

Electronics &

JULY 1982 75p

# MUSIC Maker

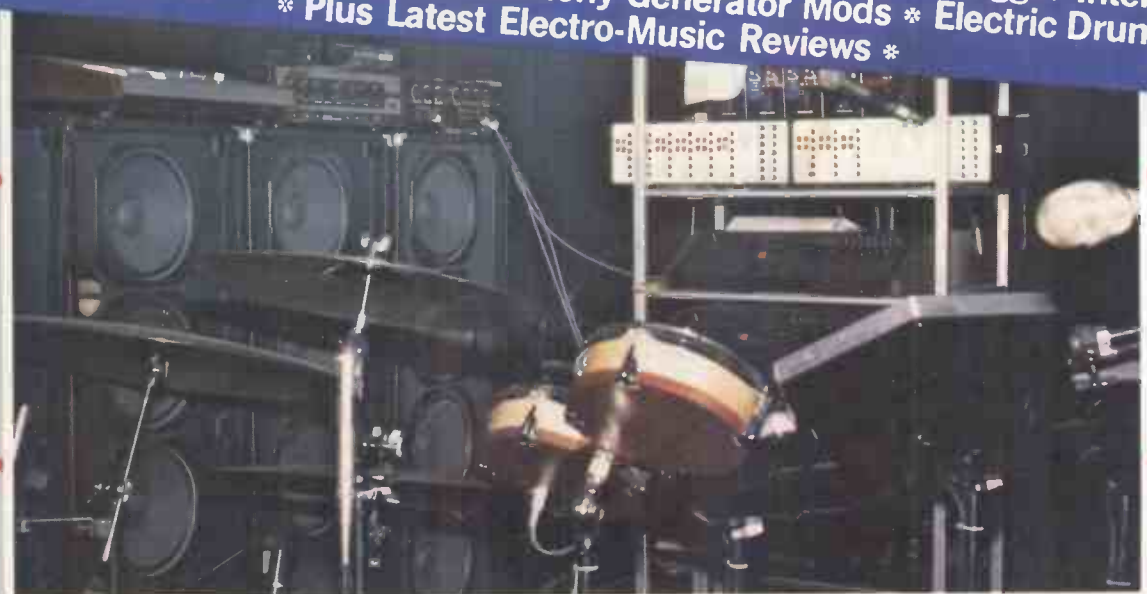


**RONNY'S ELECTRO-MUSIC CABARET**

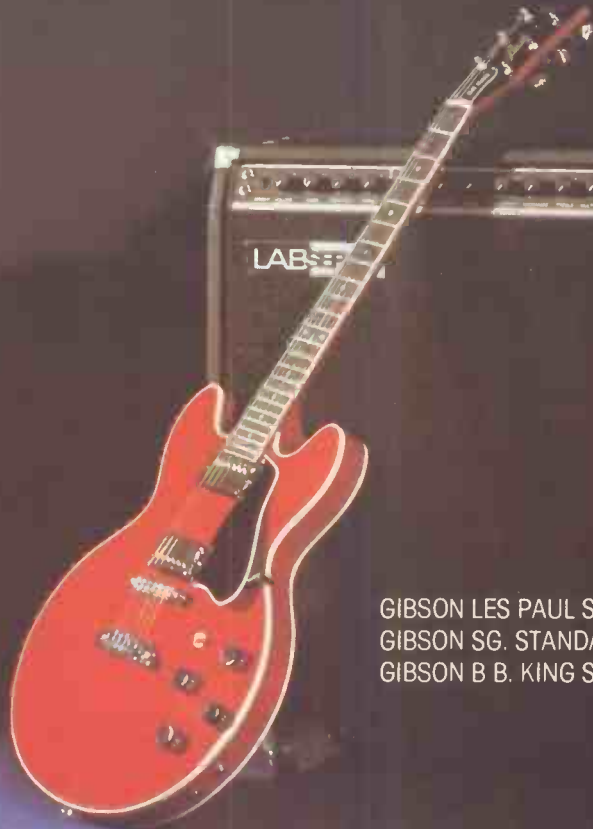
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**The Concerts In China LP**



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Projects: Universal Trigger Interface \* Harmony Generator Mods \* Electric Drummer Part 5  
\* Plus Latest Electro-Music Reviews \***



