run through the entire heavy rock repertoire, from slow ballad styles with powerful crescendos to faster blues and boogie numbers. As usual Jon Lord's keyboards weave in and out of the guitar lines, and his instinctive sense for dynamics shows clearly. For solos on 'Love an' Affection' or 'Rock an' Roll Angels' he's able to jump immediately to a setting capable of dominating the entire sound, whereas elsewhere his Hammond organ and Piano create a backing which is unobtrusive but vital to the overall feel.

Well worth studying for a quick refresher on your rock technique.

The Queen Collection Louis Clark/RPO EMI EMTV 33 Fresh from Hooked on Classics, arranging the strings for ELO and an interesting solo album called Perspective (going back a few years now!) Louis Clark presents an evening at the Albert Hall with the Royal Philharmonic Orchestra and Choral Society.

Lacking the bite of Brian May's guitar or Freddie Mercury's cutting vocals the whole enterprise is a little low-key, but at least the basic quality of the melodies is left. On classically-structured tunes such as 'Bohemian Rhapsody' these really stand out, and make the whole project worth a listen.

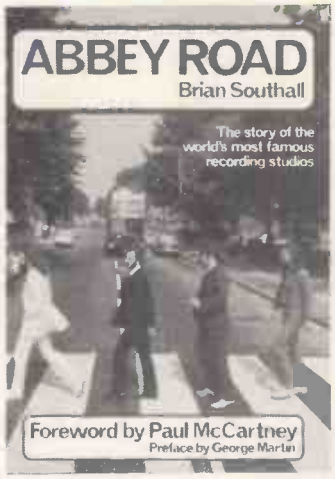
The John Lennon Collection EMI EMTV 37 Opening with the all-time classic 'Give Peace a Chance', this album traces Lennon's solo work from the days of John and Yoko, Timmy Leary, Rosemary, Tommy Smothers, Bobby Dylan, Tommy Cooper, Derek Taylor, Norman Mailer, Alan Ginsberg and Hare Krishna to 'Double Fantasy' and the popular singles 'Starting Over' and 'Woman'. Material is taken from 'Shaved Fish', 'Walls and Bridges', 'Mind Games', 'Plastic Ono Band', 'Imagine', 'Rock 'n' Roll' and 'Double Fantasy' and the difference in studio techniques from 1969 to 1980 can be quite startling. If you're not particularly enamoured of the melodies it's an interesting exercise to listen out for the very unusual treatments and miking techniques for acoustic guitars, bass drums and vocals in particular.

Electro-Music Top 20

1	Chromium Echoes	Neuronium
2	1st LP	J-P. Rykiel
3	Eclipse	M. Garrison
4	Vortex	Amon Duul II
5	Synthesist	H. Grosskopf
6	Belle Alliance	Ashra
7	Tales of Fantasy	Bernd Scholl
8	Digital Dream	Neuronium
9	Fusion	Vander/Top
10	Vivre Ice...	P. Languirand
11	Visions	Gandalf
12	Galaxy Cygnus A	R. Schroeder
13	Kamikaze 1989	Edgar Froese
14	The Visitor	Neuronium
15	Eyeless Dreams	Wolf. Duren
16	Audion	Synergy
17	X	Klaus Schulze
18	Queen Millenia	Kitaro
19	As Falls Wichita...	Metheny/Mays
20	Haleakala	Deuter

Compiled on Mail Order Sales by Lotus Records, 23 High Street, Newcastle-Under-Lyme, Staffordshire, UK.

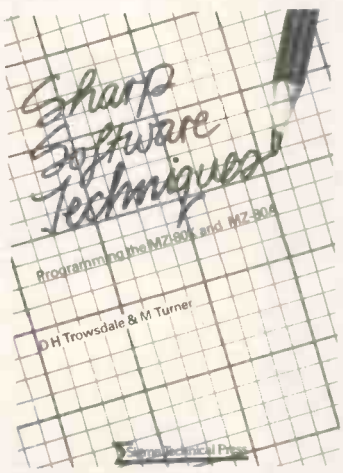
BOOK REVIEWS



Abbey Road
by Brian Southall
Published by Patrick Stephens Ltd.
Price £6.95

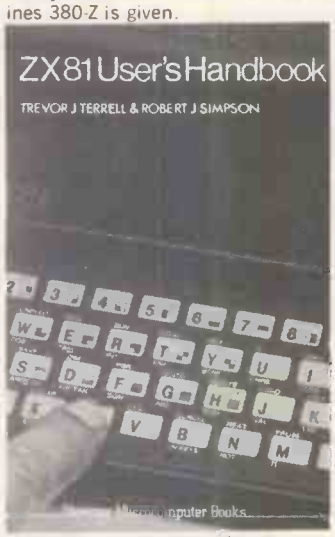
Abbey Road and its famous studio may be internationally known through association with the Beatles album of the same name, but its musical reputation is high enough to ensure for it a place in history quite independently. From the early days of Sir Thomas Beecham, violinist Jascha Heifetz and Yehudi Menuhin and other classical musicians to the Joe Loss Dance Band, Cliff and the Shadows, the Beatles and Kate Bush, Brian Southall's book gives a comprehensive guide to a studio whose history reflects that of the music business itself.

Over 200 pages of text with plentiful photos provide reminiscences, technical details, a few trade secrets and a fascinating catalogue of artists, including Sky, Pink Floyd, Alan Parsons and Adam Ant. Abbey Road has produced over seventy number one singles alone — they're all listed here, and there's every indication from this excellent book that the list can only become longer in the years to come.



Sharp Software Techniques
by D. H. Trowsdale & M. Turner
Published by Sigma Technical Press
Price £5.95

This is an extremely handy book for users of the MZ-80K and MZ-80A micros. It's a companion to 'Software Secrets' by Graham Beech and contains numerous programs, small routines, hints, tips and 'inside information'. The programs, whilst being useful and entertaining in their own right, give valuable practical experience of programming techniques under the headings games, utilities and education, including organ composer and music tutor programs. There are two sections on hardware modification and not often mentioned POKES, PRINT and machine code copying details. Finally, conversion data for PET, Apple II, Tandy TRS-80 and Research Machines 380-Z is given.



ZX81 User's Handbook
by T. J. Terrell and R. J. Simpson
Published by Newnes Microcomputer Books
Price £4.95

The Sinclair ZX81, now available at under £50, is an excellent first buy to introduce the user to the fascinating world of computing, however, the manual supplied leaves many questions unanswered. This is where this handbook takes over.

The first two chapters deal with connecting the computer to the necessary peripherals namely, power supply, TV and cassette recorder, then entering information via the keyboard.

The next chapter explains decimal, binary and hexadecimal number systems and how to convert between them, progressing into binary arithmetic and floating point notation.

Arrays, strings, substrings and the mathematical functions, often a source of confusion for the beginner, are dealt with next with clear sample programs to demonstrate the use of each.

The basics of flowcharting and subroutines are then described along with the basic logic elements and the 'IF' statement before delving into a very informative section on the ZX81 graphics.

To demonstrate many of the principles discussed, several programs, all of which can be stored in the 1K machine, are listed.

The book then takes the reader inside the ZX81 to consider the 'black boxes' or circuits inside the 'chips'. Flip-flops, shift registers, counters and memories are all discussed including the Sinclair hardware.

The Z80A processor is dealt with in detail including a complete printout of the processor's instruction set.

The last two chapters concern writing and using machine code in the ZX81 with details of some very handy routines available from the BASIC ROM. The book ends with a comprehensive Glossary of basic computer terms.

This book is ideal for the ZX81 beginner or enthusiast who wants to make more of his machine and understand the internal workings of its Z80 processor. **E&MM**

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The RCA Synthesiser.

macro-music

Part I **This article is the first in a series on the ever-expanding world of computer music. Following on from Macro-music, we'll be looking at the basics of digital synthesis, the development of software techniques, hardware solutions for high quality synthesis, microcontrolled one-chip synthesisers, and the latest commercial 'add-ons' for microcomputers.**

Macro-music is all about making music on large, expensive mainframe computers, and, in my idle moments, I dream about having a Cray-1 supercomputer (33 million operations per second) for my computer music studio. Anyone who caught the 'Horizon' programme on computer graphics will have seen what a computer like that can do for the visual artist, so just think what it could do for the cause of digital synthesis! (Pause for a great sigh of frustration ...). Of course, the truth of the matter is that all the money in the world won't make a man happy, and even the Cray-1 won't necessarily balance out the creative input = creative output equation. Even more salutary to bringing one down from cloud cuckoo land are the experiences of the early pioneers of computer music.

When computing was a matter of vast arrays of gas-guzzling thermionic valves, some early computer programmers made the first tentative steps towards using their tricky charges for more frivolous activities than calculating annual turnovers and the like. At least, this was the attitude of their manufacturers. Music and sound synthesis was definitely at the bottom of the list of computer applications - except for one enlightened company, Bell Telephone Laboratories in Murray Hill, New Jersey. A young Massachusetts Institute of Technology graduate, Max Mathews, joined the Acoustic Research Department of Bell Labs in the early '50s to apply digital techniques to the analysis of speech transmission. The original work that Mathews initiated was for computer simulation of telephone speech after it had passed through mouthpieces, carbon granules, selector switches, and many miles of cable. The rationale behind this was that a successful simulation would allow new telephone systems to be tested without actually building them! The modus operandi of this program was to subject digitized speech to the synthetic brutalizations of the 'modern' telephone system so that it came out in all its grunged glory replete with the customary noise, distortion, and restricted bandwidth one's led to expect from this side of 20th century communications. Though this was far from what one wants in digitally-synthesised music, there was an important principle at work - that of the digitization of sound.

As every electro-musician knows, sound is a pressure wave that varies from moment to moment, and these pressure differences make themselves heard by vibrating the tympanic membrane in the middle ear. If these pressure changes can be turned into something the computer can understand, then you're halfway to the goal of sound digitization. An analogue-to-digital converter (ADC) provides the means of doing this by converting the pressure changes (in terms of voltage fluctuations from a pre-amplified microphone) into data (in the form of a stream of binary numbers). These changes can be measured 30,000 times per second and then stored in the computer's memory as a corresponding sequence of 30,000 numbers. The numbers can then be manipulated by various mathematical operations (as in the case of Mathew's telephone simulation program) and eventually returned to the outside world via the opposite conversion process - digital-to-analogue conversion (DAC) - as sound (Figure 1). So, the two key procedures for sound digitization are analogue-to-digital conversion and digital-to-analogue conversion. This, of course, meant that one of the first hurdles facing Mathews and his team was the development of suitable hardware to do the conversions. The fact that the digitization procedure allows any sound heard by the human ear to be reproduced from numbers is a very attractive proposition, and led Max Mathews to suggest that a computer "can make the sound of any instrument that exists today or of any instrument that anyone can possibly conceive of making in the future."

For Mathews, this relationship between music and the computer really started in earnest after a contemporary piano recital he'd attended with a friend one night in 1957. Of the various pieces played, only the Schoenberg seemed 'satisfactory' to them, and that prompted Mathews to start work on a program to show that he (or, rather, the computer) could do better. (Curiously, that's the only time that Mathews has shown an egotistical bent; the rest of the time he's been an unassuming and mild-mannered as Clark Kent!) Consequently, Mathews rents time on an IBM 704 computer, a machine so new at the time that the only model was on display at IBM World Headquarters on Madison Avenue in New York City. This led to the much applauded observation that digital music synthesis was born quite literally in a shop window! In fact, it was only the processing that took place in the middle of the window display; the final audible product was realised only after the 704-generated data (in the form of magnetic tape) had been

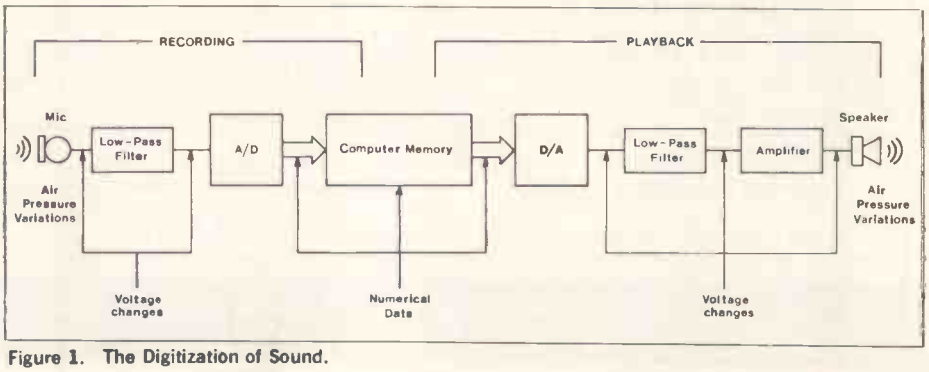


Figure 1. The Digitization of Sound.

passed through a 12-bit Epsco DAC back at Bell Labs.

Like any infant of the digital age, the first cry was a fairly primitive cri de coeur. The first program, Music I, generated just one sort of sound - a triangle wave with no choice of envelopes. However, pitch, amplitude, and duration were prescribable, and one person (a psychologist by the name of Dr. Newman Guttman) did actually write a piece using Music I, although, by most contemporary accounts, it sounded rather terrible. These limitations weren't helped by the difficulty of getting adequate computing time to improve on the original program or just for plain experimentation by interested parties. Fortunately, Bell Labs recognized the potential of these developments, and the next program that Mathews wrote, called, logically enough, Music II, which was capable of four independent voices, with a choice of sixteen waveforms stored in memory, was developed on an IBM 7094 at Bell Labs in 1958. The first more-or-less commercial result of this work was a couple of records called 'Music from Mathematics' released in 1959. One of these was issued privately by Bell Labs to show what could be done with the new digital technology and the other was from Decca (DL9103). Interestingly, the reactions to the early examples of computer music were much as they are now; composers were intrigued, but unsure about coping with learning a new language; traditional musicians were downright antagonistic; rock musicians were keen to explore new territory; and Joe public didn't really understand what was going on.

Higher sampling rates

Both Music I and Music II, as well as the subsequent series of programs, relied on the computer calculating the string of numbers needed to produce sounds after reading in and manipulating data supplied to the synthesis program by the composer. However, the much greater bandwidth needed for high quality music synthesis, as opposed to speech, put considerable demands on the design of digital synthesis programs. The main problem is that the faster a wave is changing (i.e., the higher the frequency) the more often it's necessary to put in numbers into the DAC to recreate a reasonably faithful version of the waveform (Figure 2). If each of these numbers represent a waveform sample, and the numbers are sent to the DAC with a sampling rate of 2n Hz, then it was demonstrated by Mathews that the maximum possible audio bandwidth was n Hz. This is the all-important sampling theorem, and the ½ sampling rate bandwidth represents the Nyquist limit for digital synthesis.

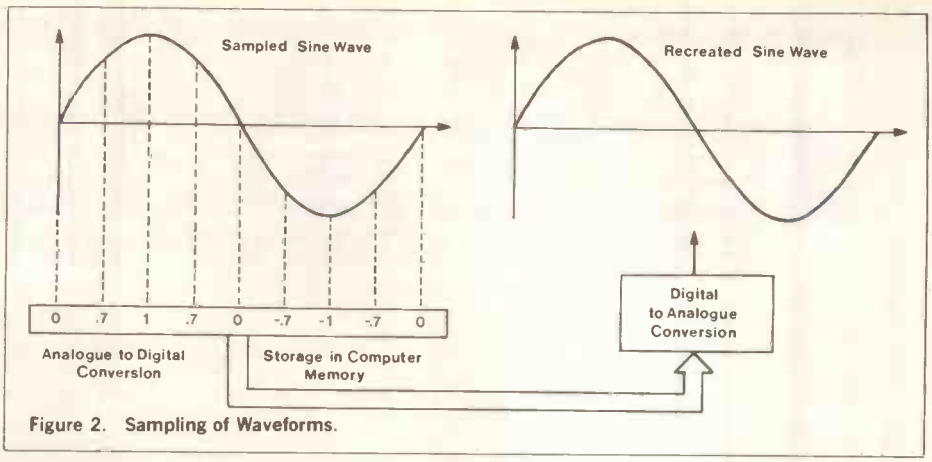
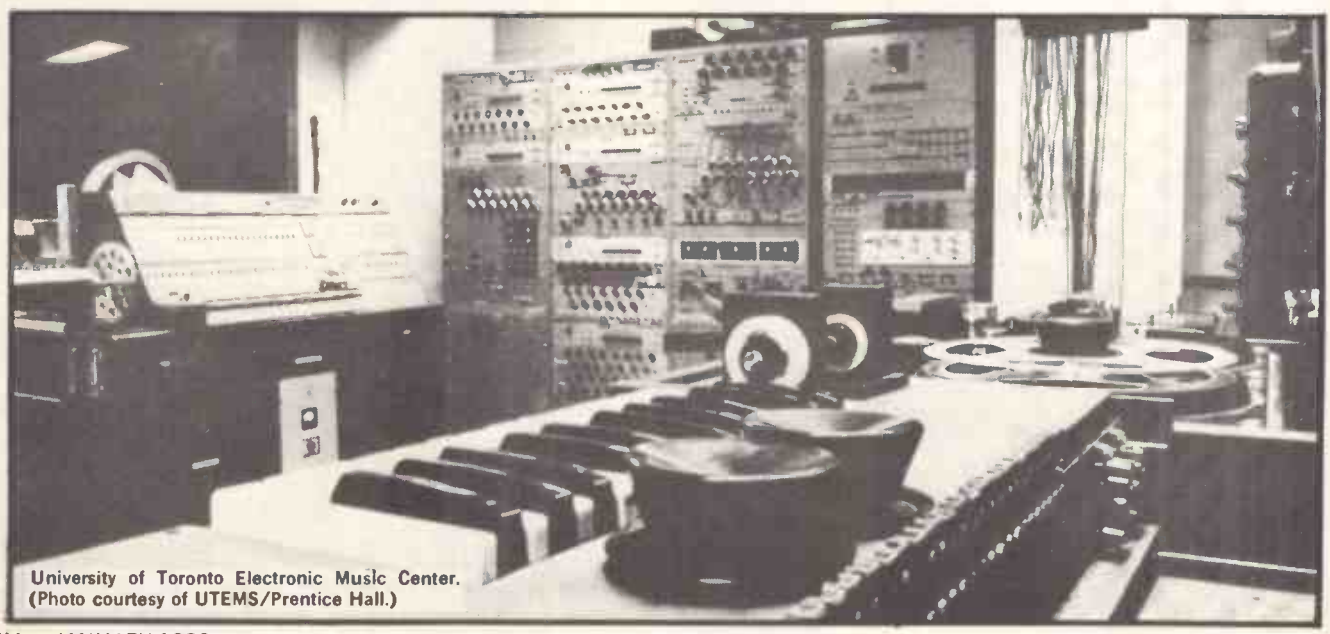


Figure 2. Sampling of Waveforms.

What this means for digital synthesis is that a 20 kHz bandwidth would necessitate a new sample being sent to the DAC at least every 25 us (a 40 kHz sampling rate), and that just wasn't feasible for the first generation of computers. The solution adopted by Mathews in his program design was for the computer to calculate the necessary numbers at its leisure and store them on tape for playback via a DAC at a later stage. This technique of 'delayed playback' synthesis means that the computer has no real-time constraints as far as processing of DAC data is concerned. The big advantage of that is that the quality and variety of synthesised sound is limited only by what the composer and programmer feel like putting into the system. In fact, there are a number of advocates of delayed playback synthesis amongst users of microcomputer music systems (Hal Chamberlin, in particular), and, judging by his incredibly authentic rendition of Bach's D minor Toccata and Fugue, it's an approach that makes a lot of sense if real-time synthesis isn't a necessity. However, one of the big problems of delayed playback synthesis using high sampling rates (for high fidelity) is the large amount of data storage needed.

As a contemporary example, Hal Chamberlin's NOTRAN system (using a special music transcribing language), with a 20 kHz sampling rate and 12-bit DAC resolution, stores all the precomputed DAC data on floppy disks, but, in performance, feeding the data to the DAC requires a new disk to be replaced every 20 seconds! In the early days of computer music, data storage wasn't as straightforward as using floppy disks, and the typical 12 Mbytes of storage needed for a 5 minute piece meant that cumbersome and expensive tape playback machines were required. Even more to the point, as regards what the composer had to put up with, was the fact that 12 x 10^6 numbers took a great deal of processing, and a conversion factor of 100:1 was the norm when comparing the time required for processing with the amount of music that actually emerged.

E&MM


University of Toronto Electronic Music Center.
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CASSETTE REVIEW

CASSETTE REVIEW is always interested in music from E&MM readers whether recorded live, on a couple of cassette decks, in a professional studio or by any intermediate method. We try to give at least a mention to every tape received, although with limited space and scores of tapes coming in it's best to have a little patience!

Send one cassette, mono or stereo, clearly marked with your name and address on the cassette itself and preferably in its plastic case. Include a covering letter giving full information on instruments and recording method used, and a relevant colour or black and white print, and send to E&MM Review, 282 London Rd., Westcliff-on-Sea, Essex SS0 7JG.

Unfortunately it's no longer possible to return tapes or photos, but readers should note that our Electro-Music compilation cassettes will contain full details of each selected track and will ensure international promotion of our readers' music. Tapes are accepted on the understanding that permission has been given for the use of a track or part of a track if space permits, with copyright remaining with the contributor.

Scores below refer to musical content, recording technique, packaging and promotional material and hi-fi quality respectively, and are out of a maximum of ten in each case.

Tape of the Month

TRANXMIXXION (Stockport, Cheshire) 8 tracks; Peter Goodwin, 8060 and Z80 based computers and Powertran sequencer. Arnie Sage, ARP Axxe, ARP Solus, Cat, Yamaha CS50, Syntom, Synwave. Teac 4-tracks. HH 12:2 mixer. A very mixed set going back over the last couple of years, containing much that is fairly average together with some of the best electronic pieces ever heard at E&MM. All synthesisers and percussion are capable of computer control, and the basic rhythms are monolithic and compelling. Over them weave a series of fluid leads, digital-sounding bell noises, swirling strings and many sounds which, while emphatically melodic, defy easy description. Comparisons? Kraftwerk, Depeche Mode without vocals (except one beautiful contribution by Sandra Jones on 'Day in the Sun') or perhaps John Foxx meets Robert Schröder. Commercial? Perhaps not, but this is how it *should* be done.
Music: 8 Production: 8 Presentation: 8 Tape: 8

INDUSTRY (Shrewsbury, Salop) 'Centres of Industry/Canopies of Experience'. Christopher Jenkins, Moog Sonic 6, Wasp, Welson strings, Transcendent 2000, Spider and Oberheim sequencers, VL-1 and Master Rhythm. Teac A3340, ProKit 6:2 mixer. 'Centres of Industry' contrasts the discords of heavy industry (the fuzz guitar and percussion of 'Machines') with the harmonies of electronics (the Mexican-flavoured synth melodies of 'Microprocessors'). 'Canopies of Experience' (it says here) goes on to explore the possibilities of electronic harmony on 'Distance Lends Enchantment' (rhythmic but formless) 'Dance on Dust' (with hints of Peter Baumann, conventionally melodic) with the chilling 'She's So Alien' (unashamedly Numanesque), with 'Connie Schnitzler Goes to the Bog' (satirising the results of a complete break with ideas of conventional melody and rhythm) and with 'T.H.R.U.S.H. Central' (concentrating on repetition as the image of eternity in music). None of this, of course, is meant to be taken seriously (it says here).
Music: 6 Production: 6 Presentation: 9 Tape: 6

DECREE NISI (Yorkshire) 'First and Last'. Bob Ellis from RAF Linton and friends have produced a varied tape of electronic pieces ranging from pop to gentle ballads to sinister sound collages in the Hawkwind vein. After a brief flirtation with aerobatic flying Bob now intends returning to solo electronic music by updating his Yamaha CS30/Casio setup to Korg and Roland polyphonics and E&MM digital delay. This should ensure that the lead sounds are as rich as the polyphonic textures and sequences on his rather exotic solo keyboard pieces.
Music: 6 Production: 6 Presentation: — Tape: 7

ROB WILLIAMS (Nottingham) 4 tracks: Roland SH-09, Wasp, Casio MT-30, Doctor Rhythm, AKS, Drumatix, vocals & alarm clock. Otari 8-track or Teac 2-track and Sony cassette deck. A very accomplished tape of rhythmic pop ('Hi-Rise Boys') melancholy electronics ('D.I.T. Disco', including an excellent foghorn sound on AKS) and a few novelties. Influences from Depeche Mode to Klaus Schulze to Rolf Harris — there's a wonderful version of 'Sun Arise' complete with synthetic didgeridoos. The vocals are good too — interestingly enough the 2-track recordings are every bit as clear and sharp as the 8-track recordings.
Music: 7 Production: 7 Presentation: 7 Tape: 7

EXCLUSIVE OPPORTUNITY FOR E&MM READERS!

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

UNCLE IAN AND THE TOOTH DECAY (Petersfield, Hants) 'The Urban Picnic'. Mark Francombe, guitar, E-bow and electronics. Nick Elborough, Kitten synth, incredibly clunched up guitar(!). Helen Badham, bass and electronics. Uncle Ian, Soundmaster Rhythm. 14 tracks of very powerful improvisations, tape collages, jam sessions and general lunacy. Definitely brings to mind the mid-70's improvisations of Can and Amon Duul II, with a few jazz influences thrown in together with an infectious sense of humour. Side two has a mystical feel with typical Gong-like glissando effects and titles such as 'Mystyk in the Rain' and 'Radio Batteur'; a very impressive tape considering it's all recorded live onto an Akai 4000 DS.
Music: 6 Production: 6 Presentation: 7 Tape: 7

AERIE (Shrewsbury, Salop) 'Inertia Remains Dominant'. David Gate, Godwin and Welson string synthesisers, Transcendent 2000, Korg MS 10 and Sequencer, DR55 and vocal. Robert Andrews, Ibanez Artist, Zenta bass, string synth and vocal. Teac A3340 and HH Stereo mixer. An interesting and often eccentric collection of pieces of concrete music, free improvisations and tape collages with a hint of Gong and Henry Cow. The recurring use of taped birdsong, dogs and even gardeners (all meticulously credited) gives the whole tape a relaxing pastoral air, only occasionally broken by sinister interruptions from echoed vocals, synths or guitar.
Music: 6 Production: 6 Presentation: 6 Tape: 6

GEOFFREY ARMES (London) 'Radio Albania'. MCS Drum Computer, Oberheim polyphon- guitar, bass, saxophone, Moroccan clay drums, tapes. Teac 8-track and Revox. Two very accomplished tracks which belong almost in the realm of avant-garde classical music. 'Radio Albania' uses taped radio transmissions and 'Somerset Childrer in Alexandria' uses taped playground sounds to evoke specific atmospheres in a similar style to Holger Czukay's work but a little sparser. Geoffrey Armes' free jazz/electronics band 'The Duplicates' should be something to look out for.
Music: 6 Production: 7 Presentation: 5 Tape: 7

LINEAR MOTION (Reading) 5 tracks; Martin Jones, bass. Simon Hood, drums. Dave Sharp, guitar. Rob Bridgman. Jupiter 8, RS 202, SH5, SH2000. Everybody, vocals. Union studio 8-track, Oxford, Engineers Calvin & Dave. At good old-fashioned pomp-rock band in the Genesis style who play mainly lengthy, grandiose, semi-autobiographical and rather depressive songs about love and rejection. Lots of orchestral climaxes, heavy guitar flanging, harmony vocals and keyboard pyrotechnics — watch for the polyphonic portamento! The band play regularly around Reading and Oxford and should be worth checking out.
Music: 7 Production: 7 Presentation: — Tape: 8

MOSCOW (Kirkella, North Humberside) 'From the Edge to the Sea'. Kieran Moses, vocals. Twig Leafe, self-built Stratocaster, Rickenbacker guitar. Jez Ross, Tama/Zildjian drum kit. Bill McKeown, Kramer bass. Mark Elvidge, self-built poly and monophonic synthesisers. A very professional 8-track recording made at Soundcraft Studio, Bridlington, and showing the beginnings of a highly distinctive style. There are hints of Duran Duran, Teardrop Explodes and reggae music, with an imaginative use of string and brass arrangements on the keyboards. Almost certainly a band who can look forward to some commercial success.
Music: 7 Production: 7 Presentation: 6 Tape: 7

The following also deserve a mention:

Mystery Plane A three-piece from London with three tracks resembling Japan or a lightweight Visage — excellent sound from Drumatix and acoustic drums, good vocals and guitar treatments, but a little hissy for Teac 4-track.

George Garside A selection of instrumentals recorded on two home-built modular synths, rhythm machines and Casio VL-tone. Some excellent rich sounds, a brave cover of Vangelis' 'Chariots of Fire' and not too much hiss for a pair of cassette decks.

Music 8 Two tracks recorded live using four Transcendent 2000 synths controlled by a Sinclair Computer. Quite a catchy pop sound and decent vocals.

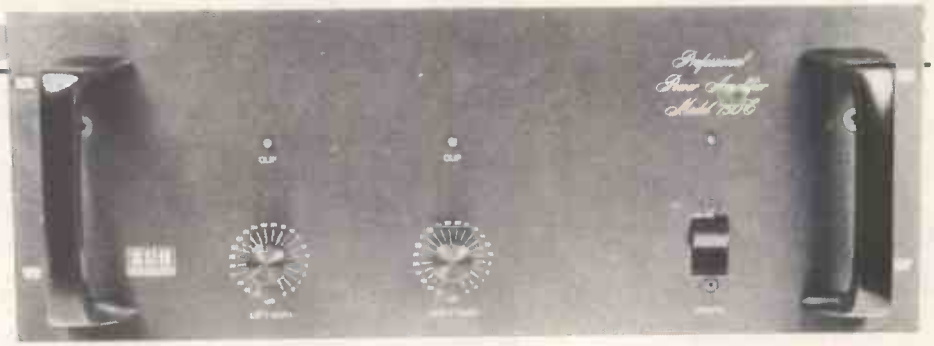
Terminal 3 16-year-olds Darren Washbrook and Simon Young are developing a catchy pop style similar to Depeche Mode or a harsher Silicon Teens which should result in some very high-quality music in the near future.

Leather Canary Some catchy instrumental pop from James Vincent and Mark Hughes with a good balance of synth melodies, rhythm guitar and electronic percussion, and some nice low-key vocals.

Martin Weetman Very gentle and attractive instrumental music heavily featuring phased Fender Rhodes Piano, flutey leads and rolling strings. Ideally suited for film music perhaps; a touch of Camel in there somewhere?

We've recently received our first music videotapes from some enterprising readers; if you have a videotape of your performances or backed by your music, send it along! E&MM will pay return postage; VHS system only at the moment.

BGW 750C Power Amplifier



BGW are a company, based in California, who manufacture professional power amplifiers and electronic crossovers. Their products are distributed in this country exclusively by Theatre Projects Services Ltd.

Two versions of this amplifier are available, the 750B, which has 11 stage LED VU meters and the 750C reviewed here, which simply has 'clip' indication.

In normal use, i.e. Stereo, the power amplifier is capable of producing 225W continuous average power output per channel into 8 ohms. When the two channels are used in a bridge configuration a monaural output of 720W continuous can be obtained.

Weighing in at 26Kg the amplifier is not exactly light but can be manhandled using two large handles bolted to the front panel. A standard 19" × 7" panel allows the unit to be rack mounted, however, despite the panel being ¼" thick the amp is best supported at the back in addition to the normal fixings. The matt black casing is 12" deep.

The mains lead is terminated in a moulded, parallel blade, U ground plug, standard in America, but which must be removed for use in this country.

Input connections can be balanced or unbalanced. Standard ¼" jack sockets are included for unbalanced inputs along with XLR plugs which can be used with unbalanced inputs, although the latter will require additional transformers.

Five way binding posts are used for the amplifier outputs, allowing banana plugs, spade connectors or tinned wires to be connected.

To prevent hum loops earth and signal grounds can be separated if required by removing a connecting link on the rear panel.

The front panel is sparse but functional. Each channel has a 22 step gain control marked in dB's, allowing precise control over the output volume (a good feature with around 200W behind each pot!). Above each control is a clip indicator which indicates when the peak output voltage has reached the power rails. The LED's stay on for approx ¼ of a second once lit to indicate if peaks are occurring which are too fast to see. A third LED to indicate 'Power-on' is situated above the power switch, a rocker switch with a built in circuit breaker which disconnects the mains supply should overload occur.

Circuitry

The input signal is passed through a filter network to remove DC and RF interference and then into a precision operational amplifier with a high slew rate.

The output is fed into two complementary transistors which divide the signal into positive and negative components. These signals feed another pair of complementary transistors, this time in a current amplifying configuration, to provide enough drive for the main driver transistors. These drive the output stage, each channel consisting of ten 150W power transistors! The outputs go through load compensation networks before passing to the protection circuits.

The chipping indicator for each channel is driven from the output of the op-amp when the output is at a significant level to try and push the power section over the supply rails.

The output protection circuit is provided by a relay which operates under two conditions; firstly it delays connection of the load for about a second after switch-on, to prevent transients damaging the speakers, and secondly it disconnects the load when DC is detected on either channel.

A fan is used to cool the massive heatsink assembly, however, should this output stage start to overheat a thermal switch mounted to one of the output transistors will speed up the fan. If the temperature still continues to rise a second thermal switch will cut off the load until the output stage cools.

Construction

The casing is extremely rugged, built from 16 gauge steel throughout. Removing the top panel reveals the expansive heatsink assembly, with the power transistors mounted in two rows of five for each channel. The transistor leads protrude through the heatsinks and are soldered to the main drive circuitry mounted underneath on a glass-epoxy PCB. Connections to the board are made via multi-way connectors which allow each module to be easily disconnected for servicing or replacement.

The transformer takes up almost 1/3 of the case and probably contributes to most of the weight! The supply smoothing capacitors are not exactly small either providing 21,000uF of capacitance on each rail.

The output protection relay is mounted on a third PCB next to the capacitors. The fan is mounted in the centre of the rear panel and blows air through the gap in the two heatsinks, across the transistors and out of the ventilation slots in the case.

The quality of construction is high as can be seen from the photograph.

Operation

To obtain a stereo output speakers are connected (via external fuses) to the binding posts at the rear of the amplifier. If mono operation is required then only the left input is used and output taken across the 'positive' posts. The left output now becomes the 'positive' signal out. 'Mono' must also be selected on the slideswitch on the back panel, which grounds the right input and applies the left input signal to the inverting input of the right channel. The two outputs now work opposing each other. The resultant output across the two 'positive' posts is therefore double the output voltage swing. An external fuse must be used and the load impedance should not be lower than 8 ohms.

Conclusions

Test results of the amplifier supplied showed that the specifications were even better than claimed with noise levels at -108dB and distortion at 0.007%.

The unit certainly has most of the elements necessary to build a professional sound system around, be it in a PA or studio application. These include; low noise, virtually distortion free operation over the whole audio spectrum, versatile input/output options, circuit protection devices and sturdy construction both externally and internally. BGW obviously have faith in their products covering each unit with a 3 year guarantee.

The 750C is priced at £800+VAT and the 750B at £860+VAT. These units, however, can be hired from Soundhire.

Kenneth McAlpine **E&MM**

For further details contact Nikki Antoniou at Theatre Projects Services Ltd., 10 Long Acre, London WC2E 9LN. Tel: 01-403 3838 or 01-240 5411 for Soundhire. Please mention E&MM when doing so.

Specifications

Intermodulation Distortion:	Less than 0.02% from 250 milliwatts to rated power
Small Signal Frequency Response:	+0, -3dB, 1Hz to 90kHz +0, -0.25dB, 20Hz to 20kHz
Hum and Noise Level:	Better than 106dB below 225 watts (unweighted, 20Hz to 20kHz)
Input Sensitivity:	2.12 volts for maximum power output. Voltage gain 26dB (20 times)
Input Impedance:	Greater than 15k ohms
Damping Factor:	Greater than 230 to 1 referenced to 8-ohms @ 1kHz
Output Impedance:	Designed for any load impedance equal to or greater than 3.5 ohms
Power Requirements:	Interchangeable for either 100, 120, 200, 220, or 240 volts A.C., 50-60Hz 1500 watts

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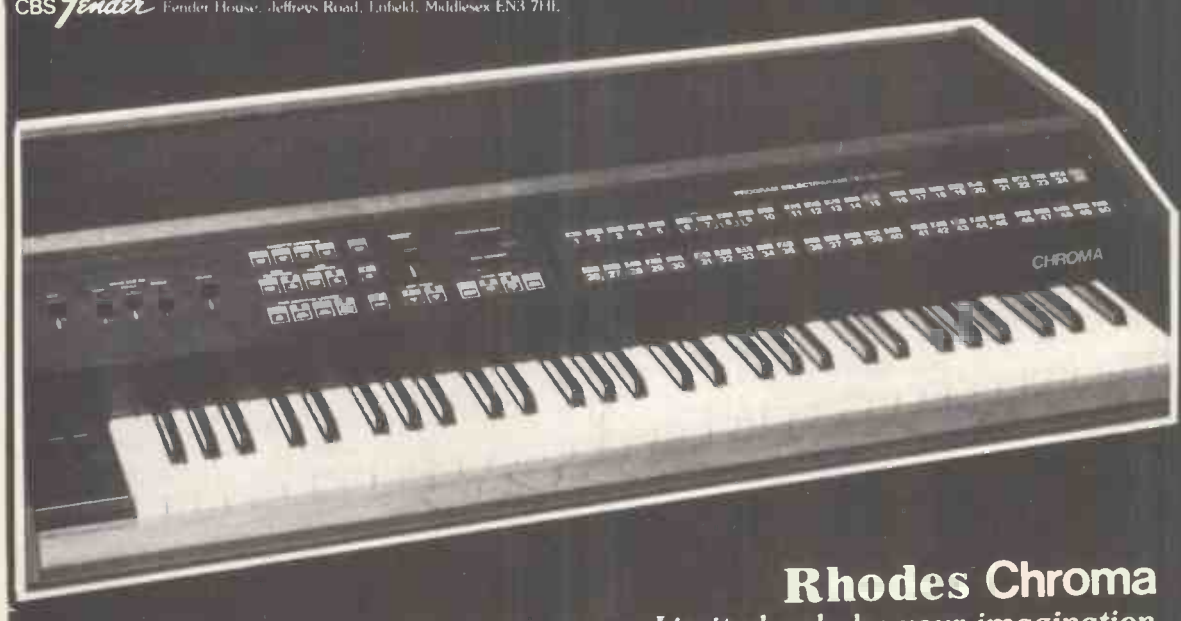

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ELECTRO-MUSIC ENGINEER

by Charles Blakey

Tuning Up — A Review of VCO Calibration Methods Part 2

This month we continue with some other practical methods for tuning and calibrating your VCO's.

METHOD 2.

Oscilloscope; Additional Oscillator

Conventionally the vertical axis of an oscilloscope displays the amplitude of a signal applied to its input while the horizontal axis displays time. Timing is obtained through an internal sawtooth oscillator and if the oscilloscope has a calibrated scale then this may be used to obtain an approximate measure of frequency. For example, a waveform input having a frequency of 1kHz displayed with a sweep time of one millisecond per division of the graticule should show one complete cycle of the waveform per division.

Most oscilloscopes have facility for using an external time base on the horizontal input. Suppose that the same sinewave signal is applied to both inputs then due to the nature of the timing waveform and the equality of the two inputs a perfect circle should be displayed on the screen. Whether the circle is symmetrical will, however, depend on the quality of the amplifiers. If separate sinewave oscillators are now used for the two inputs then when their frequencies are equal a circle will again be generated. In this instance the circle could be asymmetrical due to variations in amplitude of the two inputs. Also as one of the oscillators drifts slightly the circle will turn into an ellipse, or even a straight line, at a tangent to the vertical axis. The latter is due to phase differences between the two signals. These displays are known as Lissajous Figures. Of greater interest from a calibration point of view is that if the frequencies of the two inputs are integer ratios then clearly defined figures are generated. For example, if the ratio is exactly 2:1 then two complete ellipses are formed resembling a bow tie. For calibrating it is best to keep to a 2:1 (or 1:2) relationship since at higher ratios the complex patterns formed as the oscillators drift slightly apart can be very confusing.

In references to the use of Lissajous Figures the additional requirement usually stated is a Signal Generator. The latter is just a name for an oscillator and so another VCO would serve the purpose and the essential factor is that the second oscillator should be stable - at least for the duration of the calibration. Similarly, the method usually refers to using sinewaves but many voltage controlled oscillators do not have a sine output. A triangle waveform will do just as well and while two triangle inputs are assumed below, a combination of sine and triangle waveforms will work equally well, but the shapes obtained will differ. The calibration arrangement is shown in Figure 3.

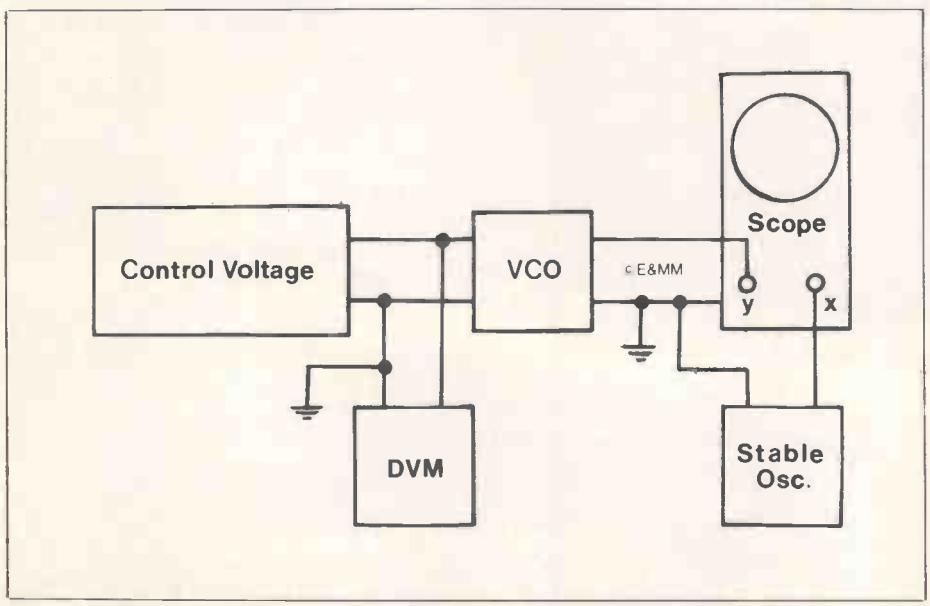

Figure 3. Method 2.

From a keyboard keep note A = 440Hz held and adjust the frequency of the stable oscillator to match the frequency of the VCO being calibrated. This will be shown by a stable single diamond shape on the oscilloscope screen (Figure 4a). At this stage you may need to adjust the amplitude control(s) to obtain the best shape. Now press next lowest A and if the frequency is not half that of the stable oscillator there will be a complex pattern on the screen. To find out whether the VCO being calibrated is sharp or flat adjust the frequency of the test oscillator first one way and then the other in order to obtain a stable pattern resembling Figure 4b. Do not worry about exact shape or whether in fact you end up with a figure resembling an eight the important feature is the figure now resembles a doubling of the original shape obtained at the first matching. If the frequency of the stable oscillator had to be decreased then the VCO is sharp, i.e., the frequency ratio is greater than 2, and the 'scale adjust' preset should be turned accordingly. Continue the first step (keyboard A = 440Hz; adjusting stable oscillator to match; pressing next lowest A) until

pressing A = 220Hz gives a figure of the type shown in Figure 4b. In practice it will be difficult to maintain absolutely stable Lissajous Figures but so long as they are rotating at a speed of about one per second then this is adequate. This is not necessarily a reflection of the stability of the VCO but more the stability of the control voltage and the accuracy of its measurement.

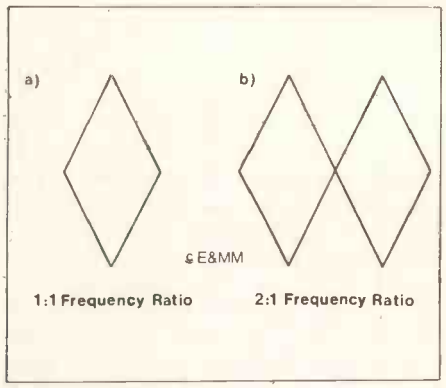

Figure 4. Lissajous Figures.

The procedure is similar when using an external control voltage for calibrating. The initial slight difficulty that some may experience is obtaining a frequency in the region of 440Hz (within ± 50Hz will do). This can be obtained by simply listening to the output of the VCO through an amplifier and getting in the region of A = 440Hz by ear. Alternatively if the oscilloscope has a calibrated time scale then use the method described earlier. Another approach relies on the fact that most constructors will be familiar with the sound of the dreaded mains hum and the control voltage can be set so that the output of the VCO into an amplifier resembles this. Alternatively, the output from the secondaries of a low voltage transformer may be input to one side of the oscilloscope and the VCO frequency matched to a single figure. With both the latter methods the control voltage is then increased by three volts which should bring the VCO into the correct frequency range. Note the voltage reading, get the single Lissajous Figure as above and then decrease applied voltage by exactly 1.00 volts and proceed as already described.

The Lissajous Figure technique is as accurate as the first method using a digital frequency meter but the remaining problem is having scaled the VCO one does not have the means for tuning it to an exact standard. The technique may also be used for the high frequency adjustment (when fitted) although the figures will be less stable. Simply aim to get the double figure rotating as slowly as the initial single setting up figure - or at least as slowly as patience will allow!

METHOD 3.

Tuned Musical Instrument

This is a popular method since it does not require additional test equipment and many constructors will know someone who has a tuned keyboard instrument. In fact, it does not matter for calibration purposes whether the musical instrument is exactly in tune so long as it is a polyphonic instrument which uses a frequency divider. If the instrument is another synthesiser then the calibration can only equal its scaling and in these circumstances it would be preferable to use Method 4. The test set-up is shown in Figure 5.

The arrangement shows the outputs going to a stereo amplifier but they could equally well go to separate amplifiers/speakers which may be built into the instruments. The method will work best if the waveforms are of low harmonic content, for example, a triangle from the VCO and an equally mellow sound from the musical instrument being used. Also observe that in this and other methods we show the voltage controlled oscillator being calibrated going direct to the amplifier, or other equipment. In some synthesisers it may not be practical to have a direct link from the VCO but this can usually be circumvented with jump leads. The alternative is to connect the amplifier, or other test equipment, to the output of the synthesiser. Normally there will be a voltage controlled filter and amplifier in the signal path and these should be set to their fully 'open' position. If the VCA does not have an 'open' facility then set its envelope generator to maximum sustain and the note on the keyboard will have to be kept held down during the calibration step - a matchstick wedged between keys will keep the hands free!

From the keyboard attached to the oscillator being calibrated press A = 440Hz and also press the same note on the musical instrument. In this instance the two sounds will have to be matched using another adjustment attached to the VCO, for exarnple, the initial frequency adjust (RV17 on VCO 1 of the 'Spectrum'). As the pitch of the two instruments become closer one should hear a secondary beat frequency and the time interval between beats decreases as matching approaches. When zero beat is obtained press next lowest A for both VCO and musical instrument. In this method the best approach is to turn the 'scale adjust' pre-set until zero beat is obtained once more. The direction of turning as well as the number of turns to achieve matching should be noted. Afterwards turn the pre-set half the number of turns back in the opposite direction. Remember, as in all methods, to keep an eye on the voltmeter and press the key again if the voltage changes during a calibration step. Press A = 440Hz on both instruments and repeat the above procedure of matching with the scale adjust pre-set and going back halfway. The number of turns of the pre-set will gradually decrease until only a part rotation is required for perfect matching.

When an external control voltage is used a different approach is required. Press A = 440Hz on the musical instrument and adjust the calibrating voltage for zero beat. Note the voltage reading. Press next lowest A and reduce calibrating voltage until zero beat is obtained once more. If the voltage adjustment required is less than 1.00 volts then the VCO is sharp and the scale adjust pre-set is rotated in the direction to achieve the correct scale. If this is not known then turn it in one direction and repeat the previous step and note whether the voltage required is lower or higher than before. If lower then it is being rotated in the correct direction. Simply continue the procedure: A = 440Hz; match with applied voltage; press next lowest A and alter scale adjust pre-set if the voltage change required to achieve zero beat varies from 1.00 volts.

At high frequencies beats are much more difficult to discern and thus the method is not really practical for a high frequency trim adjustment. If this trim is fitted then normally its wiper will be grounded during the low frequency scaling and the best approach is to subsequently set the wiper in the mid position and tweak the pre-set if there is an audible tendency for the oscillator to go sharp or flat at high frequencies.

METHOD 4.

Stable Oscillator.

The advantage of using a correctly tuned instrument in Method 3 is that both calibration - at least at the important lower end - and tuning can be achieved. This 'beat frequency' technique may, however, be used for calibration when only a stable oscillator is available, such as, another VCO.

The arrangement is the same as Figure 5 but with the stable oscillator in

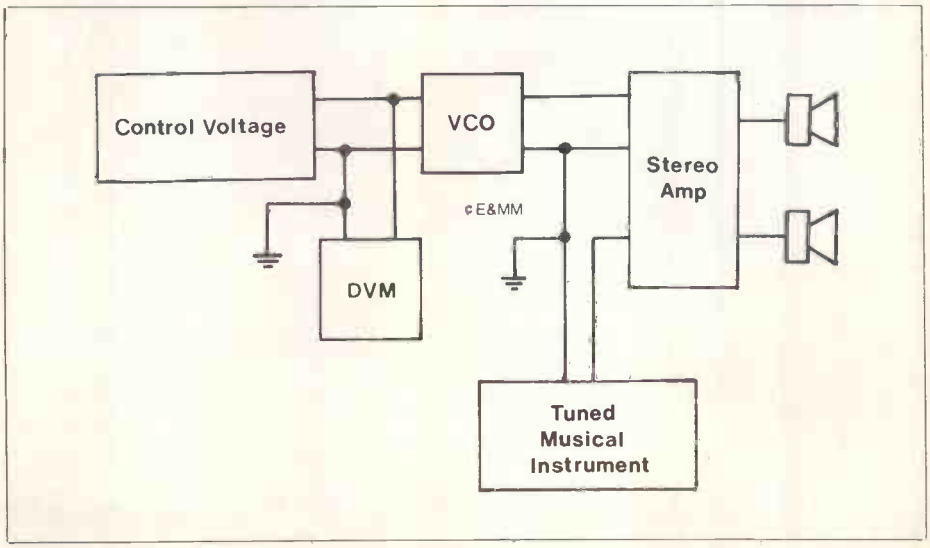

Figure 5. Method 3.

place of the musical instrument. With a keyboard/VCO calibration set-up, note A = 440Hz is pressed and the stable oscillator adjusted until zero beat is obtained. Now press next lowest A and use the same procedure as Method 3, namely, alter the 'scale adjust' for zero beat. This time, however, the beats are on notes an octave apart and some will find them more difficult to hear. Turn the trimmer half way back, as before, and repeat the procedure until zero beat is obtained on both notes. Often some benefit will be obtained by adjusting the volume from the amplifiers so as to more clearly discern the beats.

The procedure using an external control voltage is virtually the same as that described in Method 3, except that the stable oscillator is not touched and one relies on hearing beats between notes an octave apart.

This method is applicable to most situations. For example, with the 'Spectrum', VCO 2 could be used as a separate stable oscillator by disconnecting it from the keyboard by omitting R163. Similarly, in a modular system, such as the Digisound 80, a second initially uncalibrated oscillator may be used as a stable VCO when calibrating the first

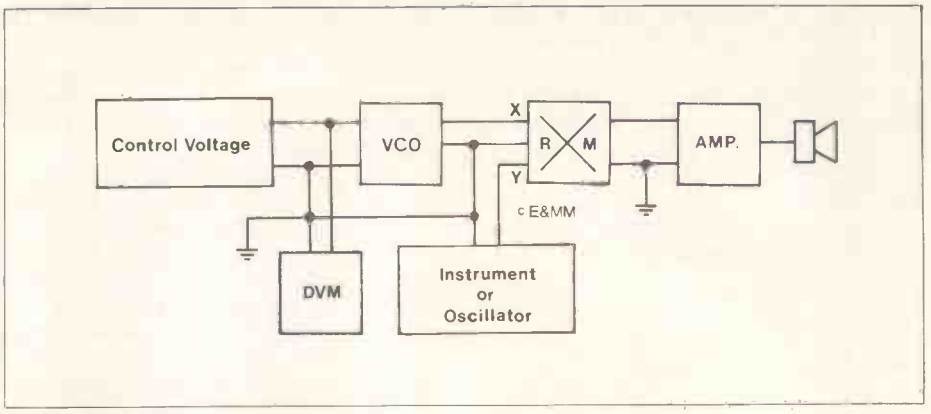

Figure 6. Method 5.

and then the latter used to calibrate the second. Furthermore, the 'beat frequency' technique can be very accurate especially if the person has what is known as a 'musical ear' which is not the same as an ear for music. In contrast, however, there is a surprisingly high proportion of people who cannot hear or have difficulties with beat frequencies. These problems are increased when the beats are an octave apart. The next method overcomes this problem.

METHOD 5.

Tuned Musical Instrument or Stable Oscillator; Ring Modulator.

The set up is shown in Figure 6 and the techniques used are exactly the same as for Methods 3 or 4 according to whether a tuned musical instrument or stable oscillator is used. The outputs of both the VCO and the calibrating aid should preferably be waveforms of low harmonic content and in this instance they are taken to the two inputs of a ring modulator. One will recall that the action of a true ring modulator is to produce the sum and difference of the frequencies of the two inputs. If the inputs were two pure sinewaves then when the inputs become matched the output from the ring modulator will be a pure tone an octave higher and with an amplitude half that of the signal inputs. Thus there is a quieter pleasing tone when the two inputs are matched. If, however, we put in sinewaves of, say, 438Hz and 440Hz the output will contain frequencies of 2Hz and 878Hz. The effect of the 2Hz component is to cause variations in amplitude, rather like 'beats' but much more clearly audible.

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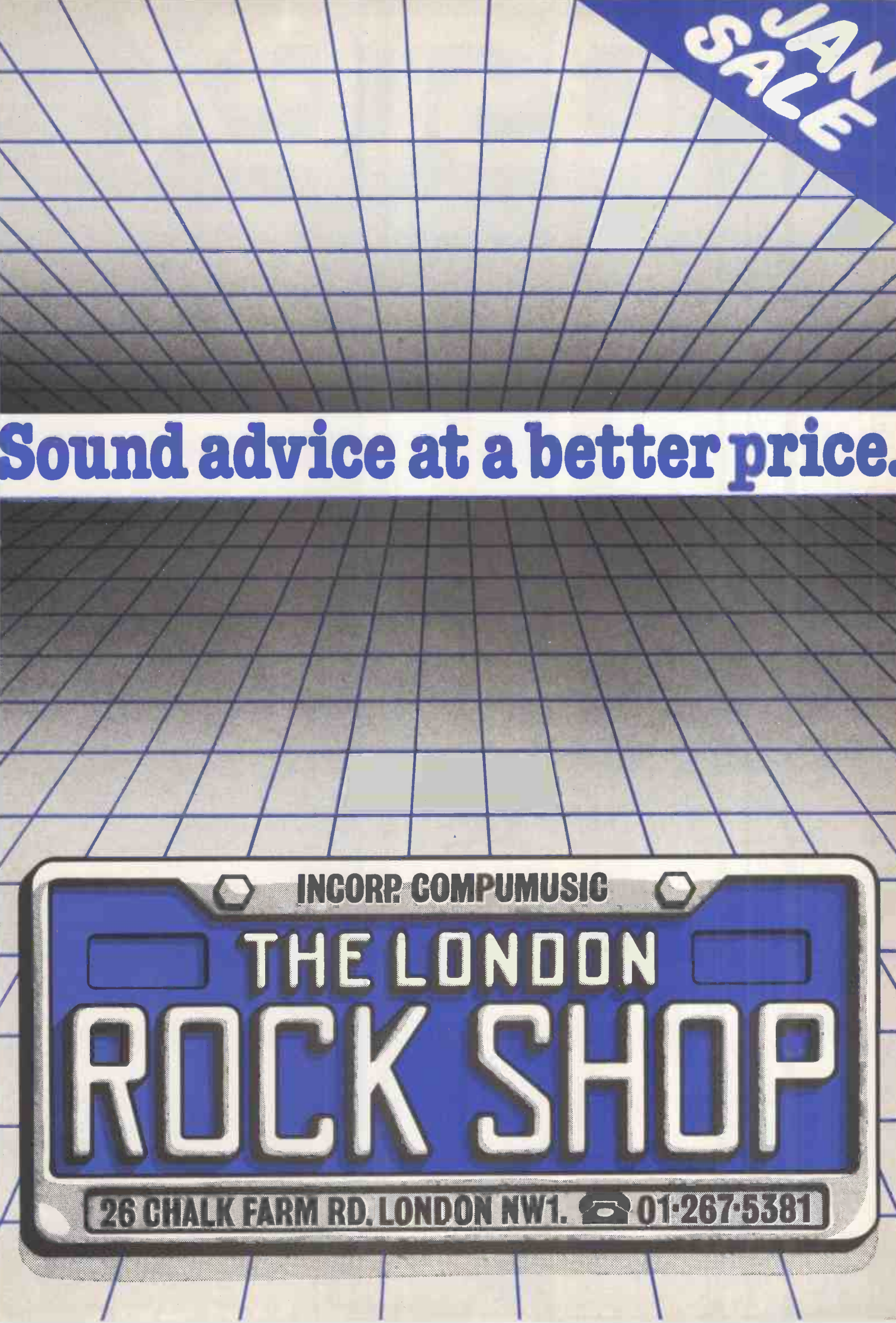
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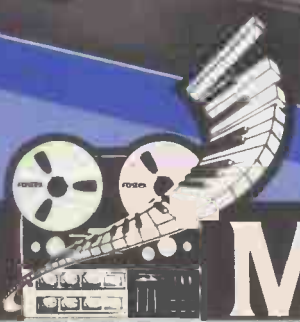

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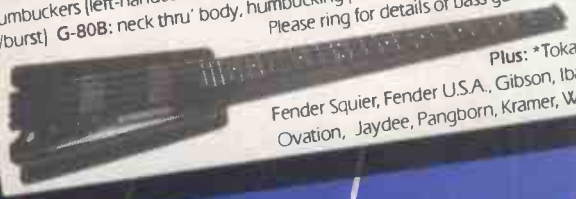

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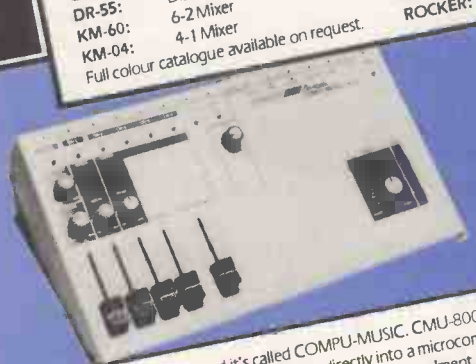

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Latest additions to the vast Roland range include the Juno 6 and Juno 60 polyphonic synthesizers. These incredibly versatile keyboards have made people think twice before buying a string/brass ensemble because now you can buy a true polyphonic synthesizer that will sound like piano, organ, clavinet, strings and brass for under £600! The Juno 60 enables you to programme your own sounds into its 56 memories, recall them, edit them and still keep the original patch. Add to these features the microcomputer interface and you have a superb value keyboard for under £1,000 (only the Korg Polysix comes near it at this price).

Roland computhythm units have found a well-earned niche in studios around the U.K. providing instant rhythm tracks for demos and masters alike. The TR-606 DRUMATIX is a fully programmable, chain-linking electroni drum kit for under £200 whereas the TR-808 RHYTHM COMPOSER has all th features of the Drumatix plus handclaps variable drum tunings, latin percussion instruments and individual audio outputs. Both these units sync with the TB-303 BASSLINE: A programmable sequencer and synthesizer in one. Now you have a complete rhythm section at your fingertips – a real creative tool for composing and songwriting.

Further details on Roland, Boss and Amdek products may be obtained by sending 25p in postage stamps for full colour catalogues to: The London Rock Shop, 26 Chalk Farm Road, London N.W.1.
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AMDEK

Compressor Kit

This month we continue our Amdek series with the Compressor, another useful effect which can be assembled and customised with the minimum of technical difficulty.