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 <p><b>SX2000</b> RRP: £300 Chase Price: £129</p> <p>3½ Octave keyboard • 3 Workstations • VCO • VCA • 2 Presets sounds • Octave Selector • Vibrato • Portamento • Great per penny price (1981)</p>	 <p><b>SX1000</b> RRP: £300 Chase Price: £149</p> <p>3 Octave keyboard • Octave Selector • Finger Math Modulator • Portamento • Vibrato • Low Frequency Oscillator • Full size stereo sound generator • Great made in UK!</p>	 <p><b>TEISCO S60F</b> RRP: £220 Chase Price: £199</p> <p>2½ Octave keyboard • VCO • VCF • VCA • Frequency Generator ADSR • Workstation Memory • EQ • Parametric • Pitch bend • Touch Sensitive Pad • LED • All Tests for (1981)</p>	 <p><b>Kitten</b> RRP: £500 Chase Price: £299</p> <p>3 Octave keyboard with frequency match for 8 Octave spanners • 5.5 Movable Workstations • 4 function envelope generator ADSR • Noise generator • Auto tremolo in keyboard mode • Sample and hold circuit • 7.68 kHz filter for super little sound • Interchangeable with most suitable applications • Best new keyboard synth on the market for £299!</p>	 <p><b>CAT</b> RRP: £950 Chase Price: £349</p> <p>• Doubleoctave synthesizer • Will play 4 notes at a time • Upper and lower voice memories • 2 oscillators with 7 movable overtones • Same and hold circuit • Noise generator • Interchangeable with most suitable synthesizers • Best bargain synth now available at £349!</p>	 <p><b>Pro-One</b> RRP: £350 Chase Price: £499</p> <p>• 3 Octave keyboard • Voltage controlled oscillators • Voltage Control filter • Noise generator • Voltage Control amplifier • 40 note sequencer • monophonic synth at £499!</p>
 <p><b>ARP Solina</b> RRP: £900 Chase Price: £299</p> <p>• 4 Octave fully polyphonic keyboard with noise volume controls and brass - all made to produce extensive range of sounds including organ, electric piano, etc. Specials like organ Attack and crescendo facility. Interchangeable with other instruments to produce polyphonic, synthesizer sounds. Released from over £900 to £299. Carving case available for only £75 extra. This is the best bargain we have ever offered!</p>	 <p><b>Crumer Performer</b> RRP: £300 Chase Price: £349</p> <p>Crumer's completely new performer is a professional quality string and brass synthesizer at a real bargain price. As a matter of fact, you could pay much more and still not get all the features the performer has to offer. Like two distinct 8 and 16 foot string voices, an onboard organ, flautist, Violin, Crescendo, full brass line and envelope control. Built-in modulation - four active, range keyboard and trouble-free LED switching.</p> <p>The Crumer performer does a number on your ears without doing a number on your budget!</p>	 <p><b>Crumer Multiman S/2</b> RRP: £700 Chase Price: £549</p> <p>One major credit on Crumer's versatile Multiman S/2 comes from brass, brass and piano sounds with a brass range of 2 full octaves. All sounds can be played simultaneously to provide arpeggiated effects. A split keyboard permits operation of each sound quality on either hand or upper registers. Complex, flexibility and a redesigned new look, characteristic all aspects of this 70s' professional instrument.</p>	 <p><b>Crumer Roadrunner Piano</b> RRP: £300 Chase Price: £199</p> <p>The Roadrunner? Has been designed for a completely new look and positive electronic and mechanical reliability. The features include a new variable "chorus" effect, an accessible pitch control and various tap controls for bass and 3 different piano sounds. Still included is the two octave brass extension that can be fed through a separate amplifier to give a "trumpet" effect. For the ultimate in portable pianos John Crumer's new Roadrunner? - the first and largest of its kind.</p>	 <p><b>Crumer Roady Piano</b> RRP: £400 Chase Price: £299</p> <p>Keyboard of 61 keys (5 octaves). Bass section - variable, on/off and sustain on/off controls. Treble section - volume, on/off switch, tremolo rate and depth, percussion volume and decay controls. Piano action - volume, left, right, voices 1, 2 and 3 controls. Master volume control. Other controls: Master pitch, sustain, pedal up!</p>	<p><b>FENDER RHODES PIANOS</b></p> <p>Stage 72: £599 Stage 88: £867 Suitcase 73: £1053 Suitcase 88: £1166</p>