- **Variable Sustain**
- **Automatic Level Control**
- **LED effect on and battery check indicator**
- **Pre-assembled circuit board**
- **Complete kit with detailed instructions**

The Compressor is a useful addition to any Electro-music studio. In recording applications it can be used to reduce the dynamic range of input signals or in PA situations it could be used to stabilise often unpredictable microphone signals.

The unit compresses the sound by boosting small signals and attenuating larger ones. This is demonstrated in Figure 1. The input, A, has a percussive envelope, such as that produced by a guitar, which, when processed by the circuit, results in the compressed output (shown dotted). The initial high peak, B, has been reduced and the decaying input is boosted to a sustain level, C.

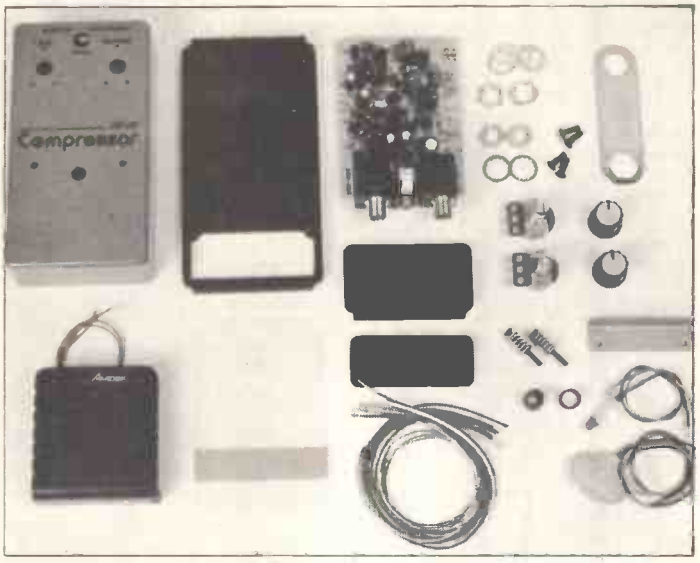
The box has two controls, output Level, and Sustain level with the facility to use an optional external power supply.

The Kit

The Compressor is supplied in the usual bubble pack, complete with all parts, connecting wire, solder, a handy Amdek spanner and the instruction sheet. The only extra items needed are a 15-30 watt soldering iron, cutters (or wirestrippers), pliers, screwdriver and the ubiquitous PP3.

Once all of the parts have been separated from their packaging they can be spread out on a worksurface and checked off against the parts list in the assembly instructions. When this has been done construction can commence.

The first stage is to cut and strip the appropriate leads for the pots.



All the parts ready for checking off.

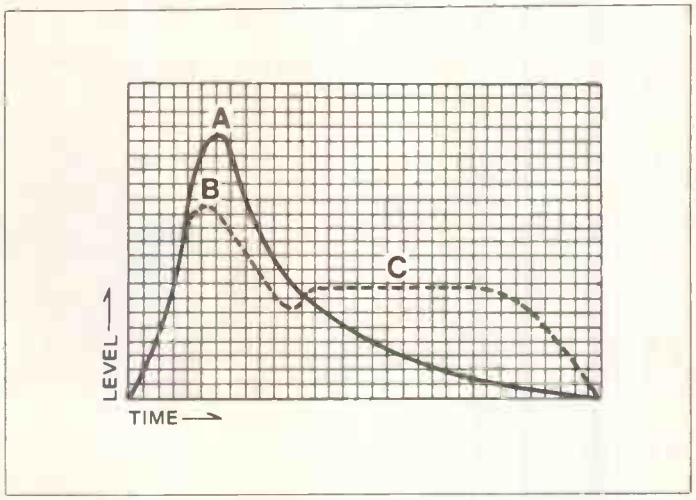
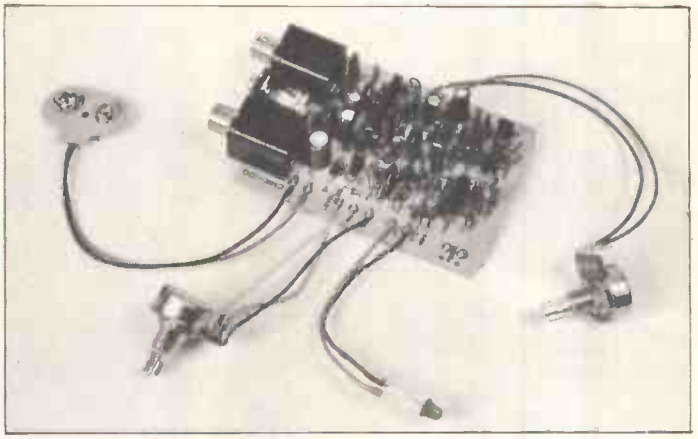
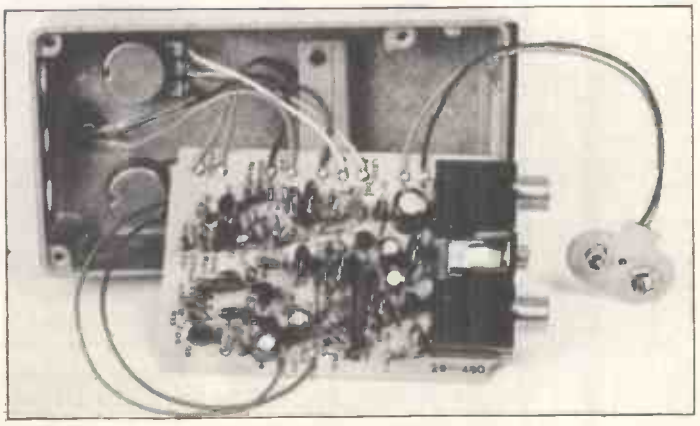


Figure 1. Output characteristics of the Compressor.



Steps 2-8. Pots, battery snap and LED wired to the board.



Steps 9-14. Footswitch assembled and pots fitted into the case.

Once these have been soldered to the controls, the battery connector, LED and footswitch leads can be cut to length (Steps 2-6).

When the eyelets in the factory assembled PCB have been suitably tinned and filled, the leads for the battery snap, pots and LED can be soldered to them (Steps 7-8).

Assembly of the footswitch is next requiring the footswitch, two 25mm screws, springs and footswitch stopper plate. Once this is complete the LED holder can be clipped into place and the footswitch leads soldered to the PCB (Steps 9-11).

The pots can now be fitted into the case using the Amdek spanner to tighten the hexagonal nuts. Once the LED has been fitted (with its locking ring) the PCB can be located into the case and held in place with the jack socket nuts (Steps 12-15).

A self-adhesive insulation sheet is now attached to insulate the PCB from the bottom of the case. Once the rubber pad is fitted to the bottom plate it can be screwed to the case with the four 10mm screws (Steps 16-18).

The stages required to finish the unit are: fitting the battery, the rubber battery cover and the two control knobs (Steps 19-21).

The Circuit

The circuit diagram of the Compressor is shown in Figure 2.

The IC is a transconductance amplifier whose gain is controlled by the current into pin 1. With no signal present transistors Q8 and 9 are off. This allows C15 to charge via R26 almost to the supply rail. This causes a current to flow through Q5 and into the IC via R14 and the resistance set by the Sustain control. This sets the initial gain of the amplifier.

With a signal present Q8 and 9 come on, discharging C15 and causing a voltage drop at the base of Q5 turning it off, the IC now decreases in gain since the control current has stopped. Since the input signal has now reduced C15 again starts to charge and increase the gain of the IC. The circuit therefore keeps the output constant at a level set by the Sustain control. The effect is switched in and out with two FET's Q2 and 3 controlled by a flip-flop toggled by the footswitch.

Operation

Our Compressor worked first time after assembly but should you have any difficulties Roland UK have a 'Hot Line' at their factory which is 01-847 1671 — they are always willing to lend a helping ear!

Although Amdek believe they have supplied component values for perfect operation of the unit they do suggest some modifications which can be made. Note that these mods are made at your own risk and may affect guarantee conditions.

Modifications

These modifications alter the Attack and Decay times of the Compressor action.

Mod 1. Resistor R27 determines the discharge rate of C15. If this is increased the 'attack' increases in amplitude giving a very 'punchy' sound. Try values from 0-1k.

Mod 2. Resistor R26 determines the charging rate of C15. When this is decreased the charging rate increases and vice-versa. Try values from 10k to 330k.

Mod 3. For full control over the Compressor action fit a miniature pot in place of each resistor. A 1k in place of R27 and a 220k in series with a 10k resistor in place of R26. The two pots could be fitted below the present controls (with some careful drilling!)

E&MM

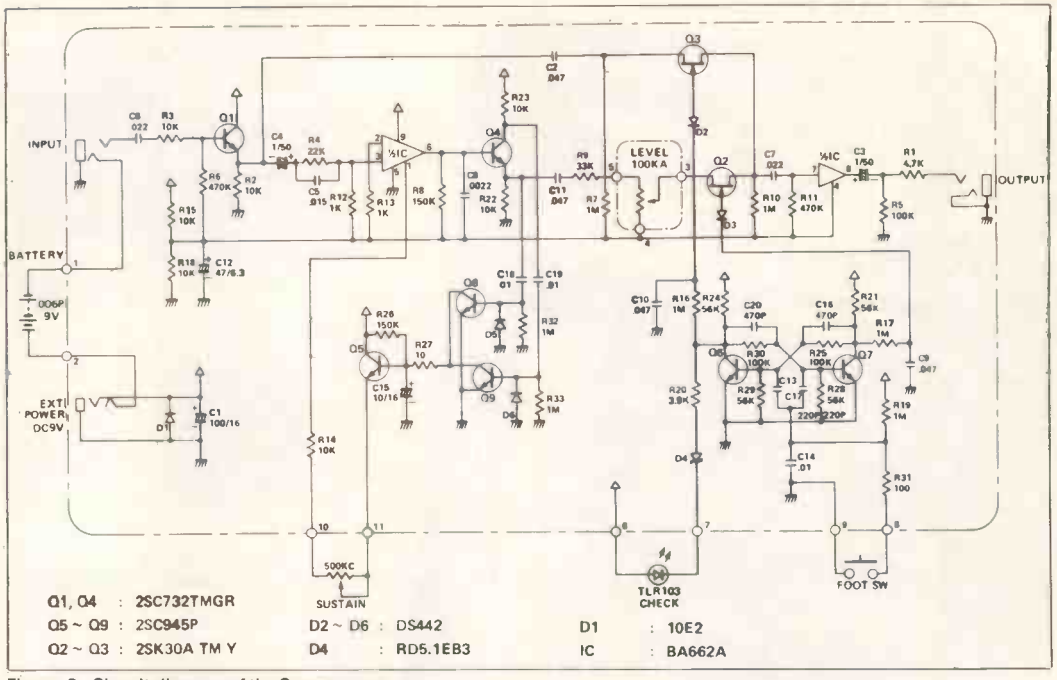
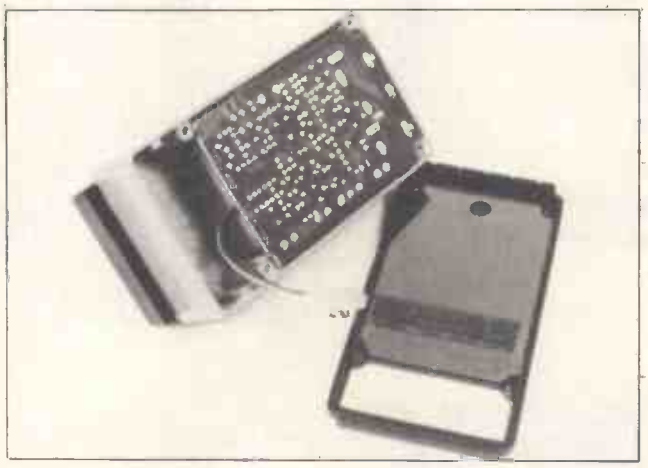


Figure 2. Circuit diagram of the Compressor.



Steps 15-17. PCB fitted into the case and insulation added.

Steps 18-21. Base plate and knobs fitted to complete the unit.

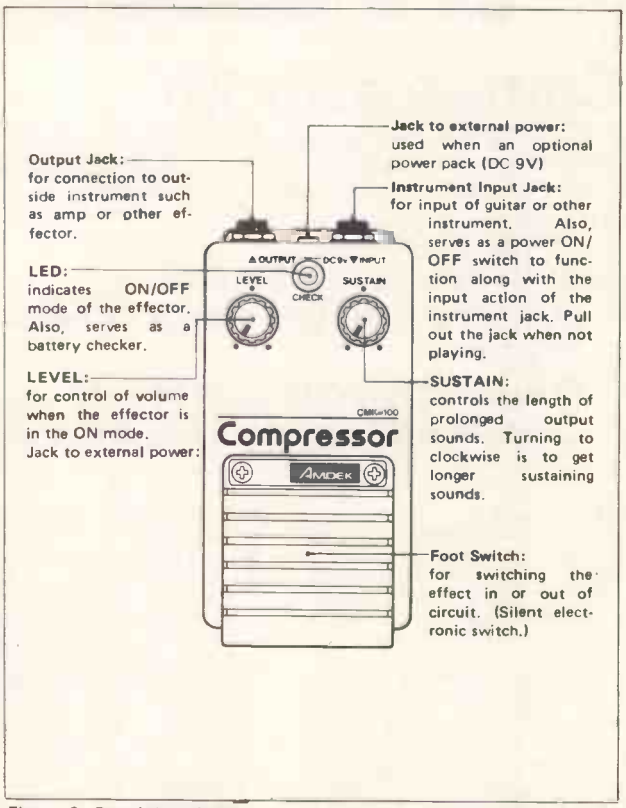


Figure 3. Panel description.

E&MM's special offer price for the Amdek Compressor Kit is £28.00 incl VAT and P&P. Please order as: Amdek CMK-100 kit.

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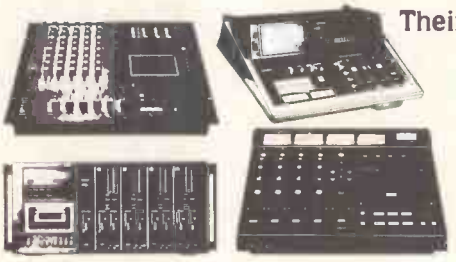

Theirs

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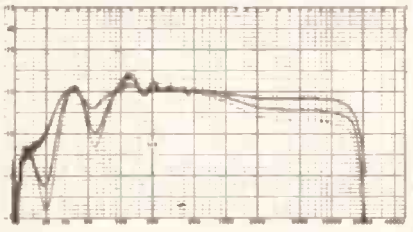
A bumpy tale

Heads that put multitrack onto cassette are true feats of precision engineering. Yet they all exhibit a characteristic that's known as 'head bump'. A slight discrepancy in the way low frequencies are recorded.

Dolby 'C', which reduces noise by controlling the higher frequencies, does not worsen this problem. However, compansion systems (such as BEL and dbx), which affect the entire audio band, accentuate it, unless compensating circuit techniques are incorporated. On the second or third overdub, what was once a clear bass line, can become a rumble. And the resultant mistracking, affects the clarity of everything.



Demonstrations can deceive you

Manufacturers' demo tapes are bound to sound good. They have to, in order to convince you. But the real test, is when you do the test yourself. Plug in an instrument and make your own recording. Check how easily you can perform an overdub. Then listen closely to the sound of your more complex mix. Listen carefully for clear tight bass that doesn't degrade when you bounce*.

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Thank you Dr. Dolby

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DOLBY C NR

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MAKING NOTES

by Brenda Hayward Part 10 **Counter Melody — how to create extra melodies in your music.**

This month I am using excerpts from my Organ Master Theory Book Two for starting to create 'Counter Melody' or 'Counterpoint', which is the musical term for adding extra melody notes and encouraging movement *underneath* the melody notes of the music. The original melody note on the manuscript will always be played in the dominant or highest positions on the keyboard so that it will still be clearly heard as the melody or theme. In Ultravox' Hymn music in this issue you'll find counter melodies used both above and below the tune.

When you are listening to a group of musicians or an orchestra, see if you can ignore or 'shut out' the melody to concentrate on what is actually being played as the 'backing'. The effects you will hear are Counter Melody, Harmony and Bass as the musicians will not all be playing the melody line. A musical arrangement is divided into parts and shared amongst the musicians, so that when each player's part is blended together, a complete melodious arrangement can be heard.

On the electronic organ, left hand chord progressions (see Part 6, June '82) can provide the harmony while the bass pedal notes will be sounding the deep rich bass accompaniment (for pedal progressions see Part 8, September '82).

If by following my articles you can now embellish a sparsely written bass stave, all that is left is to learn the technique of adding counter melody notes to transform a simple musical score into a full arrangement.

A knowledge of scales and the note numbers of left hand chords are necessary to play a counter melody, as it is not simply a case of adding any notes which take your fancy to the melody notes. However, once you have completed the first simple steps this month you should be able to play your own counter melody in any key of music. I'll now show you various forms and ways of playing counter melody.

COUNTER MELODY is created by a movement of notes *underneath* a melody. If the notes move in semitones it is referred to as 'Chromatic Movement', and if the notes move in tones it is referred to as 'Tonal Movement'.

One form of Counter Melody is created underneath a melody when the 3rd note of one chord resolves to the '7b' note of the next chord. In Figure 1 a 'Chromatic Movement' is created between the 'G', 'F#', 'F' and 'E' notes as each note movement is in Semitones.

In the 1st Bar the Counter Melody note is 'E', the 3rd note of the 'C' chord which resolves to 'G' the '7b' note of the 'Am7' chord. In the 2nd Bar the 3rd note of the 'D7' chord, 'F#' resolves to the '7b' note of 'F' in the 'G7' chord. The Counter Melody ends in the 3rd bar with 'E', the 3rd note of the 'C' chord.

The note movement of the Counter Melody is: 'E' to 'G' to 'F#', to 'F' to 'E'.

The example in Figure 2 shows the same 3rd to '7b' note movement creating the same Counter Melody in a different 'Key of music'.

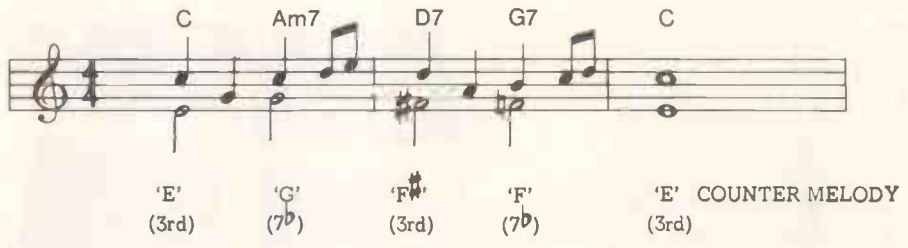


Figure 1.

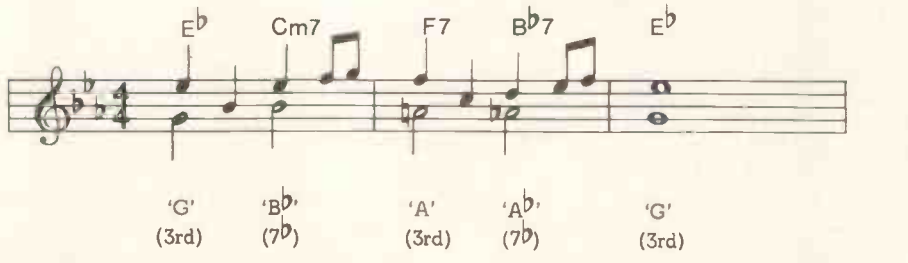


Figure 2.

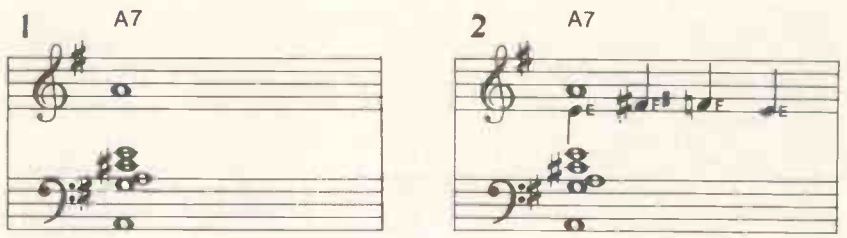


Figure 3.

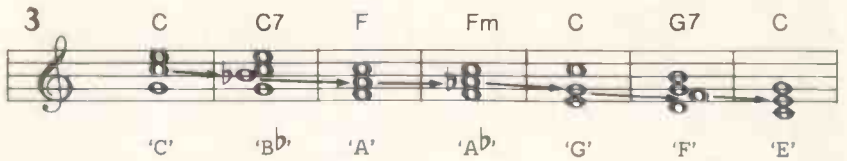


Figure 4.

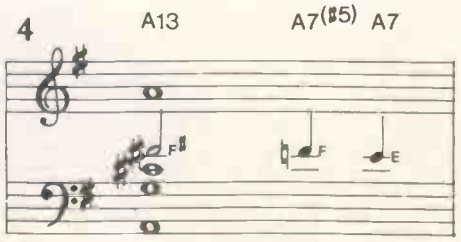


Figure 5.

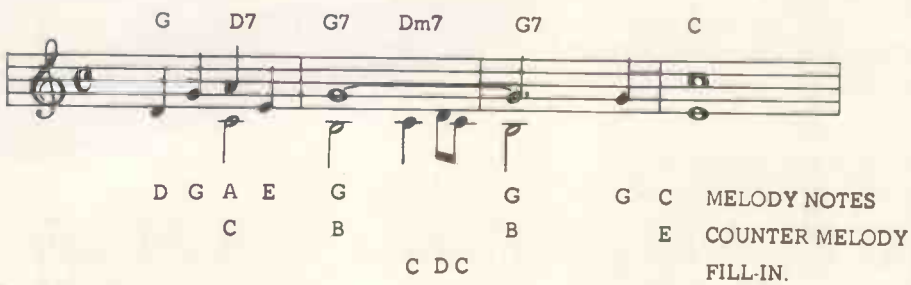
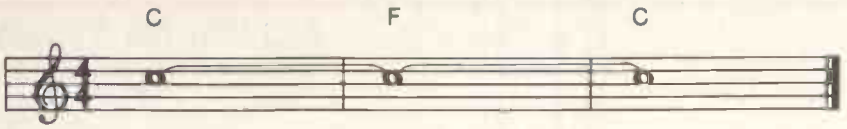


Figure 6.



A normal 3 bar ending with a single, sustained melody note.

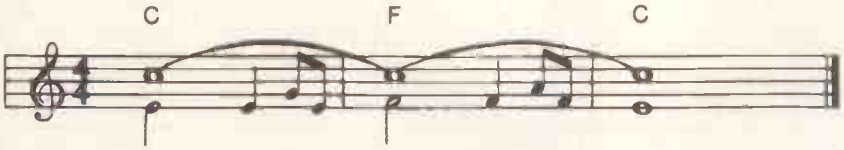


Figure 7. The same 3 bar ending with added 'Fill-In' notes.

This form of Counter Melody can be created with any number of chord changes provided the 3rd note of one chord resolves to the '7b' note of the next chord or vice-versa.

A simple bar of music with one melody note and one left hand chord can be 'filled out' by adding Counter Melody Notes. The added Counter Melody can be created from the 6th, '#5' and 5th notes of the major scale or chord indicated by the chord symbol.

Figure 3(a) shows an 'A' melody note with an 'A7' chord and an 'A' pedal. The Counter Melody is created by playing the 5th, 6th, '#5' and 5th notes of the 'A' major scale underneath the melody note. The 'E' note resolving to 'F#', the 'F#' resolving to 'F', and the 'F' note resolving to 'E'.

Figure 3(b) shows the Counter Melody played underneath the 'A' melody note which is held for the 4 beats of the bar, starting on E.

The next illustration in Figure 4 shows how a Counter Melody can be created by a moving note between the chord changes. The moving note creating the Counter Melody is shown by the arrows: 'C' to 'Bb' to 'A' to 'Ab' to 'G' to 'F' to 'E'.

Using advanced chord symbols, it is possible to create a similar Counter Melody to Figure 3(b) by playing with the left hand the moving notes between the chord changes. See Figure 5.

The Counter Melody notes are 'F#' the 13th (6th) note of the 'A13' chord, 'F' the (#5) note of the 'A7 (#5)' chord and 'E' the 5th note of the 'A7' chord.

The Counter Melody notes are: 'F#' to 'F' to 'E'.

Fill-In notes

A Fill-In uses notes from the chords of the music to create a movement between the Counter Melody notes.

In Figure 6 the Counter Melody starts with the 'C' note (7b) of the 'D7' chord in the 1st bar underneath the melody note of 'A'. The movement resolves to 'B' the 3rd note of the 'G7' chord underneath the melody note of 'G'. The 'G' melody note is held for 4 beats during the 2nd bar. In the 3rd bar the Counter Melody is created by the 3rd note of 'B' in the 'G7' chord underneath the 'G' melody note, tied from the previous bar. In the 4th bar it is created by the 3rd note of the 'C' chord 'E', played underneath the 'C' note. The Fill-In in the 2nd bar uses the 'C', 'D' and 'C' notes from the 'Dm7' chord.

Fill-in notes can also be used to create movement underneath the Ending Melody notes. The Fill-in notes are notes from the ending left hand chords. See Figure 7.

E&MM

Korg EPS-1

In last month's Equipment Scene we previewed the EPS-1, which is a versatile combination of electronic piano and string synthesiser. Since it should be appearing in the shops in the first couple of months of 1983, and its retail price has just been fixed at £919 including VAT, it seems an appropriate time to look at the quality of what is undeniably a fairly expensive instrument.

Happily this turns out to be very high indeed. The EPS-1 is partly derived from Korg's Symphonic Piano series, which with their wooden finishes and luxurious presentation are evidently intended largely for home use. This didn't stop Jon Lord taking one on stage at the recent Zildjian Cymbals show at The Venue in London, and making it clear that they have the power and clarity to cut through a full-scale PA mix.

The EPS-1 if regarded as a stage or professional version of the piano should then be capable of some impressive sounds, which in fact it is despite a specification which at first glance appears a little basic. There are six Piano sounds with a three-way Equaliser, Presence, Key Dynamics and Stereo Effects controls, and a single string sound with a two-way Equaliser, Attack and Release, Key Dynamics and independent Volume control.

The keyboard is very pleasant to use, being carefully weighted although still in plastic, and spans six and a quarter octaves (76 notes) from E to G. In addition it's possible to transpose the pitch of the whole keyboard up or down, as described below.

Working from left to right along the vertical panel above the keyboard, the controls are as follows: Master Volume, which affects both piano and strings when the Mix output is used. Piano Equaliser, with controls calibrated from -5 to +5 for Bass (shelving), Middle (peaking) and Treble (shelving). Piano Presence, calibrated from 0 to 10 and activated at any time by the pull-on method. Push-buttons with accompanying LED's for Piano I, Piano II, E. Piano I, E. Piano II, Clav I, Clav II and Piano Off.

Stereo Effects for Piano section: Chorus and Tremolo pushbuttons with LED's, Speed Control with LED, Intensity control. Key Dynamics for Piano; Transpose control for whole keyboard.

String Attack/Pull-on Attack Dynamics, String Release, String Equaliser, with controls calibrated from -5 to +5 for Bass (shelving) and Treble (shelving), Strings On with LED, Strings Volume.

The Power on/off switch is located on the back of the instrument and doesn't have an indicator light as such, although the Effects Speed indicator at least will always be illuminated when the power is on. There's a heavy piano-style sustain pedal included in the price with a socket on the back panel, and a soft cover also included, although there's no facility for a music stand.

In operation the instrument is quiet, easy to use and rich-sounding. The piano sounds are reasonable imitations of a grand and an upright piano respectively; the electric pianos can give a good version of a Fender Rhodes or Wurlitzer, although of necessity without the overdriven tine bar effect, and the Clavinets can be deep and funky or thin, delicate and Baroque.

In each case the II setting is brighter than the I, and the equaliser can expand the range of effects available. The Presence control is a new introduction, a complex lowpass filter linked to the keyboard to add harmonics and distort the sound according to how hard the keyboard is struck. The handbook claims that this makes it possible to colour the sound as a guitarist would, although its use as a complex tone control alone more than justifies its existence.

Chorus and Tremolo are fairly standard, can be used together and operated in stereo. The usual effects from a slow shift to a manic wobbling vibrato are obtainable. Key Dynamics increases the variation available from the touch sensitive keyboard as it is turned towards 10 — although the handbook states that only the quieter ranges are extended, whereas in fact there's some loss at loud volumes which the user would have to compensate for using the Master volume.

The Key Transpose situated centrally is the now familiar notched slider with C scale central, G at the bottom and F sharp at the top. Fine if you want to fit in with a singer or saxophone — a little unsettling if you've got perfect pitch! This control effects the strings as well — Key Dynamics here can be made to determine the attack of the strings with a pull-on switch so that harder playing gives faster attack. The notes are all individually articulated, so this mode of playing can be highly expressive. Alternatively the switch can be pushed in to give a conventional attack control ranging from a fraction of a second to about 3 seconds, with release working from a fraction of a second to about 4 seconds. The sustain pedal gives up to 6 seconds on all functions.

There isn't a lot of variation available on the strings, although it is possible to get an excellent deep organ-like bass. On the other hand, the sound is very good as it is, permanently chorused and remininscent of the classic Polymoog string sound. One excellent setting has a touch-sensitive chorused Piano I over a slowly attacking string section, the rear panel output jacks giving the options of a stereo chorus, or splitting piano and strings to two different channels, or even both. Use of the sustain pedal gives plenty of time to change settings or change keyboards without a gap.

An expressive and rich-sounding instrument, then, which will appeal to those who want classic simple keyboard sounds rather than a lot of synthesizer hardware. Probably a permanent fixture in many studios, for instance, in the near future. **E&MM**

The Korg EPS-1 is distributed in the UK by Rose-Morris, 34 Gordon House Road, Kentish Town, London. Tel. 01-267 5151.

NEW PRODUCTS

New British Microcomputer

The Lynx, the new 48K British microcomputer from Camputers, will be available from High Street shops throughout the country in December. Dixons, Laskys and the Spectrum Computer Centres chain have all ordered pre-Christmas supplies of the machine, which will retail at £225 including VAT.

Production of the Lynx is now under way in Cambridge. Although supplies will be limited before Christmas, Dixons expect to be stocking the Lynx at a large proportion of their retail outlets; Laskys will have it in 25 of their 60 branches, and Spectrum expects to be offering it at all 60 of the shops in its nationwide network.

The new machine is expandable up to 192K and will have its own printer and 5¼" disc drive available. It is also CP/M compatible which opens the door to a comprehensive selection of business software. With a Z80A processor running at 4MHz, a built in machine code monitor and 40 character by 24 row display it promises to be a very impressive animal.

For further details contact: Camputers, 33A Bridge Street, Cambridge CA3 4AB. Tel: 0223 315063.

Miniature PCB Transformers

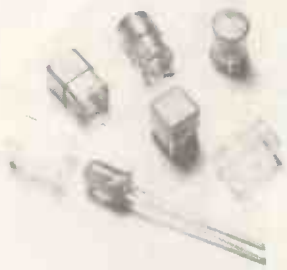
Avel-Lindberg announce their new range of miniature power transformers for direct mounting on PCB's. The non-concentric twin primary and secondary windings are wound on separate bobbins which gives maximum isolation and low inter-winding capacitance. The core construction and winding configuration achieve a near toroidal characteristic with low radiated noise, high efficiency and low temperature rise.

Load ratings of 2, 4, 6, 10, 14, 18, 24 and 30VA are available. The twin 115V primaries can be connected in series or parallel, for operation from 230 or 115V a.c. mains; and the twin centre tapped secondaries give output voltages of 10, 12, 18, 24, 30, 36 and 48V when in series and 5, 6, 9, 12, 15, 18 and 24V when in parallel.

The range are mounted in resin-filled, flat thermoplastic cases, are designed to be through-hole soldered direct to PCB's. Mechanical fixing can be supplemented by four screws using holes moulded into the corners of the case.

For further details contact: Avel-Lindberg Ltd., South Ockendon, Essex RM15 5TD. Tel: 070 885 3444.

LED Snap-In Lens



BOSS Industrial Mouldings Ltd. are now marketing a pair of Snap-In Lens for use with T1¾ (5mm dia) LED's.

Simply by pushing either the round or square lens from the front through a 7.11mm panel hole and then inserting the LED from the rear the whole assembly becomes firmly locked in position without use of tools.

Moulded in red, green, amber, clear and yellow cellulose acetate butyrate and incorporating Fresnel rings and Striated lines, which increase apparent brightness by up to 125%, these flat top 'Lens' allow up to 180° viewing angles.

The Snap-In Lens is capable of being used in metal panels or pcb's of between 1.5mm and 3.2mm thick.

For further details contact: Boss Industrial Mouldings Ltd., James Carter Road, Mildenhall, Suffolk IP28 7DE. Tel: (0638) 716101.

Low-cost Discrete Photo-transistors

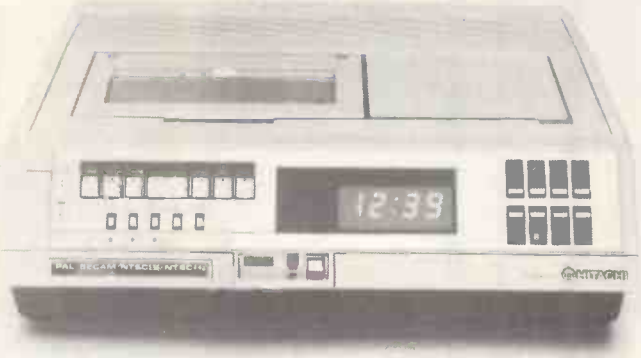
The new TRW Optron OP502 Series of low-cost discrete photo-transistors featuring exceptionally stable characteristics and a wide angle of acceptance is now available from Norbain Electro-Optics Limited.

An overall body length of only 3.68mm compared to the 5.08mm of the industry standard OP500 device gives the OP502 Series a greater acceptance half angle of 27°, measured from the optical axis to the half power point, compared to 10° for the OP500. In addition, the OP502 has the advantage of leads formed to a spacing of 2.54mm.

The Series is spectrally matched to the OP160 near infrared emitting diode and provides a good trade off between wide acceptance angle and optical gain.

Three devices are available, the OP502, OP502A and OP502B with minimum light currents ranging between 0.8mA to 2.5mA. The devices have a typical rise and fall time of 3us, typical saturation voltage of 0.4V and a collector-emitter breakdown voltage of 20V. The operational temperature range of the devices is -40°C to +85°C.

For further details contact: Norbain Electro-Optics Ltd., Norbain House, Boulton Road, Reading, Berkshire RG2 0LT. Tel: (0734) 864411.



Multi-standard video

Hitachi are adding a new video recorder to their range - model VT 8040EM, which has been specially designed to record and playback TV transmissions not only on the PAL system but also on SECAM and 3.58 and 4.43 MHz NTSC.

It has a computer controlled timer which enables any programme to be recorded up to 10 days in advance or the pre-set recording of a daily series of programmes. The VT8040EM has a full line up of features which include visual search - 5 times faster than normal speed, automatic rewind at the end of a tape, audio dub, still frame/pause, frame advance, slow motion (½ speed) and double speed playback. All these functions plus conventional rewind, fast forward, stop and play can be controlled by a wired remote control keypad supplied with the recorder.

All the principle controls are finger tip light action keys and are grouped conveniently on the front fascia panel with LED lights to indicate operating modes as well as to show the system in which the tape is being recorded or played back.

The VT 8040EM measures 435mm wide × 145mm high × 333mm deep and weighs only 11kg. The recommended retail price is £732.

For further details contact: Hitachi Ltd., 32 Craven Street, London WC2N 5NP. Tel. 01-930 0057/58.

Gripping New Case

The new Boston hand-held instrument case range from West Hyde is moulded from black ABS, although other colours are available.

The styling, which has resulted in an extremely attractive as well as functional case, is ideal for all applications involving hand-held digital readouts.

The cases feature a separate battery compartment and an optional thumb-button which could be used to operate on-off or range-change switches for example. A choice of display aperture sizes allows for a variety of digital displays to be fitted.

For further details contact: West Hyde Developments Ltd., Unit 9. Port Street Industrial Estate, Aylesbury, Bucks HP20 1ET. Tel: (0296) 20441.

Japan have made a name for themselves over the last few years as one of the most interesting bands on the UK pop scene. Despite their popular appeal, their approach to studio and stage work differs greatly from that of the average rock band. Keyboard player Richard Barbieri explained to E&MM how the band works, what its influences are, and how solo projects feature in the plans of each member of the band in the immediate future. Finally, we review one date in what is planned as Japan's last world tour.

The Oriental flavour comes about from an interest we've had in Japanese and Chinese traditional music over the past year in particular. We've picked up that interest from visiting and playing in Japan four or five times, and gradually we've become fascinated by the culture and the traditional as opposed to the modern technological music of Japan.

That doesn't mean we're not aware of the ways they're using electronics nowadays, we've been in touch with the Yellow Magic Orchestra and Ippu Do and so on for a long time. David Sylvian our lead vocalist has been working with Riuichi Sakamoto (for instance on the 'Bamboo House' single) and he's just returned along with Steve Jansen our drummer from YMO's concert tour; now we're all very interested in their system of headphone monitoring on stage, it's just like listening to a record at home!

We take most of our influences from classical or traditional music nowadays though. To be honest we can't see any good coming from listening to other bands at the moment; if you listen to diverse types of music, to traditional music or to Frank Sinatra, you're more likely to come up with something original, rather than just becoming part of musical fashion.

In avoiding these fashions we're aware of the dangers of being tied down to something we've created ourselves instead; but I don't think the name of the band, for instance, limits us in any way. The Japanese influences are more on the sound than on the methods of composition, and when we make an album we try to give it a specific sound. On 'Tin Drum' we'd sometimes spend a whole day on one synth sound until it was perfect, and then the sound itself would influence the way the composition went along.

We've tended to work that way since the group was formed. We all knew each other in school about twelve years ago and more or less went straight into the group when we left. The line-up hasn't changed since then, although David has started to play more keyboards as well as singing recently. Steve plays a Tama kit, sometimes a Simmons SDS V electronic kit with the tom-toms in particular used on stage, and also African and Indian drums and marimba.

Mick Karn has two Wal basses, designed by Percy Jones who's played with Brand X and must be our favourite bassist. Mick's also got a Travis Bean bass, again fretless, and also plays African flute, clarinet, oboe, bassoon, Chinese oboe and so on. I've got a Prophet Five, Prophet Ten and Oberheim OBXa, all of which sometimes provide tom-tom or African drum sounds which make the rhythms more interesting.

Studio Work

We wanted 'Tin Drum' to sound acoustic and natural rather than electronic, although a lot of it is played on synths with David taking about 45% and myself about 55% of the work. The percussion is quite dominant because we wanted a lively sound, and we used a new producer as opposed to John Punter who worked on 'Quiet Life' and 'Gentlemen Take Polaroids' and who's doing the live sound for our tour.

John's been involved in about half our music, but on 'Tin Drum' we were looking for a different sound, a hard acoustic sound with a sort of 'dead echo' using single repeats as opposed to a lot of echo or reverb. There's no reverb in Chinese music!

We feel very emotional about the music but a lot of careful thought goes into it, particularly in stereo placement of the instruments. It's actually a very sparse album and so the placing of rhythmic patterns and instruments is very important; we build up a track very gradually and carefully and try to put in the absolute minimum, we like to keep it simple. The spaces are the most important part of any

piece of music!

David writes most of the songs, in that he'll start with a title and come up with lyrics and a very sparse chord structure, which we'll then add to as we want. Sometimes he might have a more detailed idea in his mind, but he doesn't force any particular arrangement on us and we're free to do our own pieces. A year ago I played all the keyboards, but on 'Tin Drum' it was useful to arrange it so that if I had an idea to fill up a piece I could go and play it, of if he had a different idea he could go and play it — it reduced the pressure because there's no way I could imagine playing all the keyboards on that album. In fact we have very different styles, but it all comes over as one style on the album.

Once we've got the basic idea we put a rhythm machine track on tape and begin to add our parts over it. Steve then plays the drum parts in between for a much tighter feel before we take the drum machine off; he's a very tight drummer anyway, with impeccable timing. We're all self-taught; none of us is a virtuoso, it's just a matter of knowing and having respect for what the others can do. If I program a drum sound and have a pattern but can't quite get the timing right, I give it to Steve to play, for instance.

I use a Roland System 700 in the studio, which is great for ideas but not practical for stage use. Also I used an Emulator while I was producing an album in Sweden, and I'd like to use one for vocal effects like choirs and chants. At the moment the polyphonics are best though; I go through about 140 memories on stage, and obviously haven't got time to start twiddling knobs, so all the creative work is done in the studio. Rehearsals are pretty boring for me, because they're just a matter of remembering the numbers and pushing the buttons!

Stage Work

We don't feel we can perform very well on stage ourselves, because we see the studio as the creative medium in which to work. Some bands are more creative live, but we tend to feel a little uncomfortable; ideally we'd like to create the relaxed mood of a classical concert, but we'll probably always get screams and shouts because we'e labelled as a rock band, which I don't really feel we are.

On the other hand I enjoy the excitement of live work, which is why I'm not sure that I want to use the headphone monitoring system; I like to be able to hear the audience or even the occasional feedback. In the studio David multi-tracks the vocals, whereas on stage Mick will sing as well; I don't think I'll ever be able to sing!

We also have to use some backing tapes to do 'Tin Drum' live. Normally we take the master tapes from an album and remix them in the studio to produce a backing tape with just a few of the important rhythmic elements on it. Steve monitors that on headphones, and the rest of us play in time with him, so we can't get out of sync with the tape. We try to keep it all as simple as possible really; I haven't used the built-in sequencer on the Prophet 10 yet, because even if it was triggered in some way I think it would still interfere with the backing tape because that's already got some keyboard patterns on it.

Also we always have a guest musician on tour who takes the guitar parts and some keyboards. In the studio David plays a Rickenbacker guitar with an E-Bow, but there are only two or three guitar solos on 'Tin Drum'; Mick's bass on the other hand is very important, his bass riffs have so much personality. He's in great demand now for other people's projects and I think his style has had a lot of influence.

We try to be visual on stage without making it too complicated. Rather than changing the sets we make them appear to change by using different lighting. We haven't been too involved in video yet because we've never been sure of having total control, although we were very happy with the video for 'Visions of China' which won a music business award as the best video of the year. We are going to release a video of the tour to go with with the double live album, but we want to make them in some ways different from the normal rock band material.

Altogether the tour by the time it's over will have covered two weeks in Europe, six weeks in the UK, then Japan, Hong Kong and Thailand. In Japan they're not quite sure what to make of us — we've been popular there for about four years but have only lost the teeny-bopper fans in the last year and become respected as serious musicians.

Programming Sounds

Programming synths is what I feel most comfortable doing. I can only read music very slowly, and if I sat down and tried to play scales I'd have some difficulty. On the other hand being self-taught helps to develop your own style, and I now find I can imagine a sound in my head and then produce it on the synthesiser.

I prefer to get the sound by programming the synth rather than by using effects. The ring modulator effects on the Prophet are my favourites, but I do use a rack with a Roland Digital Delay, a Roland Stereo Flanger, Six Channel Mixer, Pitch to Voltage Convertor and an MXR Flanger. Now the keyboards are going to be in stereo on stage which means I can get the benefit of the chorus effects.

We don't use a lot of tapes in the studio; about the only ones are those based on a Chinese traditional singer which are cut up and triggered from the Prophet's keyboard. As far as we're concerend the voice is another sound, like an instrument; we've been very much influenced by Holger Czukay's album 'Movies' (see E&MM May 1982) which involved three years of collecting and editing instrumental sounds.

We like old, rough-sounding settings with a touch of white noise, very deep reverb, fast flanging, detuning and so on. On 'Ghosts' we tried to get the same feeling as Karlheinz Stockhausen's 1950's electronic albums which sound very old fashioned and scary in their way!

That means a lot of ring modulator bell sounds, and parallel tuning in fourths and fifths, which also accounts partly for the Chinese feel. All the compositions are based on repeated riffs but either the melody or the sound itself will change each time round. I wouldn't want to program in a whole song because we want to avoid that degree of repetition; I don't want it to sound computerised, it's more emotional than that. It doesn't even matter if you can't hear all the words, because it's more important for David to be able to constantly vary his vocal sound in the same way that I vary my keyboard sounds.

You'd be surprised how many people buy a keyboard and never program it, just sticking to the factory presets. I can't understand anybody doint that; I always feel incredibly guilty about using a factory preset, say for Chinese bells, because I feel I haven't worked for it. I'd rather give my own interpretation.

A lot of people ask if we used a lot of sequencers on 'Tin Drum' but there aren't many in fact; most of it is very tight keyboard patterns, and I'm working on my timing to be able to produce this sort of thing more easily. I can't find enough time to work on technique in the broader sense.

Future Plans

We've just bought a couple of Roland MC4 Microcomposers and next time we record we'll use them to put down some interesting patterns which can be left on the tape as opposed to taking off the backing track. I don't want to get too computerised because it always shows: I was longing to get these things but found I was thinking too much about numbers and mathematics and not enough about music. For the same reason I don't think our music would ever become so complex that we'd use a Fairlight.

JAPAN

I've just had a little trigger interface made up for the Prophet after seeing one in Sweden, and I'm thinking about doing a solo album next year. On the other hand that might not use only keyboards, or even any keyboards at all. I might just arrange some music for other people to play, because I've always wanted to work with an orchestra although perhaps one made up of traditional instruments rather than the normal orchestral instruments.

I've just been working on Mick Karn's solo album 'Titles' which has a very Eastern feel; we're both into Turkish and Arabian music. I think we'd all like to work on more solo projects before recording again; after the tour 'Tin Drum' will be totally out of our systems, as it is I think anything we do in the very near future might be too similar.

The group's been going for eight years now, but I think in a sense it's a good thing to reach the limelight relatively late in the day because it gives you a more mature sound. In the future I'd still like to be able to say that we've never gone out of our way to be commercial, that we've never done anything because we had to.

Japan
Hammersmith Odeon
18th November 1982

An evening of elegance, both musical and sartorial, enhanced by an excellent sound mix and very imaginative stage set and lighting. Extensive use of tapes rounded out the sounds produced by Richard Barbieri's Oberheim OBX and Prophet 10, the two Prophet 5s used by David Sylvian and the guest lead guitarist, Mick Karn's bass and the acoustic drums of Steve Jansen. Visually, the focus of attention on stage was divided between the immaculate cut of Sylvian's clothes and hair and Karn's robot-like appearance as he glided eerily across the stage.

The songs were a selection of old and new. Beginning with 'Sons of Pioneers', the set included 'Private Lives', 'Gentlemen Take Polaroids', 'Taking Islands in Africa', 'Cantonese Boy', 'Visions of China', 'Still Life in Mobile Homes' and 'Methods of Dance'. Most memorable were the highly atmospheric 'Night Porter' and 'Ghosts'. The subdued lighting combined with the glockenspiel and clarinet on 'Night Porter' to send shivers down the spine. 'Quiet Life', which drew the loudest roar of the evening, and 'Burning Bridges' closed the set.

The audience had to work hard to bring them back on stage. Japan accepted the adulation as no more than their due, and returned for two brief encores before the house lights came up and the clapping and stamping reluctantly died away. **E&MM**

Clef Computer Band-Box

If and when the Last Trump comes, there must be a good chance that Clef's Computer Band-Box makes it to The Great Digital Design Centre just out of sheer ingenuity and perseverance against all the odds. Seeing that Clef is a British company, that might sound like nepotism or blowing one's own (country's) trumpet, but, let's face it, synthesiser manufacturers in this country had had a pretty raw deal in the past, judging by the experiences of EMS and Electronic Dream Plant, and they deserve all the help they can get.

As it happens, there is a touch of the 'dream' about the Band-Box, because the frustrations that the designer encountered in playing sax in bands — drunken drummers, keening keyboards, and so on — encouraged him to pursue the goal of 'developing electronic musical instruments which assist the task of the solo musician'.

Put simply, the Band-Box provides a backing trio of drums, bass, and a chord instrument. What makes the unit different to the auto side of the average 'does-all-bar-making-the-morning-tea' electronic organ is that virtually everything is programmable by the user. In fact, the Band-Box is intelligent, in the digital as well as analogue sense of the word (there's a 6502 microprocessor taking charge), and that gives it quite a competitive edge over (thick?) units that might appear superficially similar.

Rhythmic Starts

An extremely unusual feature of the Band-Box is that part of the unit is another Clef product, the Master-Rhythm. In fact, the latter actually fits inside the Band-Box case. For any of the 1,000 or so owners of Master Rhythms this must be good news, because one can convert one's technological backing-track from drums to trio by buying the Band-Box minus the Master Rhythm. It's almost like going from a mini to a sports car by supercharging the old engine and putting the chassis in a new body shell!

Whereas many programmable drum machines of this type have a rather restricted number of voices and rhythm memories, the Master Rhythm has a healthy complement of 12 different voices and 24 memorised patterns of varying lengths. The memory and read/write control is configured rather like an 8-track tape recorder on which recording is carried out one part at a time and playback is from all 8 tracks simultaneously. The recording mode is selected from the Program Control switch, i.e., from bass drum, low tom-tom, high tom-tom, snare, rim shot, long cymbal, short cymbal, or accent options. Each of these tracks can then be fed to one of three groups of instruments according to the position of the Instrumentation switch (see Table 1). The accent track has the effect of overdriving the final output stage of the unit, and this allows a certain amount of dynamic spice to be added to a particular percussive event.

Table 1: Master Rhythm instrumentation

TRACK	STICK	BRUSH	LATIN-AMERICAN
One	Bass Drum	Bass Drum	Bass Drum
Two	Low Tom-tom	Low Tom-tom	Conga Drum
Three	High Tom-tom	High Tom-tom	Low Bongo
Four	Snare Drum	Long Brush	High Bongo
Five	Rim Shot	Short Brush	Claves
Six	Long Cymbal	Long Cymbal	Long Cymbal
Seven	Short Cymbal	Short Cymbal	Short Cymbal
Eight	Accent	Accent	Accent

In general, the quality of simulation is pretty good — especially the bass drum, snare, cymbal, claves, and conga. In all honesty, it can't be said that the cymbal sounds like the real thing — all manner of ring modulation tricks are needed to procure a convincing metallic 'zing' — but the unusual noise generation circuit (an op-amp operating at very high gain) and tune filter produces a very fair and listenable sort of sound which is better than the usual filtered white noise. The least convincing sounds were the t-toms, and I think this has something to do with the rather 'overtuned' quality associated with the twin-T ringing circuits used for percussive synthesis in this unit. Still, a big plus of the Master Rhythm is that all the sounds can be tailored to individual taste via level and resonance presets on the instrumentation board. Such adjustments used to entail poking about inside the unit, but the Master Rhythm now comes with holes conveniently situated beneath the presets for easy screwdriver adjustment from the outside of the case. This also makes it much easier to adjust the drum sounds when the unit is ensconced within the Band-Box. The length of rhythm sequences varies from twelve measures to thirty-two according to the position of the Rhythm Select control, but this is effectively doubled by each section being split into two sequence bins, A and B. Each bin can be played entirely independently or else the Sequence control can be set to program three alternative modes of sequence looping, i.e., A+B, 3A+B, or 7A+B.

All in all, the variety of instrumentation and generous length and number of sequences makes for a very flexible drum machine. I've always thought that mastering rhythms is a better policy than doctoring them, and the Master Rhythm proves my point!

As a stand-alone unit, the Master Rhythm runs quite happily off its own batteries for a good length of time (the blessings of CMOS RAM). Confined within the Band-Box, the Master Rhythm can follow the dictum of 'when in Rome, do as the Romans do' by turning its attention to the Band-Box's power supply. Alternatively, it can remain independent as far as juice is concerned. The advantage of that is that rhythms remain intact if the Master Rhythm is removed by Caesarian section from the Band-Box. Also, the 6V batteries in the Master Rhythm gives a larger op-amp output swing (desirable for percussive sounds) than the 5V Band-Box PSU. Decisions, decisions. Talking of deliveries, an umbilical cord also comes into the picture when the Master Rhythm is kicking away inside the Band-Box. In fact, there's a 7-pin DIN socket on the front of the Master Rhythm which provides some essential communications with the Band-Box circuitry, i.e., the all-important clock pulse (one per measure), a Start pulse, Rest and Play signals, rhythm pulses from the long cymbal control circuitry, and an audio output. The rhythm pulses are actually used to trigger the chord instrument that's synthesised digitally by the Band-Box, but more on that anon. The outputs from the socket can also be used with the Master Rhythm alone to provide clock pulses for one sequencer, rhythm pulses for another, and Play/Rest footswitch connections. Very useful!

Boxing the Band

Unlike the analogue instrumentation of the Master Rhythm, the sounds generated by the Band-Box are wholly digital in origin. In fact, the synthetic principles are the same in any digital system, whether Band-Box, Emulator, Fairlight, or alphaSyntauri. What it all boils down to is that any periodic waveform (i.e., one that's pitched rather than plain noisy) can be represented by a string of numbers stored in memory as a waveform table. The table can consist of 1,024 12-bit numbers (as in the case of the Casheab synthesiser for the S-100 buss) or it can be just 64 8-bit numbers (as with the chord generation in the Band-Box). In general, the more numbers in a waveform table the higher the frequencies that can be synthesised, and the larger the number of bits describing each number the better the quality. However, the vast majority of the current crop of digital instruments use 8-bit resolution in making up waveform tables, and that keeps most people happy. Regardless of the finicky details, the numbers eventually have to

be turned into sounds of different pitches, and there are two ways of going about that. The first technique is to alter the rate at which the numbers are read out of memory (the sampling rate), i.e., a low sampling rate gives a low pitch and a high sampling rate gives a high pitch. That's the principle behind the Fairlight and the Emulator. The alternative approach, and the one used by the Band-Box, is to read out numbers at a constant rate but skip some values to shorten the effective length of the table. That ploy has the same effect as increasing the sampling rate, i.e., the pitch goes up. Turning these numbers into pitches is then just a matter of sending the stream of data into a digital-to-analogue converter and filtering the output into a nice, smooth waveform.

Well, that's a brief digression from the real matter in hand — explaining how one uses the Band-Box and what it sounds like — but these principles are here to stay and one might as well get used to them. The sound quality of the Band-Box is actually very good (it's certainly pretty quiet as regards noise), but there are certain limitations. Firstly, the sounds are static waveforms (a choice of four for both the chord and bass instruments) with an envelope imposed on top (again, a choice of four from the appropriate front panel switches). This gives a fair variety of sounds, but waveforms with no harmonic shifts during the course of the envelope do have an organ-like quality. As it happens, that sort of quality is quite appropriate for the instruments that the Band-Box is attempting to synthesise, i.e., string/electric bass and electric piano/organ chords, so one doesn't feel as if one's missing out on much. The one addition that would help animate the sounds is something like delayed vibrato, but there are FX units on the market which do this, and post-synthesis treatment of sounds may be a better plan of action than trying to force more out of the hard-worked processor in the Band-Box. The second limitation of restricted bandwidth isn't quite as apparent as one might think it should be, and that's probably for the simple reason that one doesn't normally expect a bass instrument to do anything othe than utter the more-or-less occasional Deep Thought. Putting this into figures, the bass compass is limited to sixteen notes (F1 to G2) from 44Hz to 104Hz. Obviously, there are harmonics on top of these fundamental frequencies, but the low sampling rate (5kHz) and low cut-off frequency (700Hz) of the low-pass filter on the output means that you lose out on the highs.

Moving to the chord department of the Band-Box, one finds a range of eighteen notes (E3 to A4) from 165Hz to 440Hz, and the cut-off occurs at 1.6kHz. Again, this restricts the brightness of the sounds, but that's the necessary trade-off if one wants reasonably clean sounds from a digital synthesis system working at low sampling rates.

Putting the whole shishkaboodle of drums, bass, and chord instrument together makes for a pretty impressive combination, and the cymbals and snare certainly help to fill in the top end of the spectrum. All three members of the synthetic backing trio are given separate level controls and outputs (though a mixed output is also provided) and this offers plenty of scope for positioning and treating the outputs within a stereo perspective.

Micro Composing

I've purposely left the most impressive side of the Band-Box — the composing facilities — to the last. The bass and chord instruments have to be fed with the right data at the right time, and that comes from the 'scores' entered into the Band-Box. The score memory (3.5K) is arranged as 35 pages of 100 lines or instructions per page, making a total of 3,500 lines. Each instruction typically consists of a chord type and the duration of that chord entered using the following format:

Line number: 0-99
Group: 0-11 (e.g. '0' for the top line of chords)
Column: 0-11, S., d., J., F. (e.g. '6' to select an Am chord from the 0th group)
Value: 1-8 (in terms of measures from the Master Rhythm clock)

These instructions are entered using the numeric keys on the front panel in conjunction with the Enter and Compose (>) keys, and an 8-digit display provides some all-important visual feedback. In fact, there are two sets of numeric keys: those above the chord chart and the main set below the display. Judging by the layout of the keys, it'd be fair to make the assumption that the chord chart keys are specifically for composing, but they're actually just paralleled with the main input keys. I found this rather confusing, and, anyway, it's much more convenient to use the main set for instructions because of their proximity to the Entry and Compose keys (which actually enter instructions into memory). However, it's not quite an either/or input situation because some composing key functions (10, 11, S., d., J., and F.) don't get duplicated by the main set, and one ends up with flying fingers willynilly. Maybe that's making a mountain out of a molehill, but, as anyone with a ZX81 will know, ergonomics are the name of the game when it comes to entering lots of data, and I'd much prefer to see a single set of input keys with a decent amount of spacing between them. Entering chords is one side of the input story, but the composing facilities of the Band-Box also allow tacet bars (using the F. key) and segno/dal segno loops (using, respectively, the S. and d. keys) to be programmed. Such loops will then keep on repeating until the Coda button (or footswitch) is pressed, in which case the Band-Box will move on to the next instruction after the dal segno.

If there's any stream to be crossed in getting accustomed to the Band-Box, it's the somewhat overwhelming choice of chords. Still, better too many than too few! The column/group method of choosing chords is intelligent, but it does take time to learn where the chords are and what some of them actually sound like. It'd certainly be very helpful to be able to hear the Band-Box's interpretation of a chord at the input stage before committing it into memory. Entering a chord into the Band-Box only programs the harmonic flavour and duration, not the actual rhythm with which it's played. That crucial element comes from the Master Rhythm, courtesy of the long cymbal rhythm pulse, and it seems a sensible way of going about chordal animation — particularly because, whichever rhythm pattern is selected, the chords will then be played with the appropriate rhythm from the long cymbal track. However, unlike the drums and their accent control, the chord rhythm pulse is just a stop/go signal, and the chords can't help but sound a little lacking in esprit de parti. One can get around this a bit by using the right sort of envelope, but it still sounds a bit too regular for (my) comfort.

Though there's the Band-Box syntax to be learnt, entering scores is a pretty speedy process. Also, editing and reviewing is made very easy by the facility to scroll forwards and backwards through the lines of a score. As an example, the bars below took just 17 instructions (i.e., 17 lines) to enter into the Band-Box: 2-bar drum intro (bass and chords tacet), D/// A7s/ A7/ D/// A7s/ A7/ Segno: Bm/// E7/// G/// A7///: Dal Segno D Finish.

The Band-Box actually comes with 20 or so preprogrammed 'classics' for instant playing, and the protocal for accessing these or your own scores is simply a matter of keying in the right index numbers (page number and starting line), pressing Play, and retreating after lighting the blue touchpaper. A logical place to start a score is on the 0th line of a page, but it can start anywhere within a page and go on for as many pages as your fingers feel like entering.

The first version of the Band-Box (or, rather, the first monitor ROM — the source of all the composing and synthesis routines) only provided preprogrammed bass patterns, but the latest software allows bass lines to be entered in roughly the same way as chords. Four bass programs can be entered, with up to 20 instructions in the case of three of them and 170 for the fourth, and are selected on playback from the Bass Figure switch. For each bass instruction, four notes are available from each chord. Generally, these follow the options of root, third, fifth, and sixth or seventh. The other instruction needed to define a bass line is the time interval (in ½ measures) between one note and the next. Again, all this is done by using the input keys in conjunction with the Enter and Compose keys. I rather like the sound of the Band-Box's bass, and, with the added facility to program in your own bass lines, it's made even more attractive. In fact, by programming in the right chords (which needn't be actually heard), it's possible to make the bass play exactly the notes you want for a bit of demonic bass solo.