 <p><b>ARP Piano</b> RRP: £1700 Chase Price: £699</p> <p>fully polyphonic electronic piano • 4 separate voices selected by touch touch switches • touch responsive wood keyboard for piano, organ • built-in vibrato • lightweight, fold-down electronic piano now selling at half its normal price during our Easter sale</p>	 <p><b>Crumer DP50 Piano</b> RRP: £1100 Chase Price: £849</p> <p>Crumer's incomparable DP50 Electronic Piano combines the "concert hall sound" with unparalleled playability and reliability. The electronic tone generation system offers wide dynamic techniques in combination with harmonic envelope additions, and the sound has the full-bodied timbre you associate with a concert grand to a professional synthesizer.</p>	 <p><b>Oberheim OBXa</b> from £2999</p> <p>Chase are the sole UK agents authorised by Oberheim to sell and service their products in the UK</p> <p>• Polyphonic synthesizer with 128 programmable memories • complete variable synthesizer functions • 2 oscillators can be played in once • split keyboard function • 4 octave oscillator for memories • unique pitch bend and modulation levels • 2 accelerators • 2 LFO • complex modulation assignment • programmable chords • complete rear interface acts for sequencer and pads.</p>	 <p><b>Crumer Roadrunner Piano</b> RRP: £300 Chase Price: £199</p> <p>The Roadrunner? Has been designed for a completely new look and positive electronic and mechanical reliability. The features include a new variable "chorus" effect, an accessible pitch control and various tap controls for bass and 3 different piano sounds. Still included is the two octave brass extension that can be fed through a separate amplifier to give a "trumpet" effect. For the ultimate in portable pianos John Crumer's new Roadrunner? - the first and largest of its kind.</p>	 <p><b>Crumer Roady Piano</b> RRP: £400 Chase Price: £299</p> <p>Keyboard of 61 keys (5 octaves). Bass section - variable, on/off and sustain on/off controls. Treble section - volume, on/off switch, tremolo rate and depth, percussion volume and decay controls. Piano action - volume, left, right, voices 1, 2 and 3 controls. Master volume control. Other controls: Master pitch, sustain, pedal up!</p>	 <p><b>Oberheim OBXs</b> from £1999</p> <p>Chase are the sole UK agents authorised by Oberheim to sell and service their products in the UK</p> <p>• Polyphonic synthesizer with 24 preset voices • string, brass, strings, organ, electric piano, bass, flute and many other voices • pitch bend and modulation levels • auto tune facility • touch-sensitive keys • edit mode in filter, attack, decay, sustain • rear panel includes filter, pitch, sustain, filter, pitch, modulation and sequencer interfaces</p>
 <p><b>The Chase Multipiano £249</b></p> <p>Just arrived the new Chase Multipiano built exclusively for us to our very own specifications • fully polyphonic 5-octave keyboard • four separate mixable sounds • vibraphone, harpsichord, electric piano and acoustic piano • complete with built-in amplifier and speakers for instant performance • head phone socket • tuning facility • complete with sustain switch and stand • You'll love the sound of this Chase Multipiano</p>	 <p><b>TEISCO SX400 Polyphonic Synth</b> RRP: £1690 Chase Price: £999</p> <p>The Teisco SX400 Synthesizer is the first made in the home range. It features a 49 note polyphonic keyboard with a Memory incorporating 8 preset functions, as well as the facility to programme and memory bank up to 8 of the user's own escape. The Synthesizer has a wide range of effects more commonly found on higher priced keyboards. The piano can be set at a place which permits and effects are switched on by Red and Green LED indicators which are built into the ergonomically designed front panel. The keyboard has a tough metal chassis construction for the surrounding road case which a keyboard of this type is likely to receive.</p>	 <p><b>Hohner Clavinet E7</b> RRP: £325 Chase Price: £199</p> <p>The Clavinet is one of the real wonders of the keyboard world. The Clavinet has been played by so many and featured in countless recordings that its distinctive sound has become synonymous with all types of music - Pop, Jazz, Rock and 'n' Roll. The six tone colour vector switches and the variable damper after an exciting range of Clavinet sounds. Now available at a bargain price of £199!</p>	 <p><b>Hohner Clavinet E7</b> RRP: £325 Chase Price: £199</p> <p>The Clavinet is one of the real wonders of the keyboard world. The Clavinet has been played by so many and featured in countless recordings that its distinctive sound has become synonymous with all types of music - Pop, Jazz, Rock and 'n' Roll. The six tone colour vector switches and the variable damper after an exciting range of Clavinet sounds. Now available at a bargain price of £199!</p>	<p><b>LONDON SYNTHESISER CENTRE</b></p> <p><b>LONDON:</b> 22 Charlton Street, off Euston Road, London NW1. Telephone: (01) 387 7626/7449. Open Tuesday to Saturday - 10a.m. to 6p.m.</p> <p><b>LEICESTER:</b> Union Street, off High Street, Leicester LE1 4HA. Telephone: (0533) 59634.</p> <p><b>MANCHESTER:</b> 58 Oldham St, off Piccadilly, Manchester M4 1LE. Telephone: (061) 236 6794/5. Open Tuesday to Saturday 10a.m. to 5.30p.m.</p> <p><b>Please note: Our stores are closed on Monday and Sunday</b></p>	