Conclusions

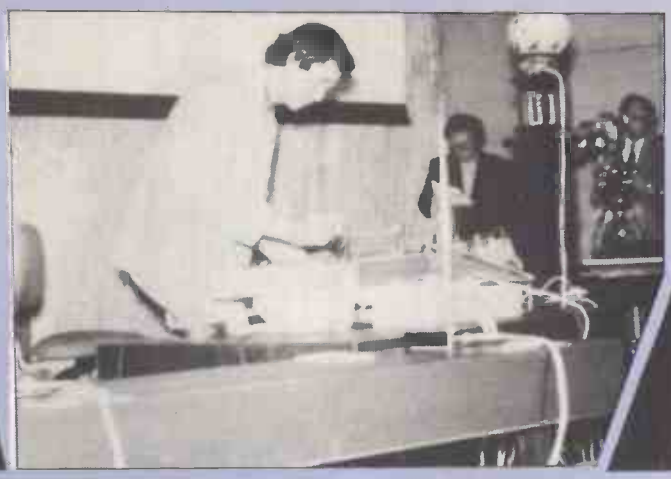
The most obvious user of the Band-Box is the solo artiste (indeed, I gather that a good percentage of units have gone in that direction), but I think there's also a lot of general electro-music potential in it. The backing trio concept of the Band-Box can't fail to raise the hackles of some people in the MU, but a fine counter-argument is that such a unit gives musicians and singers the chance to perform without the financial headaches of organizing a band.

Like the Master Rhythm, the Band-Box is available as a kit (£314 as against £439 for the assembled version), and, according to Clef, "if you can build the Master Rhythm, then the Band-Box shouldn't be any problem". Anyway, whichever option one chooses, it does seem good value for money. Also, it's extremely reassuring to know that the unit won't stop here as far as improvements/additions are concerned. An add-on memory board (to expand the score memory to 9,000 lines) is very much in the pipeline, and, amongst other rumours I've heard, there's also an intention to widen the range of sounds available for the bass and chord instruments.

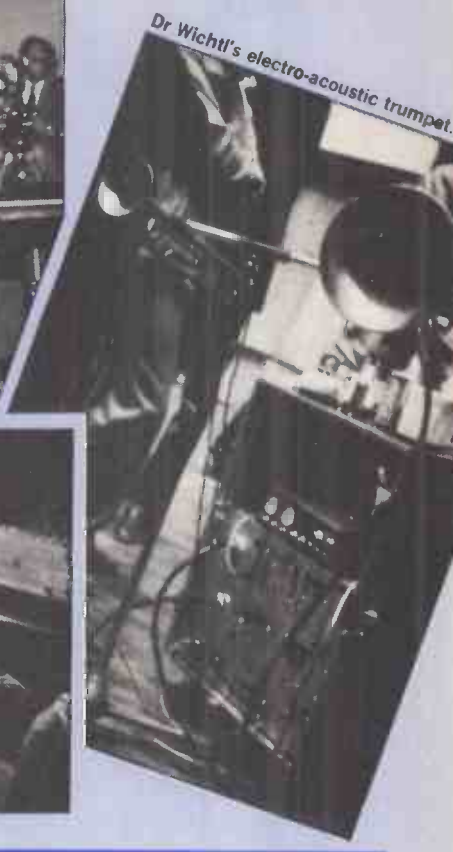
David Ellis **E&MM**

The Computer Band-Box costs £439 and is available direct from Clef Products (Electronics) Ltd., 44a Bramhall Lane South, Bramhall, Stockport, Cheshire SK7 1AH (Tel: 061-439 3297).

Hüter's Syntouch.



Ivan Tcherepnin.



Dr Wichtl's electro-acoustic trumpet.

ARS ELECTRONICA GRAND PRIZE

The 'Grand Prize of Ars Electronica', first awarded in 1979, is an international event that gives musicians an opportunity to show their original designs of electronic musical equipment. An international jury, chaired by Robert Moog, along with Gerhard Dellmann, Bertha Sarasin-Baumberger, Prof. Dr. Werner Kreitzfeldt, Bruno Spoerri and Tom Darter, awarded the prize in 1982 to 'the most original and future-orientated new development in the field of electronic sound production'. Here are comments about the seven final entries judged at last year's 3rd Ars Electronica festival.

Serge Blenner (Fr.) His live performance used the PPG Wave 2.2 Computer, PPG Waveterm video-terminal and disk memory, plus 20-channel DR mixer to analyse acoustic sounds, make resonance graphs, store 8-track compositions and dynamic poly-rhythms. Unfortunately, the presentation did not show the potential of the system, which is still under development, but we've an interview in next month's issue that discusses PPG's plans.

Joel Chadabe (USA) 2nd prize. Prepared 3 pieces for the NEDCO Synclavier I, but without keyboard, and controlled by an RCA 3301-ASCII terminal. Two sound antennae (reacting from body capacitance) and an electronic handclap touchswitch were also employed, the latter for starting and stopping programs. The first piece 'Rhythms' contained random sequences that were self-generated by the system; 'Play Thins' used the antennae to control frequency and duration to create an improvisation between musician and computer. 'Solo' had the computer acting as an improvising orchestra with speed and instrumentation (vibraphone and clarinet-like sounds) changed by the antennae. It proved to be an interesting presentation, having some surprise effects even for the composer!

Hans Deyssenroth (Ger.) 3rd Prize. Presented a 'bass sequencer', based on the KIM-1 micro (6502 CPU), that controlled a Minimoog and Roland's System 100. In addition, a Fender Rhodes and an old Dynachord tape echo were used. Rhythms were generated on the Roland TR-606. The 6K bass-computer program holds two sequences at a time, claimed to be derived from biorhythms, and played two pieces that successfully demonstrated its ability to produce jazz-style bass lines.

Uwe Hüter (Aus.). Performed on his 'Syntouch' – a synthesiser shaped like a guitar, with 2 parallel rows of 19 'frets' that are really touch contacts replacing two guitar strings. His playing was disappointing, since he only used one sound, especially as the instrument does offer full synthesis control from its Curtis chip circuitry (as in the SCI Prophet and E&MM Spectrum synths). On its neck are 5 extra sensors, one for pitchbend and others for detuning. Besides VCOs, VCAs, VCF and ADSR, there's an LFO and 2 Bandpass filters for joystick control, plus string ensemble and noise generator.

Peter Kohlrusch & Benjamin Heidersberger (Ger.) 'Head Resonance Company'. Their project was a curious soundhappening that developed in a sometimes confused, yet increasingly ecstatic manner reminiscent of Cage's experiments, such as 'Variations IV'. In the centre of the stage was a computer-controlled analogue multiplexer that received the sounds (via microphones) of 8 audience volunteers in arbitrary sequence. The sound material was further alienated by ring modulation treatments, mixed with taped and EMS Synthi AKS noises. Every 20 seconds, the connections changed with performers' faces displayed on video screens. The verbal expressions actually came out like part-song whimpering! Apart from the group dynamics, it lacked musical interest generally.

Ivan Tcherepnin (Grand Prize Winner) from Paris. His performance was based on the use of a Persian dulcimer, played with sticks, and treated by a specially designed SERGE Modular Synthesiser System. Incidentally, Serge Tcherepnin, the designer of the Serge System, is believed to be Ivan's brother! At the end of the signal chain was a Lexicon PCM 41 Digital Delay for special time modulation effects in the range 400ms to 1s. Between the miked up dulcimer and the Serge synth were pitch-to-voltage converters, and envelope gate voltage followers as the main controllers. The result was 'subharmonic Klangreighen' (loosely meaning 'sequences' and formed on specific chords like 'inverted flattened VII'). The overall sound impression was very complex, mainly from the echo treatment. It is worth noting that subharmonic Klangreien has been used before, e.g. by Oskar Sala on his 'Mixture Trautonium' composed in the 1930's (on Telefunken 'Elektronische Impressionen' 1979).

Dr Martin Wichtl from Vienna. Well-known for his novel musical instruments and devices, e.g. mouthpieces for flute, tubular chimes, and now – the electro-acoustic trumpet, where a real trumpet is the final sound source. To get the trumpet to play, Wichtl has a flexible tube sealed to the tube where a mouthpiece is normally inserted. This carries the vibrations from the other end of the tube which is also sealed (somehow!) to the front of a loudspeaker. Since his initial sounds are from a microphone, tape recorder and synthesisers, fed into the speaker via an amplifier, Wichtl's creation is a mechanical transposition of electronic music! He readily admits his design is very simple and with a voice sounds like a vocoder. His good instrumental technique on the Lyricon produced some nice sounds and was further modified by various dampers/mutes and even beer cans – most amusing!

Markus Aigner **E&MM**

Listen to the sounds & conversations with Ultravox on E&MM Demo Cassette 9.

ULTRAVOX

Midge Ure
(Vocals, Synths, Guitar)
Billy Currie
(Keyboards & Violin)
Chris Cross
(Synth/Gtr Bass)
Warren Cann
(Acoustic & Electronic Percussion)

Hymn

from their 'QUARTET' LP Chrysalis CDL 1394

An Electro-Music Transcription by Mike Beecher

About the LP 'Quartet'

Unlike 'Vienna', which was done very quickly, this latest LP was done step by step, like 'Rage in Eden', which took three months with some twelve hours every day on it. The rest of the tracks were also done over quite a long period until completed. Most of the material was recorded at Air Studios and then finished at Montserrat in the Caribbean with George Martin doing the mixing and overdubs.

'Reap the Wild Wind' was the most percussive song from the LP with Warren using a lot of Simmons SDSV modules. The bass line (as on 'Serenade' and several other tracks) is the group's own pre-recorded bass guitar sound in the Emulator. The PPG Wave 2.2 synthesiser made the main sounds for the piece, which was released as a single.

The Hymn

"We put this on a different level from the sleigh bells, jingling kind of piece for Christmas", says Warren. "The song just gave us the feeling for the season as a sort of anthem. There's a guitar solo from Midge in the middle section and quite a lot of backward tape sounds — voices in particular."

"A portion of the song is from one of the first tunes we wrote with Midge in the band some three years ago. 'The Hymn' starts with a vocal intro accompanied by a throaty vocoder-type PPG preset mixed with multi-tracked vocals — sounding like a choir. The chorus section main theme is done by Billy on the CS80 (with the ribbon controller — a trade mark of ours!). Midge uses a lot of open strum guitar done with a capo to keep the strings ringing."

"There's a bass counter melody in the verses on the PPG", adds Midge, "and the triggered strings is from the Emulator (with a Synclavier 'strings' sample we've done). The solo was done on Bill's ARP using the flanger with a Marshall Time Modulator and second oscillator switching octaves to give it our special sound for Ultravox. The vocal line was quite a challenge for me especially as the key changes up and it took a long time to get right at Montserrat — think Russian male voice choir and you've got it!"

"I've stopped using the Yamaha CS50 and CS40M because by the time they're stacked up you couldn't see me above the keyboard! I've kept Yamaha's SS30 string machine though which I think is great — I don't think we've ever played anything without it. The main synth is now the PPG Wave 2.2 which is very versatile. I like its stereo output which widens the whole sound on stage, although it probably doesn't affect out front too much. The detuning facility adjustable on every sound is useful and so are the 99 memories. In 'The Hymn' I used a Cymbalom type of sound with it, as well as some really good percussive effects. In 'Visions in Blue' I play the bass in stereo on the PPG while I'm singing the vocals — we're using Electro-Voice and Shure mics at the moment. My 'vocal rack' gives me total control for singing by using footswitching at the front mic position on stage and also at the keyboards. I can switch in echo, bizarre EQs, flanger/doubler (more as a doubler), AMS Digital Delay and Yamaha E1010 Analogue Delay. I don't know of other vocalists who control their own sound on stage — maybe I'm the only one! Peter Woods, our electronic engineer, put the rack together for me."

"I'm using an early version of the ARP Odyssey synth plus the Yamaha string synth for a nice phased chorus 'cello sound," says Billy. I also like the Elka Rhapsody strings for a colder feeling. The Yamaha Electric Grand uses an MXR Flanger to fill it out a bit and also a Boss Chorus. Then the Yamaha GS1 has the strings for 'Visions in Blue', for example, (I've been to Hamburg with Dave Bristow to work on new sounds for the instrument such as a bell sound I wanted). The CS80 plays 'The Hymn' theme using its string presets — very loud! And the Emulator gives flute sounds whilst my newest addition for soloing is the PPG — but we don't use its sequencer. We trigger the last two from Warren's main trigger unit, (incidentally designed by Peter Kershaw, E&MM micro consultant)."

"My violin has a process unit that added transposed pitches of octave, third, fourth below and fifth above, with a compressor to keep the sound at an even output level — important for violins since its upper notes get weaker."

Finally Chris comments on his line-up: "I use Minimoog and PPG Wave 2.2 for bass and harmony lines with MXR flanger/doubler in my own rack amongst other things, plus Martin side fills that are popular these days. We've several Yamaha scope tuners (PT-4) for checking out pitches and my guitars are Yamaha's new active guitar plus an Ibanez Roadstar."

Warren will be discussing his percussion equipment in one of his forthcoming drum column pages.

The group have had a completely new stage set made for their current tour — everything is light grey, including keyboards, guitars, PA, drums, Billy's violin right down to a grey carpet and all fittings! The large futuristic 'building' that forms the background and sides has windows for spots and lighting crew. Smoke billows out from hidden pipes, and even cables have been concealed to present a 'smooth' clean appearance. The light show bounces off the grey to give plenty of colour.

Ultravox are currently doing a series of tours covering Ireland and the UK. They've also a German TV show where they're doing two songs using a 70 piece orchestra and large choir which is a new experiment for the group. Then they're off to Scandinavia, through Europe, followed by a short break before covering Canada, the American East and West Coast, Japan, New Zealand and Australia.

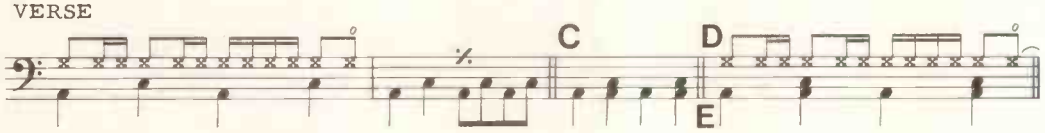
Use these parts as a guide for drums: The bar marked A is repeated throughout music section A, the bars marked B are for all section B, etc. Where important beats are added, these are indicated on the score on a drum line.

S = Synthesiser
G = Guitar

Drums — BD SD HH © Cymbals

DRUMS

VERSE

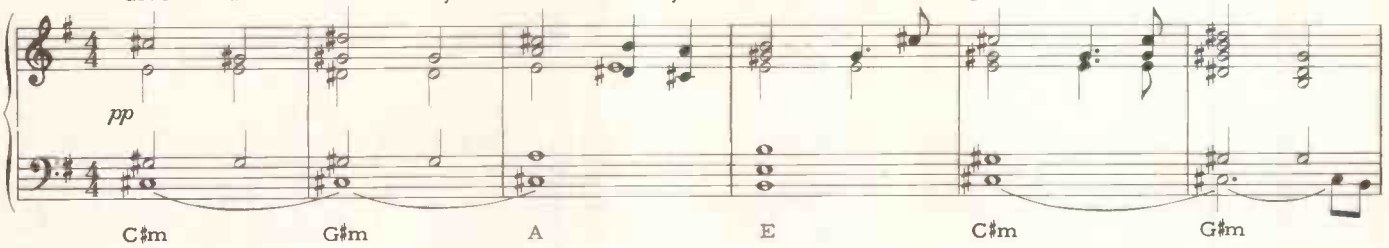


RECORDED ON CHRYSALIS "Quartet" (CDL 1394) and now released as a single.

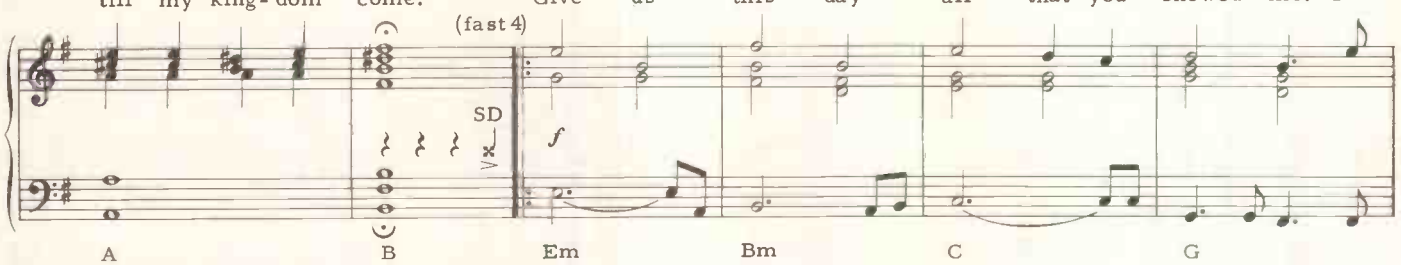
INTRO

Slow

Give us this day all that you showed me, the power and the glo- ry



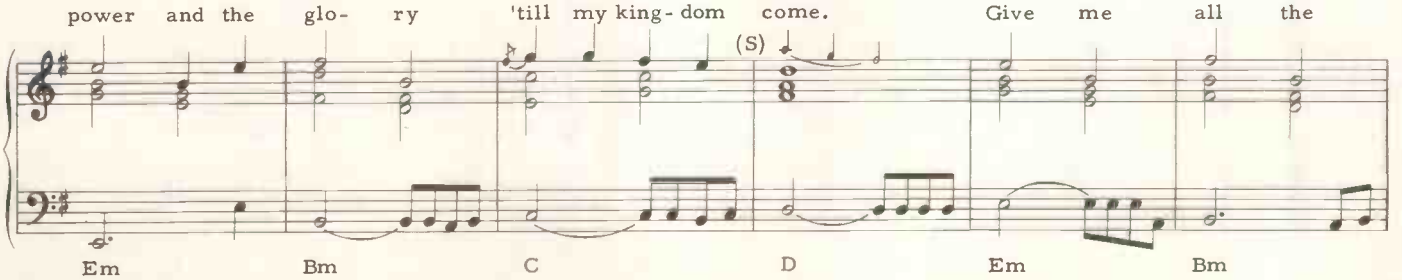
'till my king-dom come.

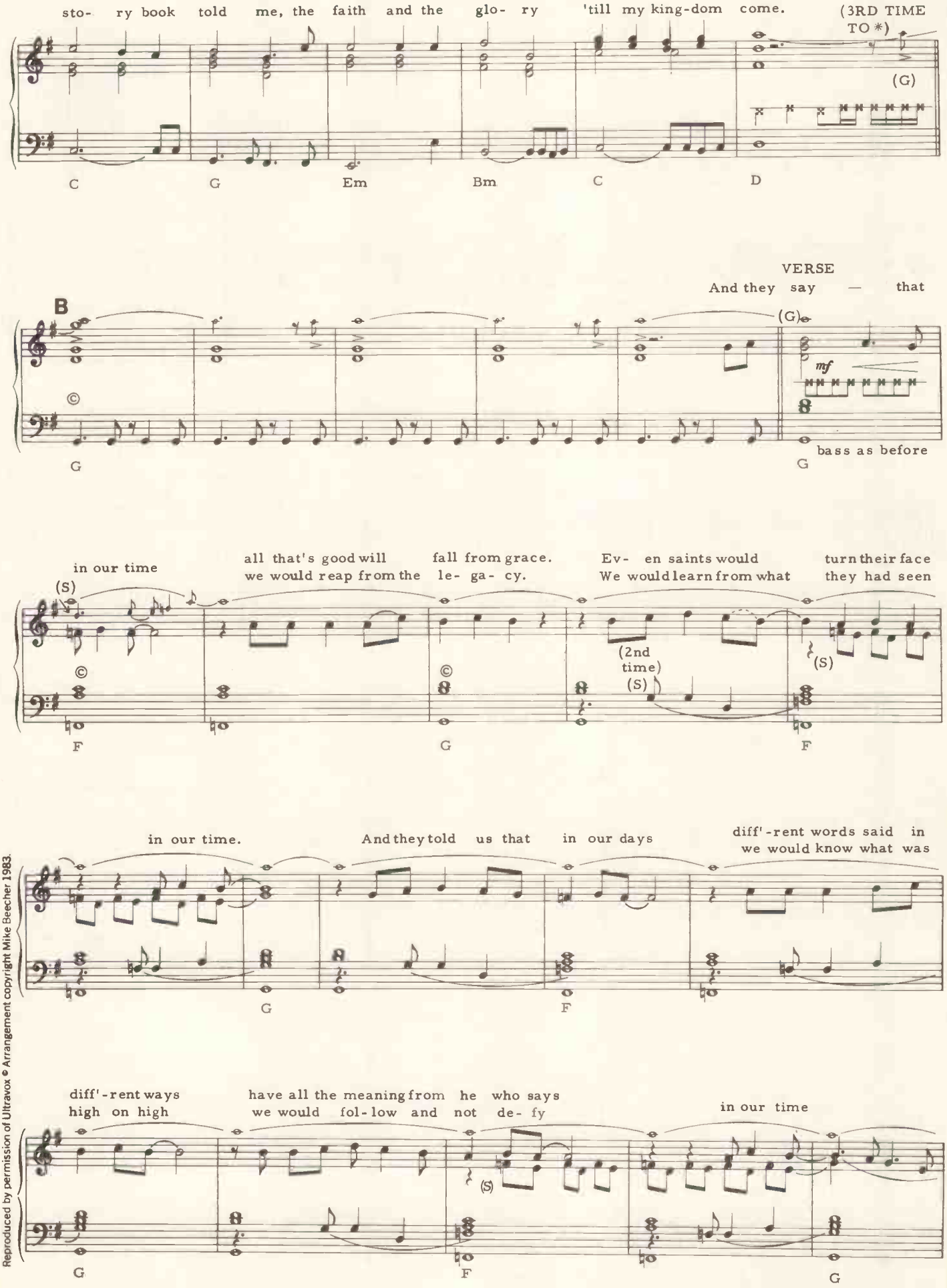


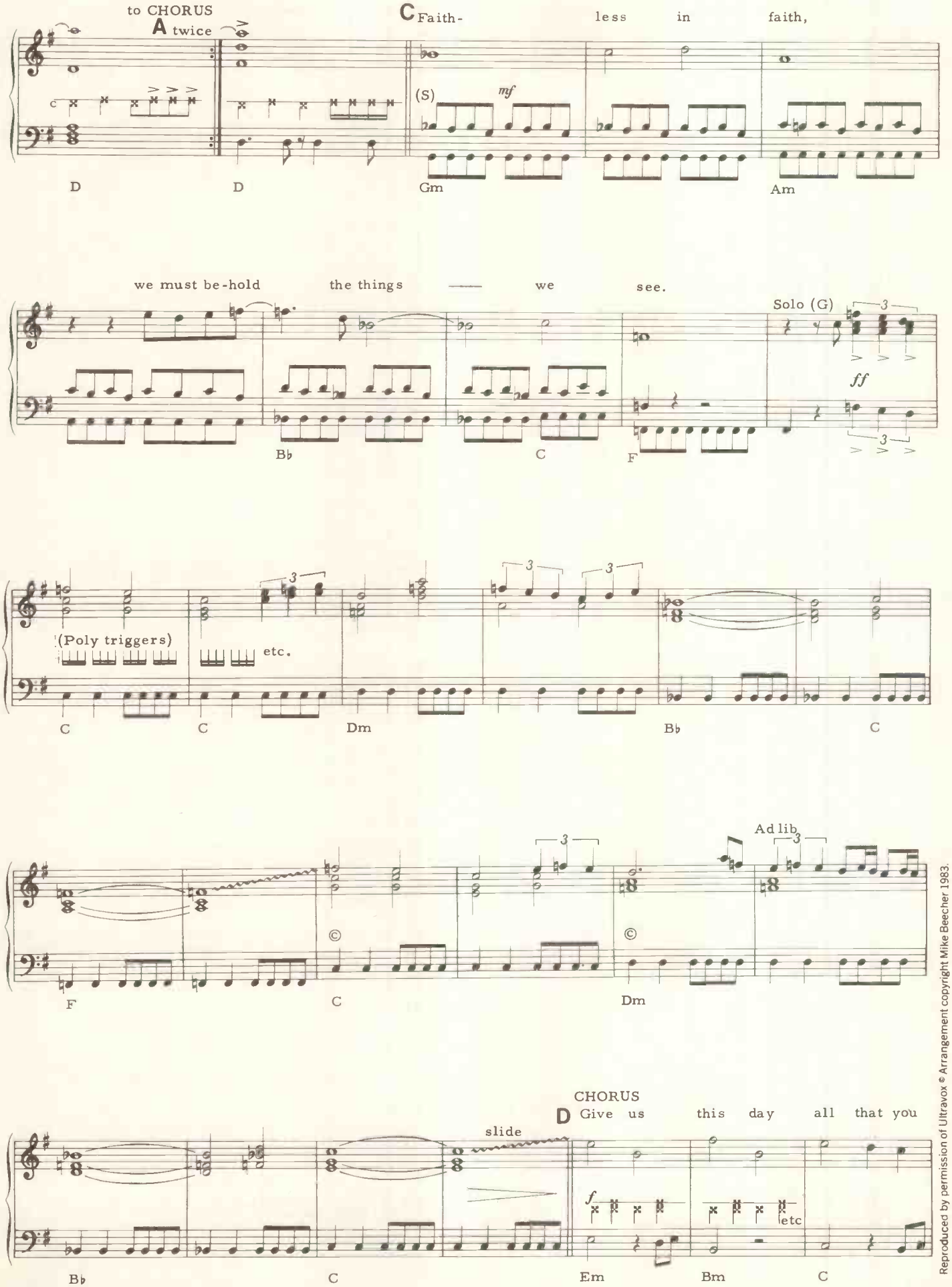
A CHORUS

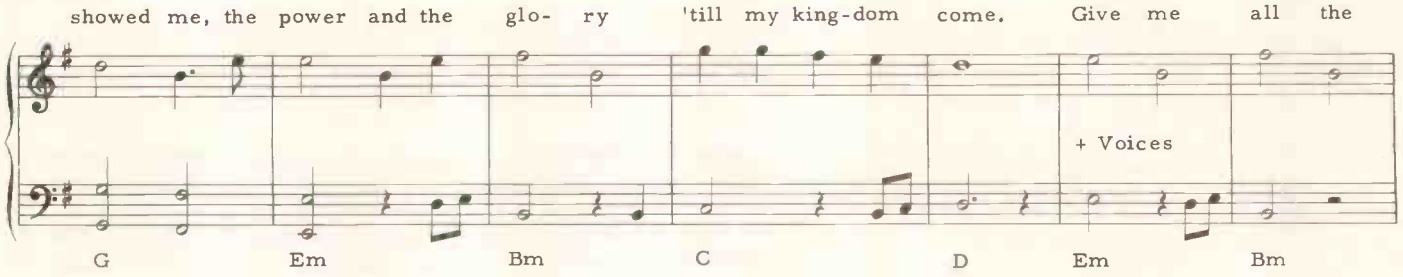
Give us this day all that you showed me. The

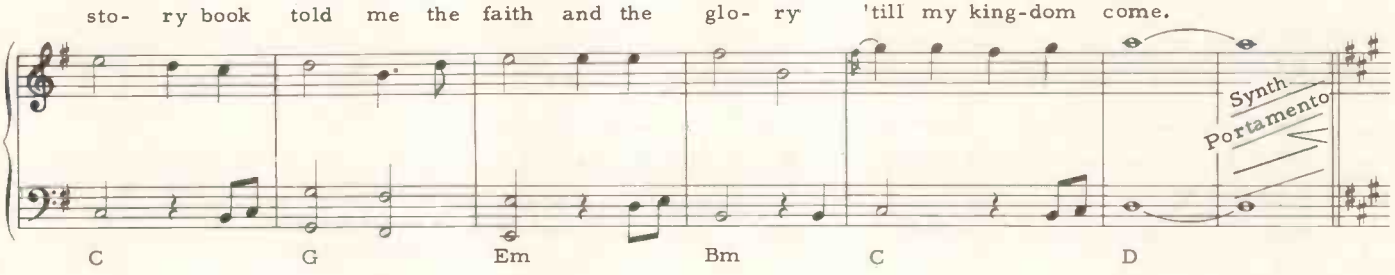
power and the glo- ry 'till my king-dom come. Give me all the

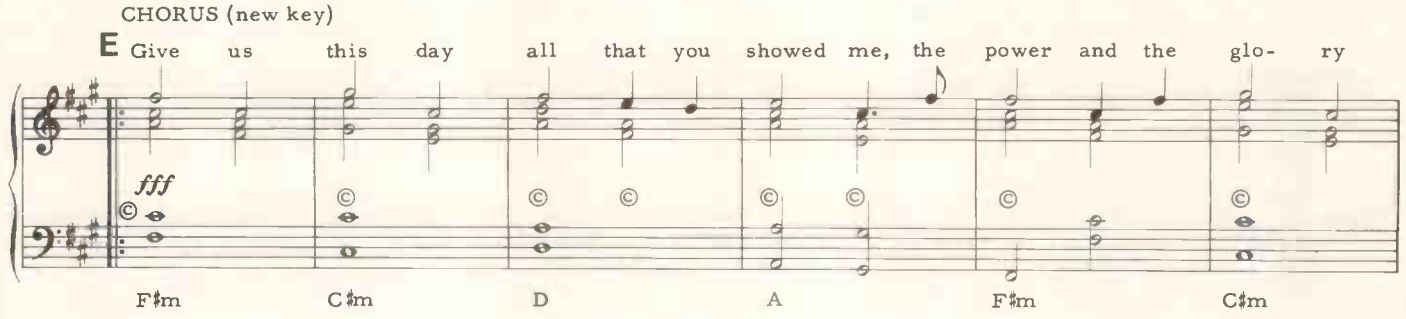


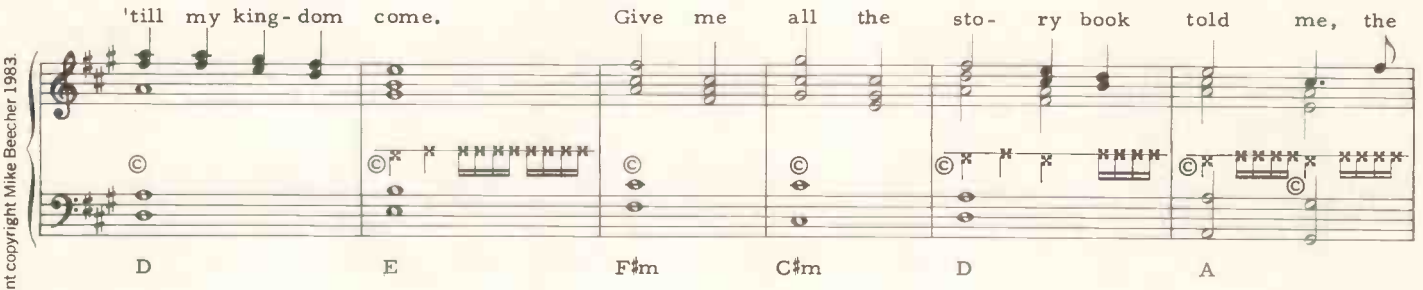


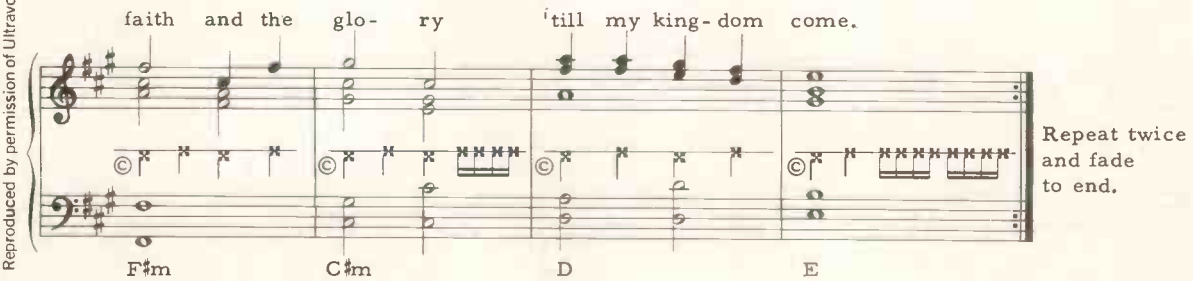












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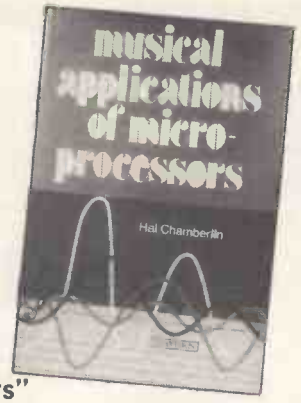
ELECTRO-MUSIC CROSSWORD COMPETITION

No. 6



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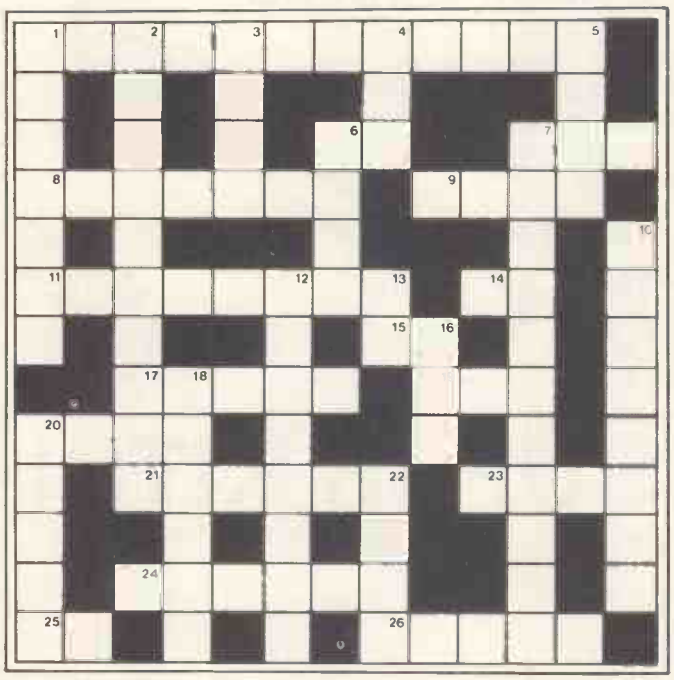

Across

1. These will change your voltage (12)
6. Popular music paper — Marilyn Monroe's favourite? (1,1)
7. Fifth note of the scale in the movable-doh system (3)
8. ------music — the sort you're interested in (7)
9. What you do to a Lyricon (4)
11. This computer synth is Rod Hull's choice (8)
14. To begin, switch . . . (2)
15. Code of manufacturing practice in the UK (1,1)
17. Strips of plastic and metal which reproduce music (5)
19. High Rupture Capacity fuse type (1,1,1.)
20. The make of synth that started it all (4)
21. Naturally ambient echo affect (abbr.) (6)
23. Larry is a speedy American synthesist (4)
24. Noise source of a guitar or bass (6)
25. The Musicians' Union (1,1.)
26. Type of drum — a trap? (5)

Down

1. Speaker that does bird impressions (7)
2. Ate an trout (anag.) — it reduces the amplitude (10)
3. Improvisational black vocal style (4)
4. Revolutions per minute (1,1,1.)
5. Opposite of 23 Across — musically, adagio (4)
6. Not stereo, not polyphonic (4)
7. Apple-based computersynth pursues the noise (11)
10. Electronic device opposes current (8)
12. Early electronic instrument, mint here? (8)
13. — & —, regular, sad music? (1,1)
16. Charles Aznavour's song about a woman (3)
18. They arrange bookings (6)
20. A note half the length of a semi-breve (5)
22. Insects, or electrical faults (4)

All answers can be found in back issues of Electronics & Music Maker.

November's Answers:

Across: 1, Module; 4, Muse; 6, Nice; 7, Fostex; 9, Rule; 10, RMI; 11, Eminent; 14, Lol; 15, Minimoog; 17, Gig; 20, ESSP; 23, Ultra; 24, Output; 25, Sync; 26, Layers.
Down: 1, Monopoly; 2, UFO; 3, Mix; 4, Metronome; 5, Effect; 6, New; 7, Fairlight; 8, Sonic; 12, Men; 13, Neo; 16, Guitar; 18, Gear; 19, Buss; 21, Poly; 22, APRS.
November's winner: Nick Fountain from Tooting, London.
We acknowledge with thanks the co-operation of John Wiley & Sons Ltd., who distribute 'Musical Applications of Microprocessors' in the UK.

PARTS COST GUIDE £25

* **Breath Control for any Electronic Instrument**
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E&MM Synblo

RECORDED ON DEMO CASSETTE No. 9

by Kenneth McAlpine

There are many ways of adding expression to your playing; using footpedals, effectors, modulation controls or by altering control settings. The number of parameters you can alter at once, however, is dictated by how many spare hands/feet you have at your disposal!

The Synblo has been designed to add dynamic expression to an instrument signal using only the player's breath. By blowing into the plastic pipe connected to the unit you can control Harmonic content and Amplitude, with the internal Filter and Amplifier, or another variable parameter connected to the external output. A trigger signal is also available which is activated when the 'breath' signal reaches a pre-set threshold.

A block diagram of the system is shown in Figure 1. The Breath input consists of a crystal microphone insert mounted directly onto the PCB. Air blown along the plastic tube, connected to the unit via a modified ¼" jack plug (see construction text), then passes into the mic producing a signal. This signal is amplified, rectified and smoothed by the envelope follower and then buffered to provide the control voltage.

The Sensitivity control adjusts the mic level and therefore how hard you have to blow to operate the circuit, while Decay adjusts the decay time of the envelope follower/generator. This control voltage is fed to the Voltage Controlled Filter (VCF), the Voltage Controlled Amplifier (VCA), to the trigger circuit and to the external output. An LED is also connected to this point to provide an indication of the CV level.

The instrument signal is first passed through the VCF which is a -12dB/Octave State Variable filter which can be switched between Band and Low pass modes. The Resonance control alters the feedback or 'Q' of the filter while the Level control sets the manual cut-off frequency. The output of the filter then goes into the VCA which also has a Level control to set the manual gain. Both the VCF and VCA have 'Bend' controls which adjust the amount of control voltage from the 'Breath' section. The output from the amplifier is connected to a Bypass switch which can be used to switch the unit in or out.

Circuit

The full circuit diagram of the Synblo is given in Figure 2.

The crystal mic insert is connected directly to the Sensitivity control. The signal tapped from the pot is filtered, to cut off low frequency 'thumps', by C1 and R1 and then amplified and rectified by IC1a, the gain of which is set up by R3 and R2. The output from the op-amp is used to charge up C2 and produce the required envelope. A discharge path is created by R4 and the control RV2 which sets ther decay rate. A final low pass filter is provided by R5 and C3 to clean up any noise on the control voltage. The signal is buffered by IC1b and then sent to the 3 pots for Filter, Amplifier and External Bend, the LED and the comparator IC1c. The threshold for this device is approx 1V and is set up by the potential divider R7 and 8.

Both the VCF and VCA require positive and negative supplies, which are created by producing a third centre rail which is used as '0V'. The centre rail, is produced by potential divider R32 and 33 and buffered by IC1d.

The VCF is built around one IC, that is the LM13600, this device contains two transconductance amplifiers and two matching buffers. In the configuration shown IC2 acts as a State Variable filter with a roll-off of -12dB/Octave.

The input impedance is 47k and signals up to 1.5V P-P can be handled before distortion. The input signal is decoupled by C4 and attenuated to a suitable level for IC2a by R11 and 12. The output signal can be taken from either pin 8 or 9 giving bandpass or lowpass characteristics respectively.

The cut-off frequency of the filter is set by the current flowing into pins 1 and 16 and therefore by the voltage applied to R19 and 20. The manual cut-off frequency is set by RV7 and the 'Bend' amount by RV3.

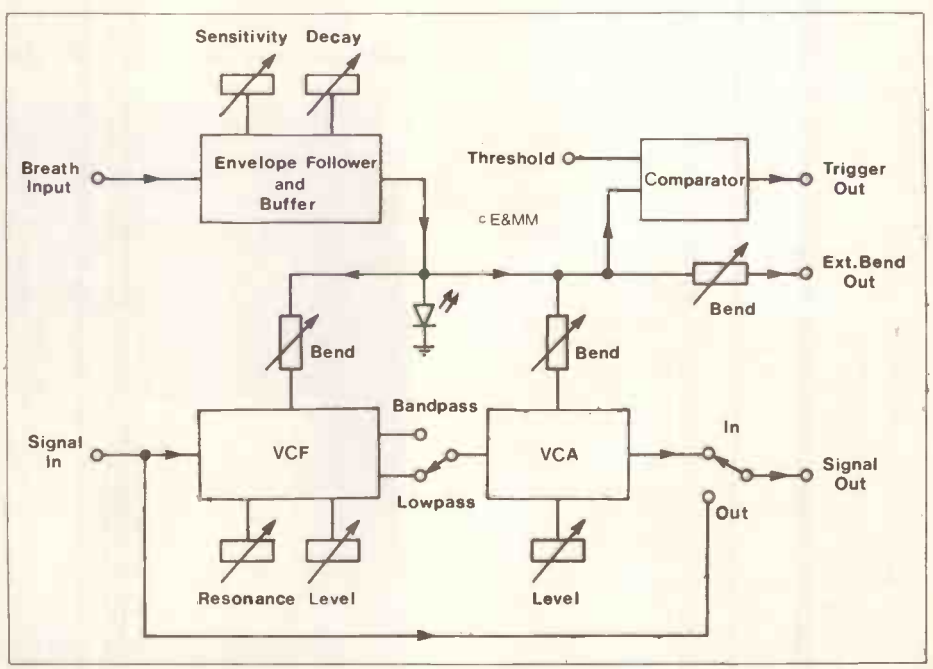


Figure 1. Block diagram of the Synblo.

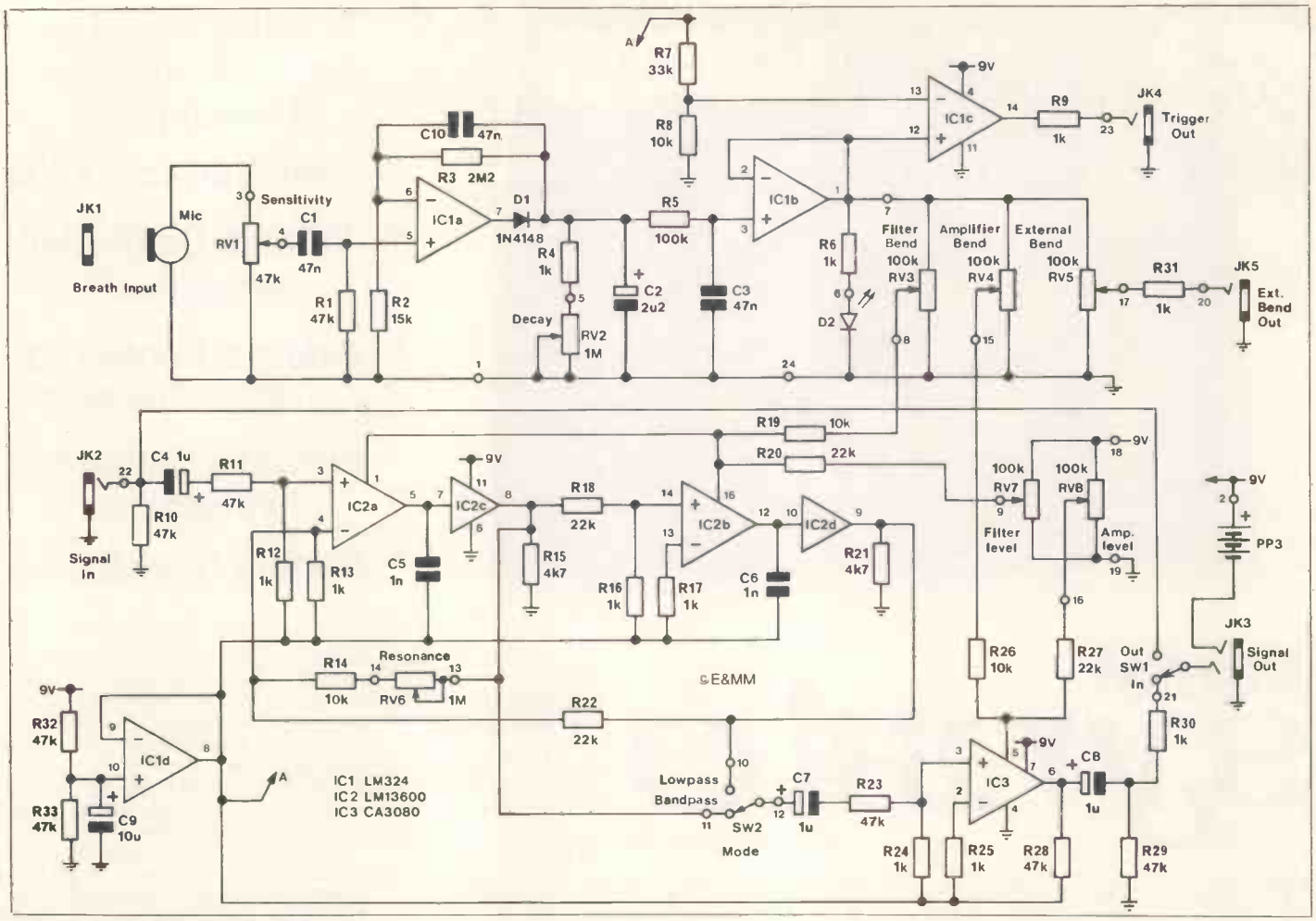


Figure 2. Circuit diagram of the Synblo.

The output from the filter is applied to the VCA via the capacitor C7 and is attenuated by R23 and 24. The VCA is based around the CA3080 transconductance amplifier. The gain of this device is set by the current flowing into pin 5 and therefore by the voltage applied to R26 and 27. The manual gain is set by RV8 and the 'Bend' amount by RV4. The output current is converted to a voltage across load resistor R28. This voltage is decoupled by C8 and fed to the bypass switch SW1. The 'Signal Out' jack is a stereo type to allow the battery to be disconnected when the jack plug is removed.

Construction

The breath input on the prototype is a plastic tube connected to the case via a modified jack plug and socket. However, should you want to take the mic out of the case and use an alternative such as the boom mic on a set of headphones, a standard socket could be used to connect it to the circuitry.

The breath tube was constructed using plastic tubing with a 3/16" internal diameter and a standard ¼" plastic jack plug (with metal collar). The plug is converted by removing the tip, insulation, connecting stem, which runs up the middle of the jack, and the solder tags. This is accomplished by removing the casing and cutting the pressed end of the stem with a large pair of cutters. The jack plug should now fall apart leaving you with the outer tubing (earth) and threaded collar intact. The plastic tubing should be a good tight fit into the plastic jack body and once secured (with an epoxy if required) can be screwed onto the modified metal part. The edge of the metal tubing should be rounded off with a small file to make insertion into the socket easier, since the tapered tip has now been removed.

The receiving socket is a moulded plastic

Continued on page 66.

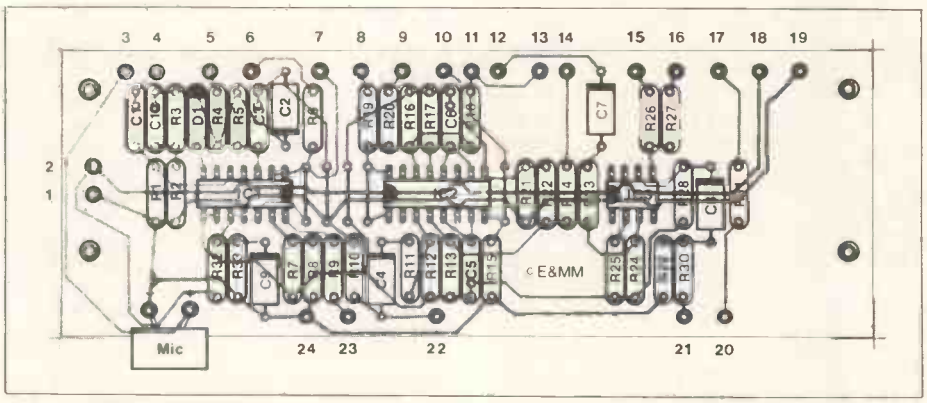
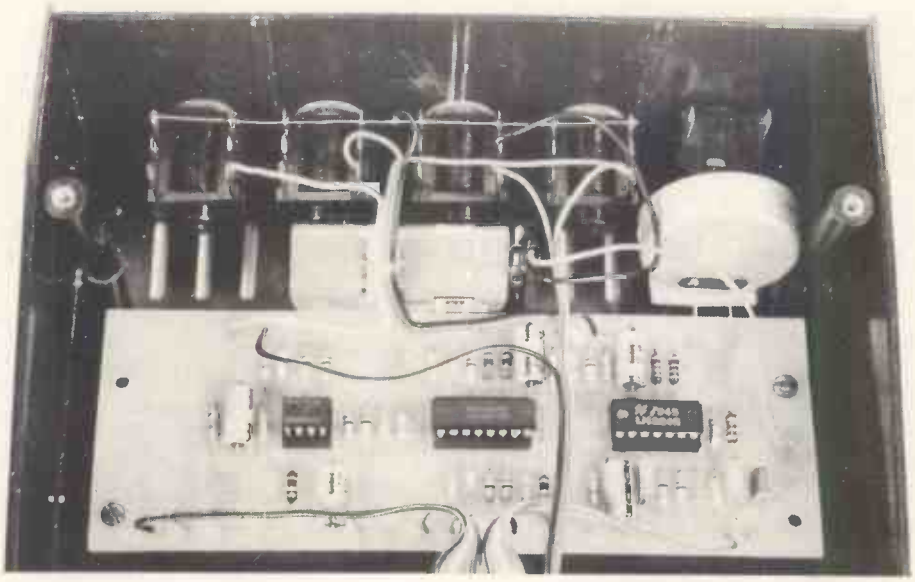


Figure 3. Component overlay of the Synblo PCB.



An internal view of the Synblo.

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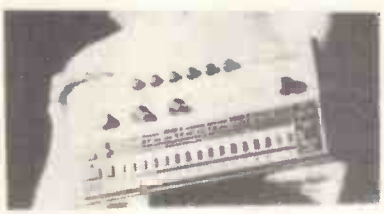

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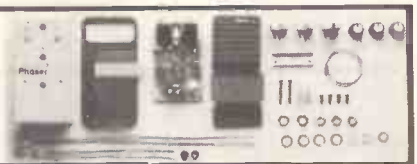

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Continued from page 64.

E&MM Synblo

type. Since the jack plug now has no 'live' connection half of the socket has to be removed. This can be done using a sharp knife or small hacksaw. This leaves only the 'earth' contact which, being sprung, holds the breath pipe plug.

A finished case can be supplied by E&MM. The only modification required is to cut a hole in the bottom of the box to allow excess moisture from the tube to drip out. The size of the hole depends on the dimensions of the mic used. (A sharp modelling knife makes quick work of this stage.)

All the components are mounted on the PCB with the pots and sockets connected with flying leads.

With Figure 3 as a guide insert and solder the links (5 in all), then the resistors, diode, capacitors — making sure that the electrolytics are inserted the right way round, and finally the IC sockets, if required. The IC's can be inserted at this stage — again noting the correct orientation.

Presuming that the E&MM case is used, or that you have prepared a suitable enclosure, the wiring can now commence.

First the control panel: once the pots and switches have been mounted the common connections can be made. Using solid core wire link between the right hand tags of pots RV1-5, 7, 8 and the LED. Then connections between the left hand tags of pots RV3, 4, 5 and between the left hand tags of pots RV7,8 can be made. The rest of the wiring is to the PCB and is made with reference to the wiring table and Figure 3.

Next the rear panel: Connect a common 'earth' bar between the sockets and then refer to the wiring table and Figure 3 for the PCB connections.

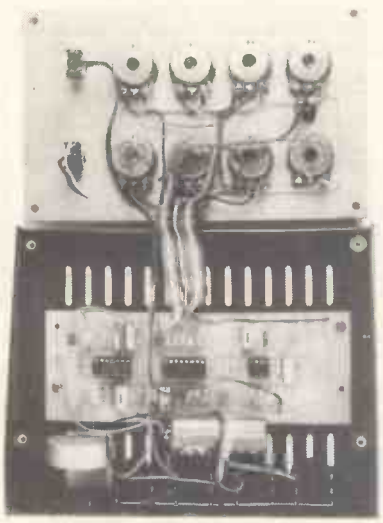
Lastly, the mic insert can be connected/mounted to the board using stiff single core wire spaced approximately ½" from the edge (see internal photographs). Foam padding can be inserted to prevent it moving around if the case is likely to receive any violent knocks.

Testing

Since there are no presets to adjust, testing is a simple matter of connecting an output (to switch on the unit), the breath pipe and a battery.

With the Sensitivity and Decay controls halfway blow into the pipe, the LED should glow brightly then gradually fade. If this does not occur check all connections and component orientations. Presuming that all is well, connect a signal to the input, set the Amplifier Level to full and slowly increase the Filter level, the characteristic synthesiser WAA should be heard on both Lowpass and Bandpass settings. Now turn up the 'Bend' controls and check that the breath input modifies both the Filter and the Amplifier.

When both the External output and the Trigger have been tested, and are known to be working, the unit can be used to make music!



An internal view of PCB and Control Panel Wiring.

The Synblo in use.

WIRING TABLE

FROM	TO		
1	Spare Ground	14	RV6/3
2	+ve battery	15	RV4/2
3	RV1/1	16	RV8/2
4	RV1/2	17	RV5/2
5	RV2/2	18	RV7, 8/1
6	D2 Anode	19	RV1-5, 7, 8/3
7	RV3-5/1	20	JK5/2
8	RV3/2	21	SW1/1
9	RV7/2	22	JK2/2, SW1/3
10	SW2/1	23	JK4/2
11	SW2/3	24	RV1-5/3
12	SW2/2	SW1/2	JK3/3
13	RV6/2	JK3/2	-ve battery

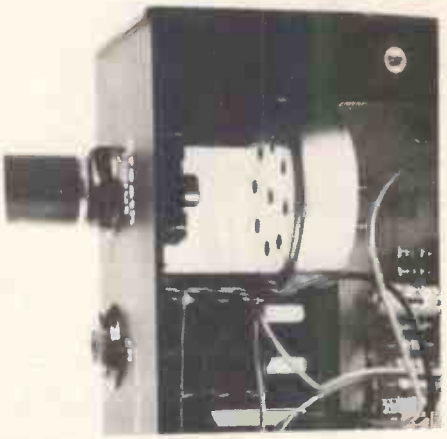
Using the Synblo

The only way to get the best results out of the Synblo is to experiment and practise, however, a good initial setting is: Sensitivity — 7, Amplifier Bend — 8, Amplifier Level — 5, Decay — 4, Filter Bend — 8, Filter Level — 4, Resonance — 10.

Points to note when using the Synblo: 1) Since a fair amount of liquid drips from the casing, especialy with enthusiastic playing, it should be situated away from vulnerable electronic equipment. A piece of blotting paper or similar material under the case can prevent any problems. 2) If the internal mic is used the case should not be placed on or near speakers which are relaying the processed signal otherwise feedback can occur holding the envelope on thereby losing the effect of the breath pipe.

The external control can be used with another synthesiser to great effect to bend oscillator frequency, pulse width, modulation depth etc., if these parameters are accessible on the instrument. The trigger can also be used to provide some interesting effects. It provides a positive going +9V signal which stays high for the duration of the breath input or Decay envelope. This can be used to trigger ADSR's or even to clock a sequencer! The possibilities are endless, so put your music where your mouth is!

E&MM



The breath input plug and socket.

PARTS LIST FOR SYNBLO

Resistors — all ¼W, 5%, carbon film

R1,10,11,23,28,29,32,33	47k
R2	15k
R3	2M2
R4,6,9,12,13,16,17, 24,25,30,31	1k
R5	100k
R7	33k
R8,14,19,26	10k
R15,21	4k7
R18,20,22,27	22k
RV1	47k 1in
RV2,6	1M 1in
RV3,4,5,7,8	100k 1in

Capacitors

C1,3,10	47nF polycarbonate
C2	2u2 63V Axial Electrolytic
C4,7,8	1uF 63V Axial Electrolytic
C5,6	1nF ceramic
C9	10uF 25V Axial Electrolytic

Semiconductors

D1	1N4148
D2	0.2" LED
IC1	3403 or LM324
IC2	LM13600
IC3	CA3080

Miscellaneous

JK1,2,4,5	¼" Mono jack socket
JK3	¼" Stereo jack socket
SW1,2	SPDT miniature switch
MIC	Crystal Mic Insert
	8 pin DIL socket
	14 pin DIL socket
	16 pin DIL socket
	LED clip
	Knobs and caps
	Battery connector
	PCB
	Case
	Connecting wire
	1M 3/16" dia. Plastic Tubing
	¼" Mono jack plug

A fully finished case for Synblo with drilled, silk screened, panel is available from E&MM, 282 London Road, Westcliff-on-Sea, Essex SS0 7JG at £7.95 inc VAT and P&P. Please order as: Synblo case.
The PCB for Synblo is also available from the above address at £2.45 inc VAT and P&P. Please order as: Synblo PCB.

MUSIC MAKER EQUIPMENT SCENE

Roland have several interesting new additions to their Amdek range this month, and are beginning to forge a link between music and a newly accessible form of heavyweight computing. Accordingly the new range includes a computer composition interface called Compu-Music, an analogue to digital interface, an X-Y chart plotter, and in addition a whole range of video display units.

First the **CMU-800 Compu-Music**, a computer peripheral half the size of an Apple which only requires an optional 'personality module' to make it compatible with almost any home computer, including Apple (slot 5), MZ-80K, 8032 Pet and so on.

Once connected to the computer and an amplifier the Compu-Music generates its own sounds for melody, bass, percussion and backing chords. The minimum 48K of RAM needed gives 9000 programme steps, which is sufficient for a composition about five minutes long, although for practicality and speed a disc drive for loading and storage will be found useful.

The outputs of the Compu-Music are as follows: Channel 1 is for melody, a preset sound with variable decay. Channel 2 is for bass, again with variable decay, and Channels 3 to 6 produce chords with a piano-like sound. In each case a control voltage and gate are available, which do not provide control over dynamics at the moment. Outputs are on standard 1V/octave scale.

Channel 7 is a synthesiser control output only, while Channel 8 is a control output with a portamento facility. In addition, there are individual audio outputs for bass, melody, chords, and for the rhythm section which draws on the same memory store as the other channels.

The rhythm section produces seven sounds, Snare Drum, Bass Drum, High and Low Toms, Crash, Open and Closed High-Hat, and is programmed in a similar manner to the familiar Doctor Rhythm. It can use 16 or any other number of beats in a bar, and like the other sections can be comprehensively edited, chained, looped and so on using the computer keyboard.

Tempo control is available on a front panel pot or there are clock in and out sockets for external rhythm machines, sequencers or arpeggiators. The computer VDU gives a constant display of the state of the composition on various pages, and reminds the user about the options available including Point Edit, Play, Loop Play, Change of Bias (for calibration with different external systems) and so on.

The **Amdek ADA-200** is an Analogue-Digital-Analogue convertor peripheral, again compatible with most home computers, for instance via Slot 3 of an Apple. It has two channels which sample any analogue input, ranging from synthesisers to thermocouples, convert the input to an 8 bit digital code and make this available for computer manipulation.

Front panel controls give a wide range of options for AC/DC inputs, Trigger Level, and Position where an oscilloscope display is being used. The Sweep Trigger can activate an X-Y plotter for a hard copy of the display, and so for instance a microphone input can be digitised and displayed temporarily or recorded on paper permanently.

Nine different sample times are available with a bandwidth trade off in operation, so that 8 seconds gives 2kHz bandwidth whereas higher rates can give up to 18kHz bandwidth. Software is presently being written to increase the potential for manipulating the stored information, and it is hoped that Fairlight CMI-style sound reproduction will eventually be possible. A Wave Memory software package including an interface card is already available for storage of up to four waveforms.