# JULY SALE

## Roland

We are London's largest stockist of all Roland products — if Roland make it then we sell it! Our displays and demonstrations are designed to show the interfacing capabilities of the newest Roland products. Roland are

committed to the concept of adding and expanding to their current production items thus expanding the capability of electronic musical instruments rather than hastening obsolescence. Blinded by flashing lights and too many buttons? Come to the London Rock Shop and we will show you how the creative musician controls the machine rather than the other way round! Since we stock the complete range of Roland gear you can come and check everything out — the one-stop Roland shop.

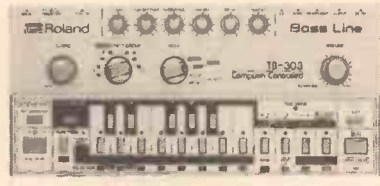
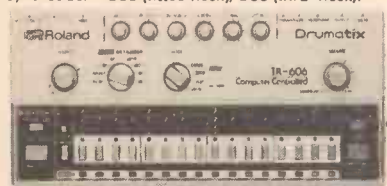
Here is just a selection from the enormous range:

### KEYBOARDS

Jupiter 8: Polysynth + MC-4 interface.  
 Jupiter 4: Polysynth (8 memories).  
 Juno 6: Polysynth: New — now in stock!  
 SH-2: Mono 2 VCO synth + sub-osc.  
 SH-09: Mono 1 VCO synth + sub-osc.  
 MC-4 A/B: Microcomposer (4 ch. sequencer).  
 CSQ 100/600: Programmable memory sequencers.  
 VP-330: Vocoder plus choir and strings.  
 RS-09: Organ + string ensemble.  
 SA-09: Organ + percussive sounds.  
 100M: Modular synthesizer system.  
 YK-09: Drawbar combo organ.  
 Piano Plus 60/70: Touch-sensitive EL pianos.  
 Piano Plus 11: Piano with rhythm and auto-bass.  
 HP 30: EL piano with built-in speaker.

### GUITAR AND BASS SYNTHESIZERS

GR 300: Guitar synthesizer (blue box) + G-202 (Nat. Blue, Wine), 303 (fitted neck), 505 (Met. Red, Met. Blue, Sunburst), 808 (thru' neck). GR-33B: Bass synthesizer + B33 (fitted neck), B88 (thru' neck).



### RHYTHM UNITS etc.

TR-808: Rhythm Composer.  
 CR-8000: Compurhythm (programmable).  
 CR-5000: Compurhythm (arrangeable).  
 CR-78: Original compurhythm: few left at £249 Inc. write switch.  
 TR-606: Mini Rhythm Composer. £199.  
 TB-303: Bass Line Synthesizer. Triggers from TR-606 Drumatrix.....£215  
 + stands, cases, footpedals, footswitches, sweat-shirts, stickers... if it says 'Roland' on it we've got it!

### P.A. etc.

16-channel Stereo Mixer.  
 P.A. 150/250 Mixer/Amps.  
 Power Amps SPA 120/240.  
 RE-201 Space Echo.  
 RE-301/501/555 Chorus Echo Units.  
 Roland Rack Dimension D  
 SDE-2000 Digital Delay.  
 SBF-325 Stereo Flanger  
 + much, much more.

INCORP. 'SYNTHESIZER DREAMS'

# THE LONDON ROCK SHOP

26 CHALK FARM RD. LONDON NW1 ☎ 01-267 5381

Yes, it's sale time again folks! Every July Rocky goes mad with his Casio calculator and knocks pounds off all our prices. We think he's made because we sell the best gear at the best prices all year round anyhow. However, as you can see, there are new goodies coming onto the market all the time so Rocky must keep up with the technology.