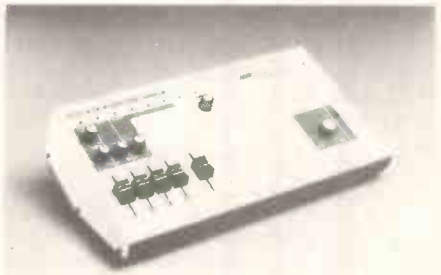
The Amdek DXY-100 X-Y plotter has a standard Centronics interface built in for easy compatibility with any computer which can already operate a printer, and offers a very large A3 maximum paper size at a very low comparative cost.

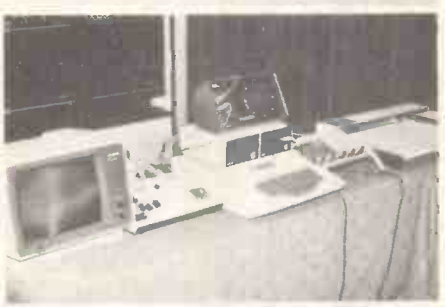
The DXY-100 is capable of tabulation in 0.1mm steps, automatic measuring and data processing, simple graphic drawing, music scoring and so on. It includes fourteen control commands including options for solid or broken lines, 10 different marking shapes, 15 letter sizes, axis changeover, and the potential for ROM expansion for complex tabulation including curves, hatchings and original character design. One obvious application is in transcription of music from the Compu-Music unit.

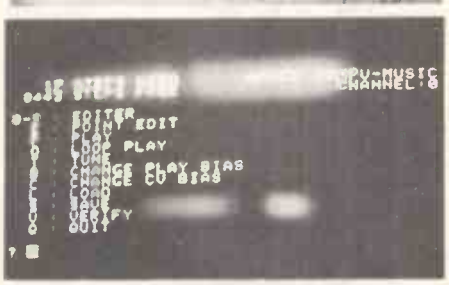
The range of Amdek VDU's includes two monochrome and four colour units. The **Video 300** and the **Video 300A** are black and white monitors with green and amber screens respectively, each with anti-glare design and intended to sit neatly on an Apple, for instance. Like all the monitors they offer much higher resolution than standard television screens, greater picture stability in the case of games, and for the colour monitors better separation between the sixteen tones often available nowadays.

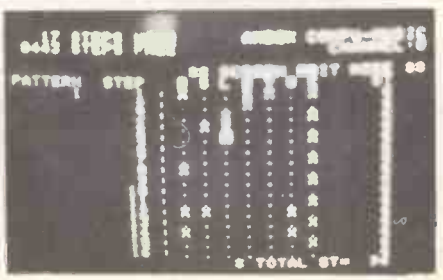
Colour 1 has a standard composite video input with audio channel and built-in speaker, whereas **Colour 2** has an industrial grade CRT and retails for around £700 as a result. **Colour 3** has a domestic grade CRT and so is somewhat cheaper, whereas the forthcoming **Colour 4** is expected to be of an even higher quality.

The links between Amdek's range of music kits as featured in E&MM or Hobby Amdek, and the peripherals now appearing or Compu Amdek, should be a source of great interest in the near future. Approximate retail prices are £350 for Compu-Music, £200 for the ADA convertor, £700 for the X-Y plotter, and £100 for Video 300/A. *Further details are available from Roland UK, Great West Trading Estate, 983 Great West Road, Brentford, Middx. Tel: 01-568 4578*









Picture captions:

Amdek CMU-800 Compu-Music

Amdek ADA-200 Interface

Amdek DXY-100 Plotter.

New Amdek Equipment.

Compu-Music 'Menu' display.

Compu-Music 'Rhythm' entry display.

TRANSPOZER

This month we continue our exciting new project with detailed descriptions of the circuitry for the main unit and the Pitch Ratio display option along with practical uses for the unit.

- ★ Wide range of studio effects
- ★ Pitch transpose ± 1 octave
- ★ Pitch ratio display option
- ★ Delay and freeze facilities
- ★ External control input
- ★ Rack mounting case

Circuit Description

Figure 2 shows the complete circuit. The input amplifier stage IC1a allows the input sensitivity to be varied between microphone levels and synthesiser-type levels, using the level control RV1, and presents a high impedance to the input source. IC1c and d constitute the anti-aliasing filter, which is of the Sallen and Key equal capacitor value 4th order type with a Butterworth response, giving a 24dB/octave roll-off. The signal is monitored at this point by the comparator IC2a which drives the peak indicating LED, D4, when the signal level is beyond the converting range of the system. TR1 and IC12 together with C10 form the write sample and hold which presents sampled analogue levels to the conversion comparator IC8. Analogue levels converted back from digital data in the memory are sampled by TR2 onto C11. The signal is reconstituted by the sixth order Sallen and Key filter IC3b, c and d, giving a roll-off of 36dB/octave. The mix control RV2 then mixes the treated signal from the re-constituting filter with the 'dry' signal from the input amplifier to produce a composite signal at the wiper of RV2 which then passes to the output. R1 ensures high frequency stability even with highly capacitive loads. Some of the treated signal, controlled by the feedback control RV3, may be mixed with the 'dry' signal by IC1b for subsequent re-processing.

IC13a provides a control voltage for the read clock in accordance with the settings of the pitch shift controls, RV4 and RV5, and the voltage on the external control voltage input, J3. IC13b via SW3 allows an offset to be applied to IC13a to give additional flexibility in choice of external control voltages. The write clock, IC2c and d, sets the timing for the conversion processes. In the harmony mode SW1a is open leaving C20 to bring about a 40kHz write clock frequency. In the delay mode, with SW1 closed, the parallel combination of C20 and C21 lowers the clock frequency to about 20kHz. The write clock output is passed to the storage area via IC20 and is returned, slightly delayed, to the conversion section. The timing of the conversion process is clarified by the timing diagram shown in Figure 3. Analogue to digital conversion is initialised when the write clock goes low, causing IC4 pin 3 to go high. On the next high to low transition of the 600kHz HF clock IC4a the flip-flop IC5b is set. A short pulse is gated from the high signal now on IC5 pin 9 by the monostable formed by IC6c and IC4c. This pulse is used to start the SAR, IC7. As explained previously, the digital word is built up in the SAR bit by bit. The first bit, however, is a polarity bit which is set up by IC8 before the IC5a flip-flop changes the mode of the DAC, IC9, from its decode mode to its encode mode. The remainder of the bits are set up with IC5a set and thus with IC9 in its encode mode. IC8 compares the input voltage with the IC9 encode output current derived from data being put on the data bus by the tri-state buffers IC10 and 11.

The two current output ports from IC9 each have two connections although they are not differential outputs; only one is used at a time, depending on the polarity of the signal. R18, 19 and R21, 22 must therefore be of close tolerance to keep the signal symmetrical and hence keep the distortion low. The output of IC8 determines the bit state at each approximation. The last bit to be determined is the least significant bit. When all bits have been set up the data remains on the data bus and is written into memory until the write clock goes high, at which time the flip-flops IC5a and b are reset and the tri-state buffers are disabled. The data bus is then loaded with data read from the memory and IC9, now in its decode mode, converts this data directly into an analogue current on its decode outputs, pins 16 and 17, and subsequently to a voltage at IC3 pin 1. IC2 pin 1 goes high at this time allowing the converted voltage to be sampled by TR2 for re-constitution by IC3b, c and d. TR1 is also gated to take a sample of the input voltage at the same time, ready for the next analogue to digital conversion. The sampled voltage is not held frozen until the write clock goes low once again.

Now referring to the storage section, the read clock IC14 has a frequency range of about 20kHz to 80kHz, determined by a +/-10V control voltage on pin 5. The read clock increments the read address counter, IC15, which is a CMOS binary ripple counter. The number of memory location addresses and hence the delay time is determined by the count at which IC15 is reset to zero, and is set by SW2a. The write address counter, IC16, is clocked similarly by the write clock from IC2d. The two addresses set up by the two counters are selected by means of the multiplexer, IC17, 18 and 19, under the control of the write clock signal on IC20 pin 6. The selected address is then put on the memory address bus. When SW1b is open the multiplexer is forced into the write address select mode to enable reading and writing to occur at the same address when in the delay mode. Since four 8-bit memory IC's are used the relevant section is selected by means of the decimal decoder, IC21, giving the storage IC's 22 to 29 the requisite chip select signals, depending on the states of A9 and A10. Data is written to and read from the memory on the data bus.

The memory write signal on IC20 pin 8 has a delayed falling edge caused by R68 and C29 to give the address counters, the multiplexer and the store address lines plenty of time to settle down before the store IC's are put into the write mode. Random memory locations would otherwise become corrupted as the address bits change state. When the freeze, or repeat, footswitch at J4 is closed the memory IC's are locked in the read mode, preventing any change in the contents of the store.

The power supply circuit, shown in Figure 3, is quite conventional, using IC regulators to provide the three DC voltages. The purpose of R69 is to reduce power dissipation by IC31. The analogue and digital

COMPLETE KIT £160
excluding display option

TRANSPOZER

Paul Williams

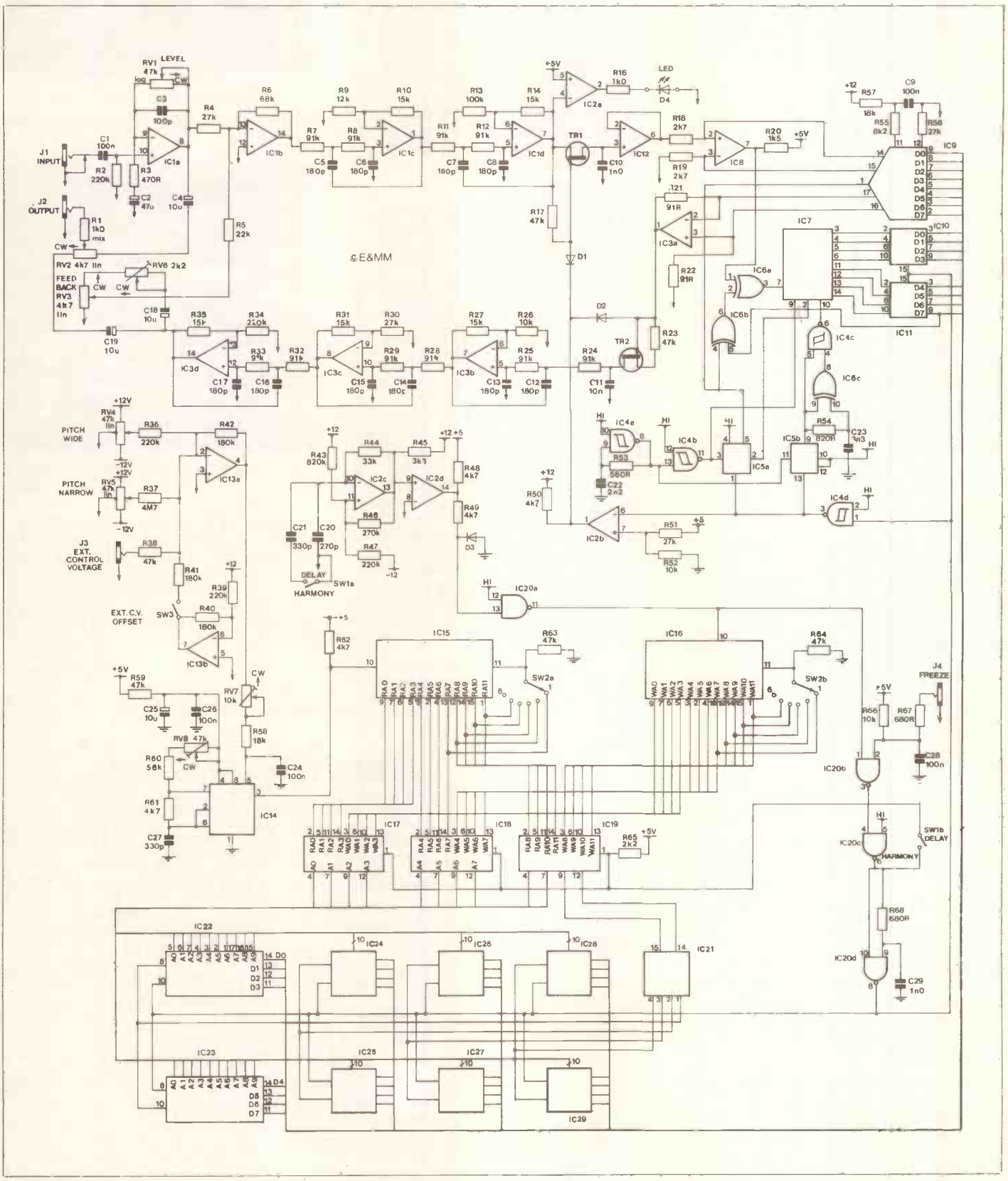


Figure 1. Circuit diagram of the Transpozer.

THE TRANSPOZER

ground rails are kept separate on the PCB, even though they are eventually connected at the 0V input. This helps to keep at bay any logic switching noise which could otherwise find its way into the audio input.

Pitch Ratio Display

To allow accurate pitch shift setting on the TRANSPOZER the option of a Pitch Ratio display has been provided. The unit will work quite satisfactorily without it, but most users will probably find it invaluable when fitted.

The display as the name suggests indicates the pitch ratio of the output signal compared to the input signal.

A readout of 2.000 indicates that the pitch of the output signal is double that of the input and therefore one octave higher. At the other end of the scale a readout of 0.500 would indicate that the pitch of the output signal is half that of the input and hence one octave lower (see photos). Obviously, a display reading of 1.000 indicates unison or equal output and input pitches.

The display prototype shown last month has been modified for production models and now requires only four connections.

Circuitry

The circuit diagram of the pitch ratio option is shown in Figure 4.

Most of the work in the circuit is done by IC6 a 4 digit counter with multiplexed 7-segment output driver. This drives the two displays via resistors R6-12 and transistors TR1-4. The decimal point in the most significant digit is held on by R5.

The 'Write' clock (PR5) is divided by 2000 by the 3 decade counters IC's 1-3, and then the D-type flip-flop IC4a configured as a ÷2 counter. The Q output (Pin 5) of this device gates the 'Read' clock (PR4) via D1 and triggers the monostable IC5 to provide a latch pulse to IC6. The $\overline{Q}$ output of IC5 (Pin 6) is used to set the flip-flop IC4b and provide a short pulse via C6, D2 and R4 to reset IC6. The gated 'Read' clock is connected to the clock input of IC6. Decoupling is provided by C1, 2 and 3.

Basically after 1000 'Write' pulses the 'Read' count is latched into the display driver and then, after the monostable period (set by C4), reset before the next 'Read' count.

If the 'Read' clock is running twice as fast as the 'Write' clock, 2000 counts will be latched into the display, half as fast and only 500 counts will be latched in. The decimal point in the most significant digit is held on to give the required display.

Construction

Assembly of the PCB is straightforward and the component overlay is shown in Figure 5. Start with the wire links which should be made with tinned copper wire, e.g. 1/0.6mm connecting wire with the insulation removed. Then proceed by soldering components in order of increasing height. In addition to the usual precautions regarding orientation of diodes and transistors you should ensure that the body of resistor R5 clears the display socket and that its lead under the display is flat against the PCB in the same way as the links. The final PCB assembly step will be the right angle 40 pin DIL socket for the displays and the following procedure should be adopted. With the socket facing you insert the two dual segment displays into the socket starting at the extreme left hand side. When installed this will leave two pins at the extreme right hand side unused. Now insert the socket plus display into the holes on the PCB. Manipulate it such that the displays are resting on the PCB and their face is at a right angle to the PCB. Solder one pin at both ends and check for squareness before soldering the remaining 38 pins. Now thoroughly check the foil side of the PCB for solder bridges, poor joins, etc.

Install the IC's in accordance with the orientation shown by the component overlay. Take great care with IC6 as it is a CMOS device and expensive! The PCB may now be mounted over the main PCB of the E&MM TRANSPOZER by using the 3mm studding provided. First firmly secure the studding to the main PCB with a nut and shakeproof

The Pitch Ratio display ±1 octave.

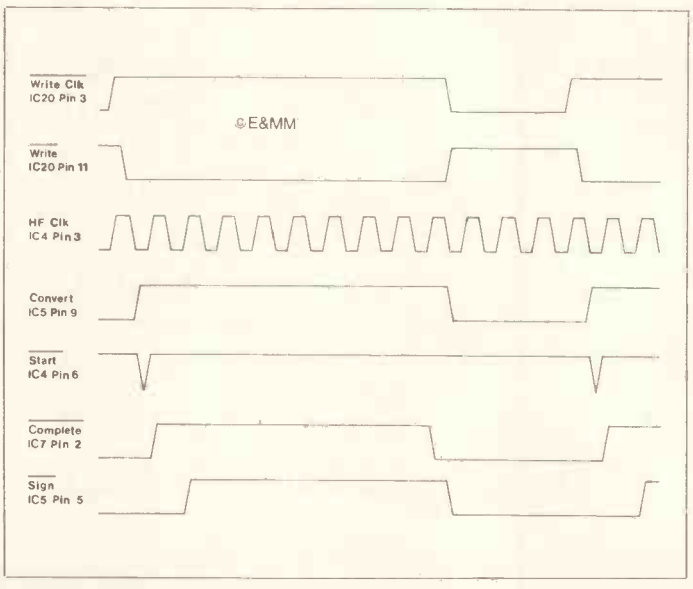


Figure 2. Logic timing diagram.

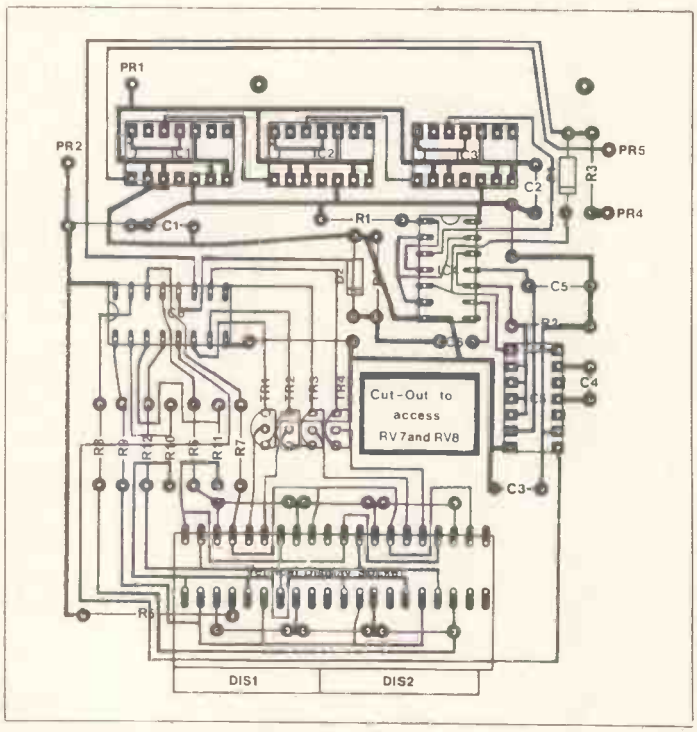


Figure 5. Component overlay of the display PCB.

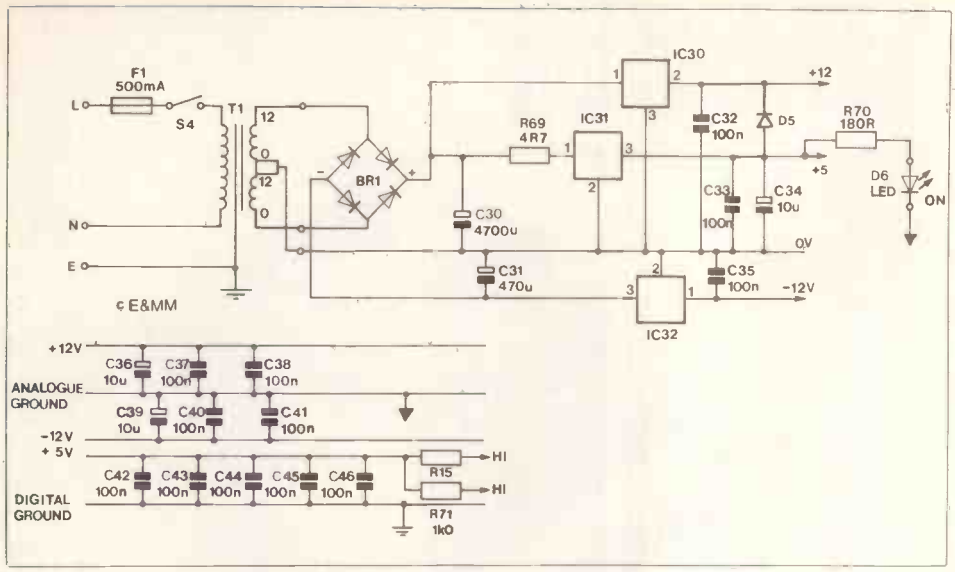


Figure 3. Circuit diagram of the Power Supply.

it runs at the same height as the display PCB and then drops down at the rear of the main PCB and along the back edge to PR1.

No adjustments are required and the pitch ratio indicator may be checked as follows. Switch power on and observe that the +5V LED is illuminated. Check the +5V supply at pin PR2 to ensure that its level has not been affected. With the E&MM TRANSPOZER in the 'harmony' mode turn the wide pitch control and observe that the indicator changes from about 0.500 to 2.000 for full rotation. The display PCB has a generously sized cut-out which allows easy access to RV7 and RV8 for the calibration step.

Using the Unit

The controls are quite self explanatory. The sensitivity control is adjusted so that the peak LED just flickers on the loudest passages. This setting will achieve the best possible dynamic range. The input amplifier sensitivity can be adjusted to allow a high impedance microphone to be used. The other end of the sensitivity range allows

washer on either side of the PCB. Place nuts on each of the pillars so formed and locate them about 1 to 2 cms from the top. The pitch ratio indicator PCB is now located onto these pillars. The unit is lined up with the cut-out for the display and the nuts on the pillars adjusted such that the PCB is resting upon them and is parallel with the main PCB. The display should be firmly in the panel cut-out and if not then remove the PCB and while holding the base of the pillars gently bend them forward. There is sufficient spring in the studding to provide a secure mounting once the displays are lodged in the panel cut-out. Next secure the PCB to the pillars with nuts and shakeproof washers.

The final step, which is to be carried out after the main PCB has been checked, is to connect four wires from the 'Veropins' PR1, PR2, PR4 and PR5 on the display PCB to the 'Veropins' on the main PCB having the same identification - refer to TRANSPOZER component overlay, Figure 2 given last month. Note that the prototype pitch ratio indicator also required a -12V supply which was available from PR3 on the main TRANSPOZER PCB. This connection is no longer required. 1/0.6mm insulated wire is used for the connecting wires and these connections are to be kept short such that they do not droop over components on the main PCB. For the 0V line (PR1) the wire should be shaped so that

PARTS LIST FOR PITCH RATIO INDICATOR

Resistors, 1/4W 5% carbon film

R1,2	1k0	2 off
R3,4	4k7	2 off
R5	150R	
R6,7,8,9,10,11, 12	56R	7 off

Capacitors

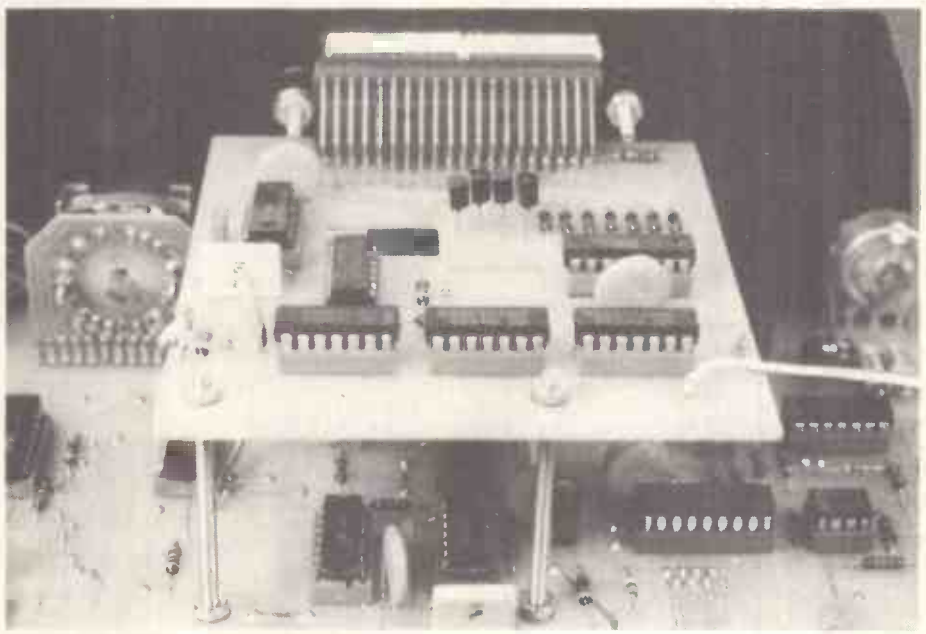
C1,2,3	100n ceramic disc	3 off
C4,6	22n polyester	2 off
C5	100p polycarbonate	

Semiconductors

IC1,2,3	74LS90	3 off
IC4	74LS74	
IC5	74LS122	
IC6	74C925	
TR1,2,3,4	BC182L	4 off
D1,2	1N4148	2 off
DIS 1,2	CQX87A or equiv.	2 off

Miscellaneous

	14 pin DIL sockets	5 off
	16 pin DIL socket	
	40 pin right angle DIL socket	
	Veropins	4 off
	Mounting hardware and connecting wire	
	PCB	



The display board mounted on the main board.

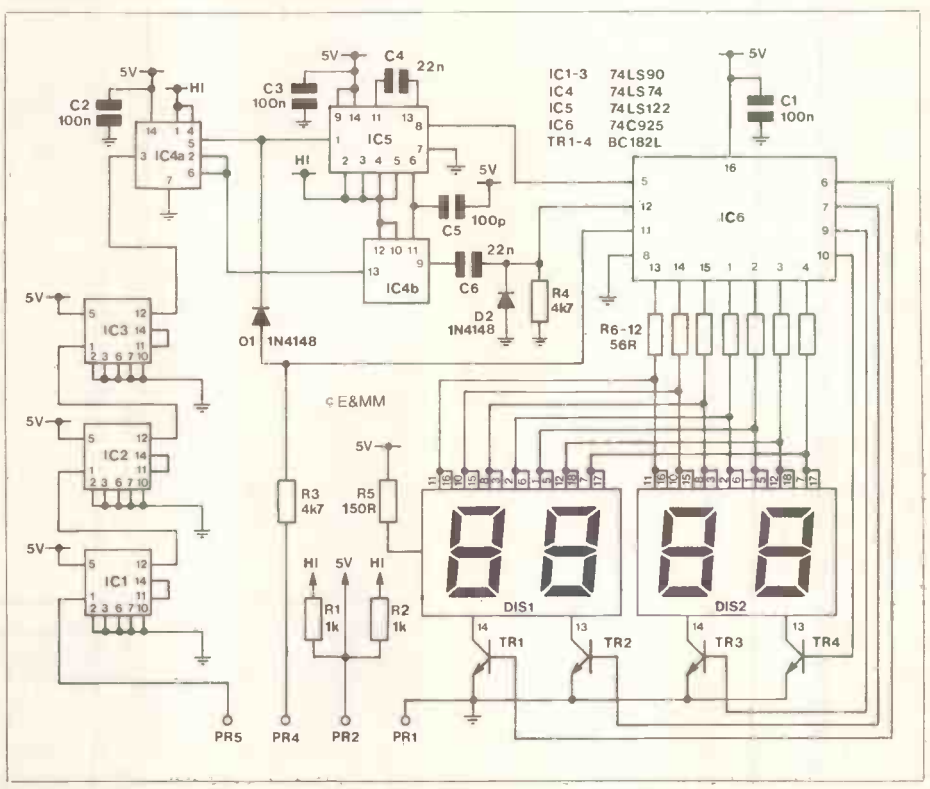


Figure 4. Circuit diagram of the Pitch Ratio display.

THE TRANSPOZER

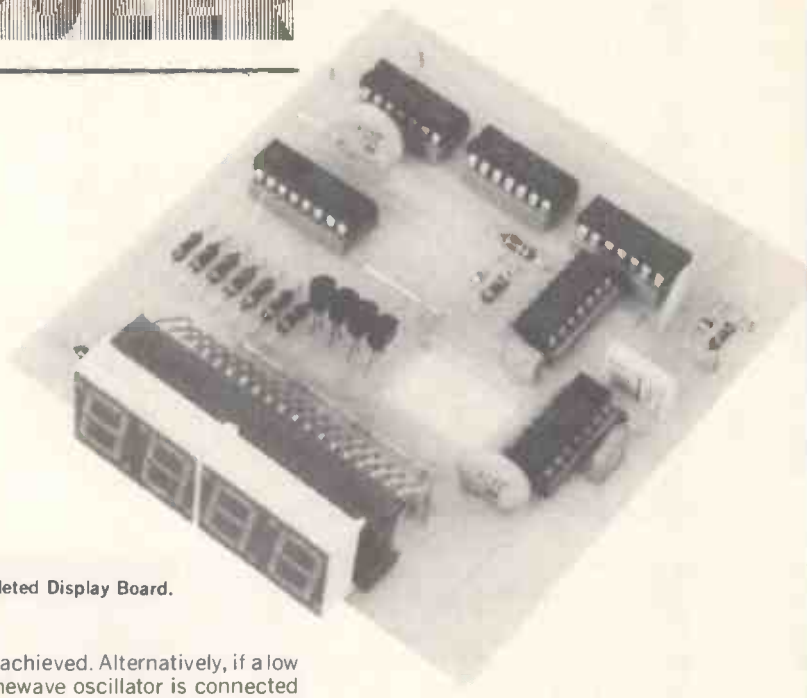
electronic sources such as synthesisers to be directly injected. The output of the TRANSPOZER remains constant at about 500mV, so no matter what input source you use, the output should be connected to the high level input of your amplifier or tape recorder.

With the mode switch in the delay position, no pitch shifting occurs, allowing all the common delay related effects to be obtained with a delay time dependant on the setting of the delay select switch over the range 6mS to 200mS. The shift controls are obviously ineffective in the delay mode. The mix control being used to adjust the contrast and delayed signals. The feedback control allows the delayed signal to be re-circulated to produce echo effects at long delay settings through reverb effects at medium delays to constant flanging effects at short delay settings. The repeat facility is most useful in the delay mode since longer passages can be captured. Delay setting 6 achieves the most useful results. To repeat a passage, the footswitch is operated just after the passage has been played or sung, and held for as long as the repeated passage is required. While the passage is repeating, playing can continue to accompany it, the mix control being used to adjust the contract between the repeated and direct signals.

In the shift mode, the Coarse shift control sets the interval in the range ±1 octave. The Fine shift control gives very precise pitch trim adjustment of ±½ semitone. The delay time switch now controls the shifted passage length. Longer delays produce smoother sounding shifts, but at the expense of introducing unavoidable ADT effects when shifting up, and missing notes when shifting down. In most applications, delay setting 5 will achieve the most satisfactory results. The feedback control now allows some very interesting effects to be produced. For instance, if the shift control is set to 3 semitones up, and feedback is used, then the shifted pitch will re-circulate producing harmonies of 3 semitones up plus 6 semitones up plus 9 semitones up etc, resulting in chord-like sounds. The repeat facility can be used in the shift mode, albeit with a reduced passage length. Only the shifted part will be repeated, allowing the dry signal to be played along with the repeating harmony. A signal, once frozen by the repeat footswitch can be shifted with a different interval to the shift setting used during capture, allowing some very unusual variable speed and pitch percussive sounds to be produced.

Some particularly fascinating effects are produced when the shift interval is very close to unison. With plenty of feedback, each recycled shift will be fractionally higher (or lower for downward shifts) resulting in gradually rising (or falling) notes after they have been played. With slightly less feedback and delay 3 and 4 selected, cyclic flanging is produced. With just a little feedback, the mix control central and delay 4 selected, beautiful chorus effects are produced. This is particularly effective on a 6 string guitar, producing some very convincing 12 string sounds. The chorus effect can also "beef-up" the sound of a single VCO synthesiser, giving multiple VCO sounds.

The CV input could be used along with an external pre-set voltage switching network to enable rapid selection and changes of shift interval to be achieved. Alternatively, if a low frequency sinewave oscillator is connected to the CV input, true vibrato can be produced.



The completed Display Board.

Since the shift controls are continuous, Table 1 provides a list of semitone intervals and required pitch ratios, allowing precise musical intervals to be set.

Shift Up		Shift Down	
Semitones	Ratio	Semitones	Ratio
12	2.000	-1	0.944
11	1.888	-2	0.891
10	1.782	-3	0.841
9	1.682	-4	0.794
8	1.587	-5	0.749
7	1.498	-6	0.707
6	1.414	-7	0.668
5	1.335	-8	0.630
4	1.260	-9	0.595
3	1.189	-10	0.561
2	1.122	-11	0.530
1	1.059	-12	0.500

Table 1. Interval Settings

Although the E&MM TRANSPOZER was designed with economy in mind, the specifications have been kept very reasonable. The only limitations to be aware of are firstly that of the cyclic glitching that is produced in the shift mode each time a fresh passage of the input is selected for treatment. Some very elegant electronic "splicing" techniques have been used in some of the more expensive commercial units to overcome the problem, frequently employing a microprocessor to handle the very complex signal "juggling" algorithms. No glitching noise reduction has been designed into the E&MM TRANSPOZER due to the high cost of even a partial solution. The problem should not be too limiting in most applications, particularly with careful selection of the delay time, and subtle use of the mix control. The problem is more noticeable at higher feedback levels, which should be avoided in the shift mode. The other possible limitation is that of the quantisation noise that is only just noticeable on instruments such as bass guitars that have very little high frequency content. This is very simply overcome by turning down the amplifer treble control. However, the quantisation noise is hardly noticeable on most sound sources.

Most musicians will gladly accept these slight disadavantages considering the many effects offered by this versatile and comparatively inexpensive unit.

E&MM

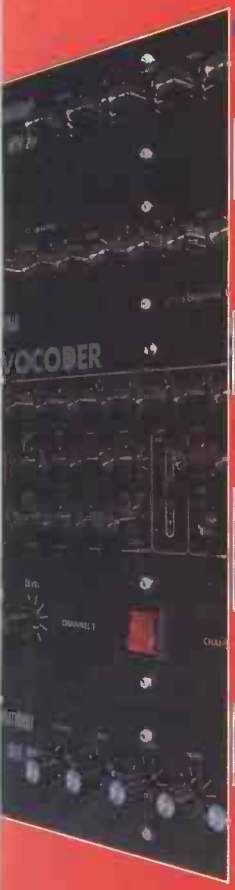
Specifications

Max Delay Time	**almost 200mS**
Pitch Shift Range	**+1 octave**
CV Input Range	**0 to +5V**
Dynamic Range	**72dB**
Frequency Response —	
Treated signal	**8Hz to 8kHz — 6dB**
Dry Signal	**8Hz to 34kHz — 3dB (maximum gain)**
Input Sensitivity	**5mV to 500mV rms**
Output Level	**500mV rms**

A complete kit for parts for the Transpozer including the case, front panel, PCB and all components is available from E&MM, 282, London Road, Westcliff-on-Sea, Essex, SS0 7JG at £159.95 including postage, packing and VAT. Please order as Transpozer kit.
The Pitch Ratio Display board kit is also available at £32.95 including postage, packing and VAT. Please order as Transpozer Display Kit.
These units are supplied with the co-operation of Digisound Ltd.
Overseas customers please add £10 for carriage.

POWER PLUS PERFORMANCE

MAN-MADE MUSIC AT IT'S VERY FINEST SEE OUR GREAT SYNTHESISERS ON PAGE 21



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

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

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

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

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

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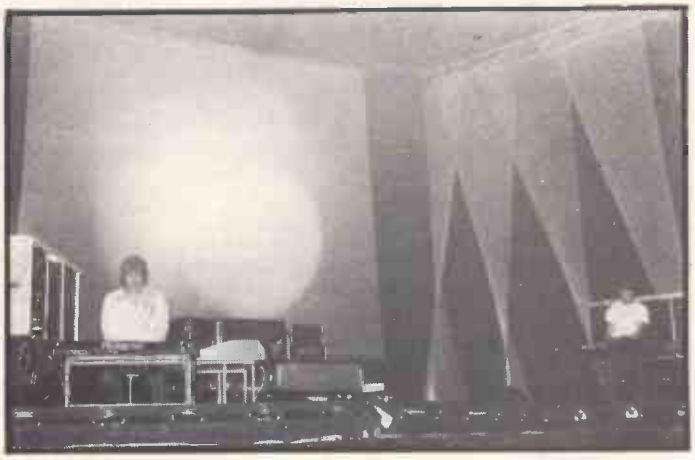
Concert Review



Tangerine Dream, Fairfield Halls, Croydon, October 31st 1982. The inevitable autumn Tangs tour, and inevitably a few changes, a few surprises, a few disappointments.

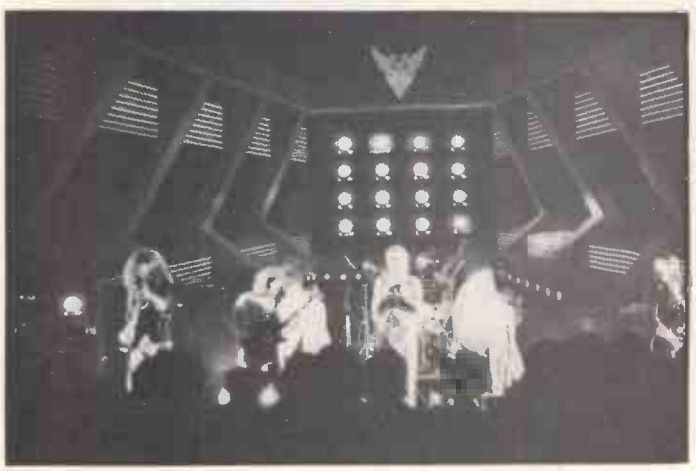
Firstly, the venue. With seats going right up to the stage it's surprisingly intimate. During the soundcheck the band are affable. Chris Franke explains the new set-up; one Minimoog missing; two Jupiter 8's and all the usual modules. The music hasn't become simpler, he says, in fact it's more complex, so the Jupiter presets help.

Johannes Schmoelling outlines his background in local Berlin bands, session work, theatre sound engineering and a surprise phone call from Edgar Froese. Edgar adjusts his Wave 2, resplendent in red and white leather. The concert starts.

As usual a mixed bag of old, new, and not yet released. 'Mojave Plan', a lot of 'Kamikaze 1989' (which they've been playing for two years, as it turns out), bits from their TV music Tatort perhaps. Piercing high-pitched digital sounds, smooth strings from the Oberheim, solos on the Jupiter ("it doesn't have to be a Minimoog!") and thumping bass. No guitar yet.

An interesting if gentle light show with shapes and colours projected onto a huge circular background. Encores from White Eagle, almost danceable at times, and with some very commercial pictorial material hinting at all sorts of styles from funk to chamber music.

No guitar at all. Members of the audience sit amazed as the lights come up. It's more commercial than ever, without being in any way a sell-out, and several knowledgeable persons enthuse wildly. Others are not so sure . . . the only solution is to go again next year. Ah-ha! . . . So that's the idea!



Hawkwind, Dominion Theatre, London, 13th November 1982. For those who missed The Space Ritual in the early seventies, the chance has come again to see Hawkwind at their most powerful, their most visually spectacular, and their most inventive.

After a period in the doldrums following the departure of master synthesist Tim Blake in 1980, the band has finally learned to use keyboards imaginatively without outside help and the money seems to have come together for a better stage show. Visually, it's breathtaking; a huge futuristic warehouse or spaceship hold backed by sixteen TV monitors, with banks of monitors and synthesisers on each side of the stage, dancers in luminous outfits, bassist and now keyboard player Harvey Bainbridge to the left, Hugh Lloyd-Langton on guitar at the front, Martin Griffin on drums and leader Dave Brock on guitar and keyboards to the right.

As the band launched into 'Choose Your Masks' the empty space was filled by the familiar figure of Robert Calvert, guesting on vocals, sax, small percussion and various toys and gimmicks. The sound for once was loud and clear at the same time, with the Korg synths backing the guitars without getting lost. Dave Brock has been endorsing Westone guitars of late, and perhaps a change of thinking has taken place — certainly there's now sustain and distortion without the old excessive loss of clarity.

As the high-technology video display churned along, flashing subliminal messages at the audience, it became clear that there are new musical directions as well as the old 'question-the-nature-of-your-orders' anarchy. Both 'Sonic Attack' and 'Church of Hawkwind' contain a good deal of tape collage, sequencers and other innovations, and now there are hints of other styles such as Peter Gabriel's ethnic approach, a sort of heavy funk, and gentler pieces featuring Lloyd-Llangton's vocals which contrast well with Brock & Calvert's harsher styles. On the other hand the terrifying Sonic Attack is still there, along with other old goodies such as Magnu and Psychedelic Warlords (Disappear in Smoke), so everybody should be happy.

About half-way through, some of the videos started to resemble parts of old episodes of Horizon like 'Painting by Numbers' (on computer graphic techniques), but by that time the whole experience had taken over and it didn't seem to matter what was happening. It's good to see that a band now coming up for its fifteenth birthday can keep growing and changing; it looks as if Hawkwind have a lot of life left in them yet.

Fashion, Odeon Theatre, Birmingham, 31st October 1982. 'Fabrique' by Birmingham band Fashion has been one of the year's most pleasurable releases. The fusing of a high technology approach to the warmest, most sensual of jazz-funk influences produced an album of superb technique and intense emotion.

But after the sudden departure of charismatic vocalist and songwriter De Harris, and faced with the prospect of 19 gigs in 22 days, the band inevitably had some rough edges. They opened with 'Move On' and 'Do You Wanna Make Love' from 'Fabrique', but sadly the vital, warm atmosphere which made previous Fashion concerts so enjoyable was missing. It wasn't until three quarters of the way through the set that some of the old magic began to filter through during 'White Stuff'.

Drummer Dik Davis kept the sound tight and to the point, making full use of his Simmons kit and Manray Chinese cymbals, while Salvador Mulligan used his Roland keyboards, Vocoder, ARP 2600 and Moog Source to lay down sequencer lines cleverly complementing the bass playing of Martin Recci, which has been going from strength to strength and sounds better at each outing.

New guitarist Al Darby's style is quite different to his predecessor's, and his use of a Roland DC 30 Analogue Delay and Boss Chorus is particularly noticeable on the new songs, during which the band seemed at last to relax and begin to enjoy themselves.

Most of the audience seemed well pleased with the new Fashion, and so having survived their recent trauma the album due for release in the New Year should show in which direction their future lies.

Lin Barkass **E&MM**

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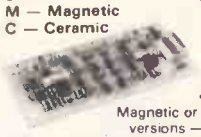

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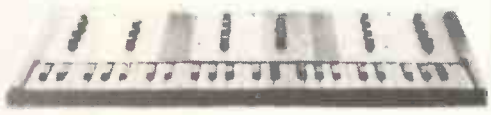

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America

Jerry De Muth

Dean Zelinsky, who successfully introduced his Dean Baby line in early 1982, has a new model of Dean guitar on the drawing boards but he's waiting for the market to turn around before introducing it.

"It will be a jazz/rock guitar that will outsustain any other guitar," declared the 25 year old Zelinsky. "I've taken all I've learned from playing 18,000 different guitars in this factory and got a concept for a guitar that will be the most screaming, the most sustaining guitar this country has ever seen. It will be a massive guitar."

The guitar, which could be introduced at the June National Association of Music Merchants show if the economy recovers, will attract "more of the conventional guitar playing market" than will all 15 existing models, he said. "It has a very conventional body style and it doesn't lend itself to a V-head."

But the Baby, 200 of which are produced every month, has been extremely popular and Dean Guitars has a large backorder for it and for other models.

"We have too much product line out there for the market so I'm waiting for the market to turn around," explained Zelinsky. However, other guitar companies continue to introduce new guitars and guitar accessories. Whether their design and marketing decisions are right, the millions of guitar players will have to decide.

Guitars

Two small companies from opposite sides of the continent have introduced new guitars. In Texas, Daion has combined its Savage body with three individually controlled Power-Pulse pickups to create the Daion SV-3 Barbarian guitar. It features a separate three-position mini-toggle switch for each of the pickups, a master volume control and middle and neck pickup tone controls. These controls, boasts the manufacturer, give the instrument an extremely wide tonal range. Other features on the SW-3, which has a suggested retail price of $475, include a 22-fret rosewood fingerboard, through-body stringing, side-lock bridge with adjustable brass saddles, rotomatic-style tuners and a slim, solid maple bolt-on neck.

Massachusetts-based Pedulla Guitars has just added the MVP Rock to its line. It features a single-piece neck design, maple body, easily accessible 24-fret ebony fingerboard, brass nut and Schaller bridge and tailpiece. But most important to the Rock's sound is a harmonically positioned Bartolini LC humbucker pickup. Silicon steel laminations, high-powered ceramic magnets and special winding techniques on this dual coil pickup give the guitar extra resonance, midrange emphasis and sustain. A unique four-position rotary switch allows the player to choose the series or parallel mode, or to use either of the coils individually. Suggested retail price is $825.

The new Cort Arrow guitar features a slim, mahogany, fully adjustable neck with a rosewood fingerboard, nickel silver frets and Gotch die cast machine heads on the

Pearl Spice Rack.

Pearl KX-3 Piano Effects.

Roland Combo Piano.

Fender String Stretcher.

original Cort v-shaped head. The Cort Arrow also has two Powersound super distortion pickups with extra gain, each with its own tone control, as well as active electronic preamp with LED light. A solid brass bridge and saddle and a solid brass adjustment cover are also featured on the guitar which has a suggested price of $440.

Effects

For those who want to do more with the guitars they already own, manufacturers continue to broaden the range of devices. A guitar effects pedal board, dubbed "Spice Rack," has been introduced by Pearl International. The compact and versatile model, GX-5, consists of a flanger (FG-02), chorus (CH-02), phaser (PH-03), compressor (CO-04), overdrive (OD-05), voltage regulator (VR-5) which supplies regulated voltage simultaneously to the five processors and an AC adaptor (AC-90). Options for the GX-5 Spice Rack are footswitches (FS-1, FS-2), a rubber ring for foot control of knobs (SG-1) and an extension plug providing stereo effect (EP-1).

The Boss DM-300 Delay Machine has been introduced by Roland. The delay effect is produced by means of a noise-reduced bucket brigade device (BBD) while natural reverberation decays are created by the Roland frequency controlled filter. The echo section allows for adjustment of echo volume, repeat rate or speed, intensity for multiple decaying echoes and tone. The DM-300 meaures 15 inches by five inches by eight inches, weighs 8.2 pounds and carries a retail list price of $495.

Accessories

For guitarists who want to move around without worrying about cords getting wrapped around themselves or wrapped around anything and everything else, including the cord itself, Nady Systems has introduced a new version of its Pro-49 wireless guitar transmitter and receiver, the Pro-49 II. Nady Systems has completely redesigned the circuitry to offer improved performance capabilities, including 20-7500 Hz frequency response and 100 dB signal-to-noise ratio within a range of up to 200 feet. In addition, the Pro-49 II features two different frequencies which can be operated simultaneously.

Another product to make playing easier for guitarists, or at least playing on new strings easier, is Fender's String Stretcher.

This small, plastic device clips onto the string and is moved back and forth along its entire length to remove initial stretchiness quickly and uniformly. It thus promises to promptly provide both the small, manageable tuning adjustments and the brilliant clarity and projection that are possible only with fully stretched new strings. Priced at $3.98, it comes in two models, Model S for steel strings and Model N for nylon strings.

Roland piano

New from Roland is the EP-6060 Dual-Voice Combo Piano, an electronic piano with two sound voice sources which can be individually created, then layered on top of each other. Each of the two voices has individual controls to select basic tone, octave and decay. The voices can be routed through the six-band graphic equaliser while two separate tune controls allow the voices to be detuned against each other to create a thick chorus-voicing effect.

Other controls include a transpose control, an upper harmony control that creates block chords from single notes, a split keyboard control and a hold control and a single-slider balance control for the two voices. An arpeggiator can be varied for rate, number of beats and for four variations in rhythm. The unit, which lists for $895, also contains its own monitor speaker.

Monitors

To help musicians better hear what they are doing with all their instruments and sound effect devices, Crate has introduced two new floor monitors, one powered and one unpowered. Each has a cabinet built with three different angles for three positioning choices and each has a thick black tolex covering to help protect the cabinet from road wear.

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Manufacturers and companies mentioned:
Cort Guitars, Westheimer Corp., 3451 Commercial Ave., Northbrook, Ill. 60062.
Daion Guitars, MCI Inc., P.O. Box 8053, Waco, Texas 76710.
Dean Guitars, 6417 N. Ravenswood Ave., Chicago, Ill. 60626.
Fender Guitars, Fender House, Centenary Estate, Jeffreys Road, Brimsdown, Enfield, Middx.
Nady Systems, 1145 65th St., Oakland, Calif. 94608-1175.
Pearl International Inc., P.O. Box 111240, 408 Harding Industrial Dr., Nashville, Tenn. 37211.
M.V. Pedulla Guitars, 541 Main St., South Weymouth, Mass. 02190.
Roland UK, Great West Trading Estate, 983 Great West Rd., Brentford, Middx.
Unicord, 89 Frost St., Westbury, N.Y. 11590.

Zildjian Cymbals

While electronic instruments are unmatched for versatility and variability, they must often take second place to traditional acoustic instruments for sheer tonal quality and expression. Without sophisticated digital sampling techniques the electro-musician would have to expend a great deal of effort to better the sound of an acoustic guitar, of a gong, a bell or a cymbal, and so these instruments still have a part to play in modern music although displaying a pedigree going back hundreds or even thousands of years.

Zildjian cymbals date from 1623, when a Turkish metallurgist, Avedis Zildjian, discovered almost by accident the correct combination of copper, tin, silver and trace impurities to produce a deeply resonant alloy ideal for cymbal-making. Manufacture was entirely by hand, and the tonal quality of the instrument was so high that cymbals ceased to be an exotic novelty and came into use in military bands and classical music all over the world.

The manufacturing process was handed down from generation to generation, and the 1940's saw the American branch of the family dominating the world of jazz and big band swing music with cymbals which were still of outstanding quality, although often now machine-stamped. In 1979, when the last Avedis Zildjian died, it was decided to re-introduce a range of hand-made Zildjians in the old traditional style, and to name them K. Zildjian cymbals after another member of the family.

On October 13th London's Venue played host to a Zildjian clinic witnessed by hundreds of drummers and other musicians and given by some of the world's top session musicians. Simon Phillips, late of the Jeff Beck group, Stanley Clarke and Friends and the Jack Bruce Band, and a sessioneer with Judas Priest, Greenslade and David Coverdale, demonstrated Avedis Zildjian cymbals as part of a Tama kit. Pete York, insisting that he was now a restaurant owner, had little chance of concealing his background as drummer with the Spencer Davis group and the Chris Barber Jazz Band as he flew around a K. Zildjian/Premier kit. A surprise bonus for heavy rock fans appeared in the form of Jon Lord on Korg keyboards, while Rick Saunders played a hollow-bodied electric violin and Steve Richardson appeared on bass.

A short introduction by Pete York filled in a little of the background and history of the cymbals. Although the K. Zildjian in its original form had a deep mellow sound ideally suited for be-bop and other forms of jazz or swing music, it was capable of a wide range of 'voices' depending on the playing technique used. A short swing solo demonstrated how cup size determines the amount of ring and tuning on a cymbal, and how a cymbal with a flatter cup and fewer overtones can fit in with any piece of music as it approaches polytonality — that is, having no particular pitch.

The K. Zildjian Crash/Ride cymbals, then, are designed for a dry, dark sound with a reasonable amount of sustain, and are available in 18, 20 and 22 inch sizes. The Ride cymbals are a little heavier, intended to give better stick definition to hold a rhythm, and come in the same sizes. Again the dominant sound is low and dark, and this can be emphasised on the 16, 18 or 20 inch Dark Crash which gives shorter sustain as it is a little thinner.

K. Zildjian hi hats, in a range of sizes and matched or unmatched pairs, give what is described as a 'deep solid chip sound' and as the main rhythm-bearing cymbal have to produce great definition and precision.

The manufacturing process helps to produce this high degree of precision and uniformity. The metal alloy is heated at several stages and rolled in different directions to produce a pronounced cross-grain for strength and durability. After these stages the K. Zildjians are hand-hammered into shape, while the Avedis Zildjians are machine-hammered. In either case the meticulous care taken results in a very expressive cymbal, compared to even to top flight machine stamped cymbals such as Paiste or Premier, but generations of drummers have decided that the extra expense is justified.

Steve Richardson's 'Shtick' and Pete York's 'Chicken Chasin' Charlie' then gave the whole band the opportunity to demonstrate how top musicians with high quality instruments and a minimum amount of rehearsal time can turn out music which is exciting, powerful and expressive. Jon Lord's Korg organ ebbed and flowed in his usual inimitable style, the electric violin and bass alternated between swirling, screaming solos and delicate ornamentation, and Pete York's kit held everything together and reinforced the overall jazz/rock feel.

The drum solos displayed a fine degree of precision and an ability to switch from delicate ornamentation to the heaviest dual tom-tom rhythm in an instant. Apart from running through the different 'voices' of the K. Zildjians he showed how tuned and detuned tom-toms could give different effects during rapid fills, and demonstrated his mastery of the whole jazz/rock/swing idiom.

Certainly his modesty in introducing Simon Phillips was largely unnecessary, despite the latter's very high reputation. Simon Phillips was demonstrating the Avedis Zildjian cymbals, and treated the audience to a fifteen-minute solo of unprecedented force and precision.

Phillips plays a dual bass drum Tama kit with a large number of toms and cymbals and an unusual layout which, he says, is necessary for a small person playing a very large kit. His high-hat has become lower over the years until it is almost level with the snare, and the four rack toms are closely spaced low along the front of the kit. There are three floor toms and a wide range of cymbals including the cupless Flat Top Ride mounted almost vertically. Despite this layout Phillips has still had to develop a 'both-handed' style to be able to play everything with sufficient power; the amount of freedom produced by his set-up and style was evident from the very versatile solo which, to his credit, showed how the cymbals fit in as part of a drum kit rather than over-emphasizing the cymbals alone.

A session of questions from the audience revealed some of Phillips' thoughts on practice ("no time any more"), on monitoring ("drums sound better on a PA than they can ever do direct"), on damping ("a Hilton Hotels towel gaffa taped to stop back head ring") and on a host of other subjects. His hints on timing, which enable him to cope with a very active bass drum style, were given a practical demonstration during the final numbers played with the whole band.

The laudable aspect of the whole clinic was that it was practical and illustrative rather than dry and theoretical. Drums and cymbals can be used as rhythmic backing, percussive ornamentation for other musicians' solos, or as solo instruments in their own right. The closing numbers demonstrated all these functions, with the deep and expressive cymbals providing a constant ornamentation and rhythmic pattern. A very successful introduction for a range of professional instruments which are inevitably going to be much sought after for years to come. **E&MM**

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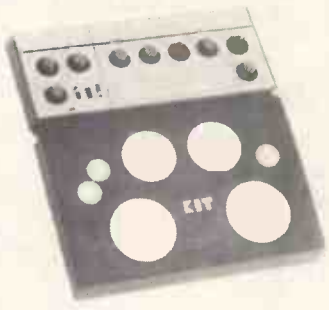

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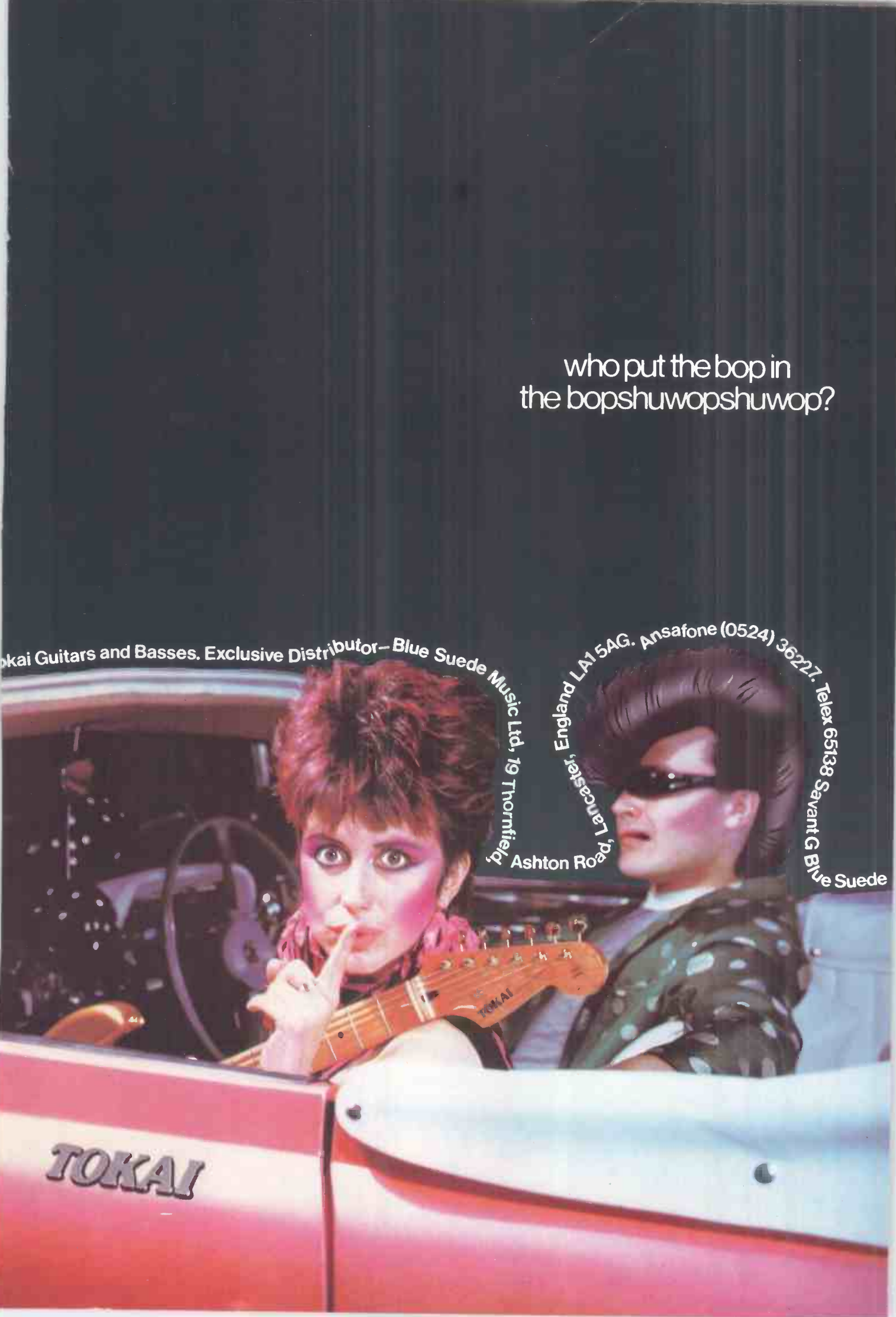

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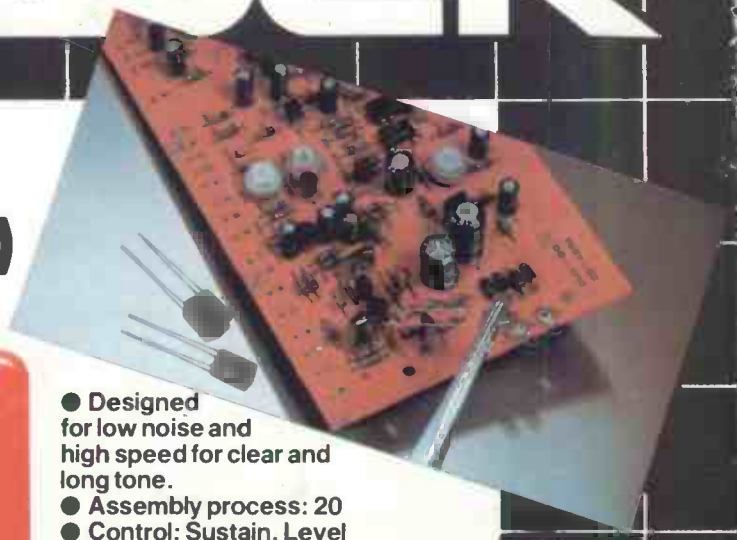

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