\*Interest-Free Credit: On selected items during our July sale we are offering 0% interest on 6 month personal finance agreements.

\*10% off R.R.P. on all goods and accessories during the first two weeks of July (until Sunday, 18th July).

\*Up to 50% off well-known makes for cash buyers: this includes some of the very newest stock items.

\*Clearly our July sale means bargain time so come on down y'all and see us; we part-exchange instruments, accept Barclaycard, Access and arrange personal finance through Forward Trust (a division of Midland Bank) for up to 3 years.

\*Our trading hours are designed to suit you; we're open seven days a week: Monday-Saturday 10.00 a.m. until 6.00 p.m., Sundays 11.00 a.m. until 5.30 p.m. Please ring our Direct Sales line 01-267 7851 to check availability of products that interest you before travelling any great distance. Alternatively, our Mail order service is fast and efficient. Please enclose 25p in postage stamps to cover any colour catalogue requests.

## INTEREST FREE CREDIT ON SELECTED ITEMS

**GUITARS:** WE choose 'em, you pick 'em! We have over 100 guitars, both electric and electric-acoustic, always on display for you to try. We only stock the pick of the crop so it sometimes pays to shop around; however, we specialise in Roland Guitar Synthesizers (all colours and all models on display subject to availability) and Washburn/Ovation Electric Acoustics. The Ovation 'Cutaway' models will be arriving in July and the limited edition 'collector' model in August. Washburn's new EC-43 nylon-strung EL/Acoustic is due any day along with their EA-42 Woodstock Studio Model (transducer and magnetic pickups). We carry selected goodies from the following:

Fender (USA)	Gibson
Fender (Japan)	Aria
Fender Bullitt	Ibanez
Washburn	Kramer
Ovation	Yamaha
Jaydee	Pangbourne
Chandler	Tokai
Vox	Westbury

Plus Secondhand

### EFFECTS etc.

Boss	GHS
MXR	Martin
DoD	Rotosound
Yamaha	Superwound
Fostex	Jim Dunlop
Ibanez	
Whirlwind	Plus all the
Ernie Ball	bits and pieces
Dean Markley	that matter!

### AMPS, COMBOS

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 Roland  
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 Plus the amazing 'Sessionette'  
 75w 1x12" ONLY £199



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Simply the best value on the market! Everybody stood back in amazement when Fostex announced that they had made an eight track 1/4" reel-to-reel recorder: Sales have proved just how successful this formula has been. The 250 4-track cassette demos to new realms — why not come to the London Rock Shop for a demonstration? We will show you how to set up an inexpensive home demo studio. We stock the complete range of Fostex equipment:  
 A-8: 8-track reel-to-reel  
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 250: 4-track cassette multitracker  
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 3060: Meter bridge for above  
 3040: Add-on 'Dolby C' unit  
 3050: Digital delay (270ms)  
 3030: 2 x 10-band graphic equaliser  
 6301: New 10w monitors



CS-01 Micro-Monophonic Synthesizer: Battery or mains powered, built-in speaker, pitch and mod. depth wheels, white noise, variable pulse width, full ADSR, Glissando, neck-strap buttons plus optional VCA/VCF breath controller. Amazing versatility and sound quality.....£189

### OTHER Producer Series COMPONENTS

MM10 Portable Mixer	MA10 Headphone Amplifier
-4 Channel (Mic/Line) Plus 2 Aux. Inputs, Panpot, Program Output X2 Plus Line Out X2	Built-in ambience effect, Multi In/Out, stereo, very practical
£75	£79



## YAMAHA HandySound

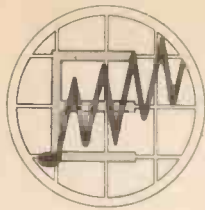


Two new Mini-Keyboards from Yamaha: HS-500 (III). Features piano, organ, violin, harpsichord and clarinet sounds, 4-note polyphonic, battery or mains powered, auto power-off, output for headphones, Hi-Fi or amp system plus... 5 Amazing Musical Games, each with 3 levels of difficulty: Match it, pairs, copy cat, chord chase and musical tennis! Yamaha have produced a truly educational electronic musical instrument... all in the handsound HS-500 for only £59.95.

Also available: Handsound HS-200, identical to above but without musical games: £39.95.  
 Direct Mail Order: Ring 01-267 7851 with your Access/Barclaycard for instant, post-free despatch or send cheque/postal order for £59.95 (HS-500), £39.95 (HS-200) to above address (allow 14 days for delivery). Limited stocks available for July/August, so please order early. Offer subject to availability.

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# Electronics & Music Maker

VOLUME 2 Number 5  
July 1982

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Patrick Moraz (left) and Mike Beecher

## CONTRIBUTIONS.

There are many ways in which electro-musicians can contribute to the editorial pages of E&MM. I believe it is important that the magazine should encourage musicians and technicians at different levels to contribute.

From this month we extend a warm welcome to Patrick Moraz, one of the world's leading keyboard players, who joins us in an advisory capacity, along with Dave Bristow, Alan Townsend, Tony Bacon and Dave Crombie, who have supported us in many ways from the start. Don't expect consultants to write for us every month — although they often do! — their role is a sort of musical 'think-tank' for us to solve your problems and make sure we bring the latest developments to your attention.

If you feel that you can review something in our field with the standard of practical and technical content expected in E&MM, then you've nothing to lose by putting an article together and submitting it. Don't forget, too, that specific areas in the magazine might encourage you to have a go — 'Home Electro-Musician', 'Cassette Reviews', and 'Circuit Maker' in particular offer participation from most readers if you put your mind to it.

There's always been strong support from the music business for E&MM, and although many companies have found it impossible to advertise their products during the recession, they nevertheless are enthusiastic in its aims and future growth. So to any companies who have a new product for the electro-musician and would like some help with the editorial, let's continue to hear from you.

Finally, it can take several months for E&MM to reach some countries. Don't despair, we are still excited by far-off contributions telling us about the music in your area — such as our latest communication with the only electronic music institute in Poland.

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# SPECIAL OFFER

Each month, Electronics & Music Maker gives a special offer to its readers that represents a substantial saving on normal retail prices.

This month, following our Electro-Music Engineer series about mains safety, we are able to make this exclusive offer:

## THE MARTINDALE RING MAIN TESTER

An indispensable asset to every musician on the road and an invaluable aid and tool in a home studio environment, the MARTINDALE RING MAIN TESTER is the simplest, safest and most efficient method of checking wiring in ring main circuits.

To operate, plug the RING MAIN TESTER into a live 13A flat-pin socket and the combination of three carefully selected neons will indicate whether or not the socket is connected correctly. The Ring Main Tester is suitable for 200-250 volts.



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Two left-hand panels lit  
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Right-hand panel lit  
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No panels lit  
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supply

Recommended retail price £6.10.

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including VAT, postage and packing

Please complete order form below. Offer open to readers in the UK, Republic of Eire and Europe only. (European customers please add 60p for postage.)  
Closing date: 31st July 1982 — subject to availability.  
Overseas payments including Republic of Eire should be covered by a bankers draft in pounds sterling. Please allow 28 days for delivery.

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E&MM/7/82

All prices shown include VAT, postage and packing

# Readers Letters

Send to: Reader's Letters, Electronics & Music Maker  
282 London Road, Westcliff-on-Sea, Essex SSO 7JG.

## Casiotone

Dear Sir,  
For what they are worth, albeit belatedly, may I offer my congratulations on the informative write-up on the Casiotone 701 which was in your January issue?

Its "automatics" would certainly not make it MY instrument, but I did wonder whether you had noticed a peculiarity with the Casiotones. In one of the local showrooms I was idly trying some chords on a CT-202 and I discovered that in general the octaves were not true, in that if two octavely related notes were played there was a beat which at certain points on the keyboard was downright unpleasant. The rate rose with the pitch of the note, but not progressively, it being almost non-existent on some. I drew the salesman's attention to it, and after some humming-and-hawing which I scientifically demolished, he said that "they all did that" and indeed it seemed that all the Casiotones did.

In the November issue you included a review of their MT-30, and in its excellent content you referred to the CT-201 and M-10 being virtually replaced by the CT-202 and MT-30, all using a 64-pin VLSI "chip". You went on to say that the later instruments used a D775G instead of a D773G. Will this imply that the 775 will replace a 773, and if not, will an M-10 or CT-201 owner whose instrument fails due to an expired 773 find his pride-and-joy turned into just a few bobs'-worth of spares? I have always questioned the wisdom of buying large items which rely on rare

specialist parts which a manufacturer can cease to produce without warning — not that I accuse Casio of this!

Can you offer any comments?

J. W. Robson Newcastle upon Tyne  
Many keyboards are deliberately "detuned" simply because perfectly pitched notes sound peculiar to the human ear.

A certain warmth of sound is generated by this method and certainly would not be a distraction in normal playing. As you may know, some pianists have a preference for a particular piano tuner for just this reason.

Concerning the advisability of buying an item which uses specialist parts, I suspect the average reader of E&MM would find life rather dull without some of the new and exciting developments which rely on up-to-the-minute technology. However, availability of spare parts is an important point and the size and reputation of the company concerned should be taken into account. I am very proud that Casio makes great efforts to ensure spare parts are available for years to come. In fact, we are currently repairing products which are over six years old.

Indirectly, the components mentioned are not interchangeable and should be used with the intended instrument.

I hope that I have answered the relevant questions as fully as possible and thank you for your interest.

Keep up the good work at E&MM!

Dave Caulfield

Sales Manager — Casiotone

## Speaker cabs — again!

Dear Sir,

I am very interested in building some PA speakers for my group, some with about 12" speakers and tweeters in a giant cabinet. Please could you find me an address of a place that could send me some instructions.

Shaun Day Sheffield  
We will be looking in detail at PA speakers later in the 'Sound on Stage' series. But, in the meanwhile, for cone drivers, Electrovoice can supply plans for their TL606D (2 x 15") and TL808 (4 x 12") cabinets. The Celestion 'cabinet handbook' is also strongly recommended; although it will cost you £1, it contains more relevant information than books costing ten times the price.

Tweeters, being horn loaded as a general rule, don't require cabinets as such, and in many cases, the bass/midrange cabinet will provide a convenient mounting surface.

Electrovoice, Maple Works, Old Shoreham Road, Hove Brighton BN3 7EY.

Celestion, Ditton Works, Foxhall Road, Ipswich, Suffolk IP3 8JP.

Dear Sir,

I write to congratulate you on your magazine, which is the first electronics magazine I have tried. As a complete beginner in the world of electronics, I find the approach very helpful and informative.

A particular feature which appeals to me are the low cost projects which you offer each month. As a musician, I of course, have a biased interest in the musical projects and have constructed the E&MM Syntom which for its price and simplicity (yes, even I found it simple!) is first class.

N. R. Hammond Brighton

## Synclock

Dear Sir,

I really enjoyed your demonstration at the International Music Show, Wembley. I have been playing an electric organ for 14 years now. I've had six organs in that time, I now have an ELKA 303. I have had fitted to this an 'Electro-Harmonix Vocoder' which I enjoy using very much. I also have a Syntom which I trigger from my top C pedal, so that I can keep my hands on the keyboard or turn knobs for effects. I have a friend who has your magazine and he made this up for me, I think this is a super little box of tricks.

I was interested in that little silver box you used to alter the timing and beats. You have opened up yet another world of music to me, the sounds and effects you got were superb. I have been thinking of getting a synth for some time now, its hard to decide with such a lot on the market and only a couple of shops in the area to hear them.

I shall in future order your magazine. Thank you again for a real superb afternoon. It's not only the young that are interested in this type of music, I'm a young 51 year old and loved every minute of your music and your enthusiasm.

E. King

Canvey Island, Essex

The little silver box mentioned is the Synclock and is one of our top selling projects.

Full constructional details of the Synclock can be found in the December 1981 issue of E&MM.

We have recently been inundated with technical queries and hope to publish a special section for these in due course.



# A keyboard that reads music. **CasioMagic!**



It may not look like music, but once the bar codes you see here are programmed into the new Casiotone CT701, it certainly sounds like it.

## For the novice

The CT701 offers you a choice of four different ways to play. There's a one key play function, you can follow the tune, you can play over the top of the melody, or play by yourself with automatic accompaniment. You can learn timing and chords too.

You can even programme the 701 yourself to any tune you like, although Casio have an exciting series of Bar Code Music Books with everything from Bach to The Beatles.

## For the accomplished

If you're already an expert, the CT701 offers a wide range of features. 5 octave keyboard, 8 note polyphonic, 20 preset sounds,



16 rhythms plus 'Fill in,' arpeggio, sustain, variable vibrato and sound effects. Plus Casio's chord system for single finger or fully fingered chord accompaniment.

In fact all the features you might expect from an expensive keyboard. The 701, however, is outstanding value at **£555 (R.R.P.)**.

The Casiotone CT701. One more reason why Casio are the fastest growing keyboard manufacturer in the world.

Ask about the Casiotone range and Casio's full range of music books at your local music retailer.

# CASIO®

Casio Electronics Company Limited, Unit 6, 1000 North Circular Road, London NW2 7JD.

# RONNY'S ELECTRO-MUSIC GABARET

Why has French singer Ronny teamed up with Warren Cann and Hans Zimmer's electronic band? Our interview with this new cabaret trio discusses the events and the instruments that have led to this special collaboration.

*How did you come together for this trio venture?*

**Warren:** Well it's very simple - it's my interest outside Ultravox, and Hans and I assisted Ronny at the Old Vic concert in London recently, putting the backing by using Roland Microcomposers and such things to do the concert in a much more unusual way than just having a whole coach load of musicians on stage.

**Hans:** I met Ronny during a BBC session and was later asked to play synthesiser for her.

**Ronny:** The sounds that Hans was producing was very different from the backings to my first recordings. I hated the concept of having a whole group of people playing behind my back - I didn't want the aggravation and I am very scared of relationships between human beings. It's harder to put up with say five different personalities than three microcomposers and a couple of players!

**Warren:** When you're essentially a solo performer, the prospect of dealing with a group can be daunting.

**Ronny:** We have built up a very strong communication between us that is hard to put into words. Personally, it is what I have been working for during the two and a half years spent doing vocals.

*How did you get into the singing?*

**Ronny:** I was in Paris dancing and modelling, but getting fed up with the whole thing and decided just to stop everything and go into something else - I wanted to explore my voice and link this with the use of electronic music. Apart from Jean-Michel Jarre in France, I could hear this music coming from England. I wasn't attracted to the current French disco sounds and later signed over here with Polydor as a solo artist.

I met Rusty Egan in Paris and he introduced me to Midge Ure (Ultravox) and they co-produced my first single here: 'If You Want Me To Stay' - a remake of the Sly and the Family Stone's number. Then I was looking for someone to write some music for me and I met Vangelis and did my second single with him. I didn't have to show him my



Warren Cann and Hans Zimmer.

lyrics - he doesn't work that way - he really works on a human level. And we talked a lot before going into the studio to see what would come of it. Obviously, the first few things we did, the record company jumped on and released.

*You give the impression that you have been doing cabaret for quite some time.*

**Ronny:** No, I have never done that, just a few times, but I know the atmosphere of cabaret through my dancing. When I stopped everything, I started to have some singing lessons. It was necessary for me to do that because I needed the security of knowing the techniques for correct breathing - that was all. I didn't need anyone to teach me how to express myself or what key to find. When you are a dancer you breathe in a different way from a singer so I had lessons for a few months, two or three times a week.

I then tried to discover my own style through the music I could find in France. My first real performance was at the Old Vic Theatre in April. It was actually the first time that I sang live in front of a crowd, apart from studios or for demos.

*Why don't you want a band backing you on stage?*

**Ronny:** I don't think I want the punch out of five people behind me to fill up the stage.

**Warren:** When you are in Ronny's position, as a solo artist having a strong concept of what you want in your performance, the differing personalities of the other people involved may result in one or two of the musicians not pushing in the right direction and so may hold back achieving what Ronny wanted. Because there are only two of us involved (and we are not short on 'voices' we can supply from the electronics), the concept





Hans with the 'Switched-on-Bach' Moog.

remains much truer to what it should be.

**Ronny:** The songs I have been singing have included 'Blue Cabaret', 'Gemini', 'To Have And Have Not', 'All The Way' and 'If You Want Me To Stay'. All that happened very quickly — we had a week and I had to break off to do two TV shows and radio interviews in Paris at the same time.

**Hans:** The song 'All The Way' was written by Vangelis and I never even played it until we were on stage! I had just talked to Vangelis about it and he couldn't remember precisely how the song went, so I decided to go on stage and pick up on the mood and just play anything that was suitable — literally an improvisation on the spot. It was a real experience to do that.

**Ronny:** We finished the Old Vic concert with 'It's a Sin' and 'Rebel Rebel'. My own songs are 'Blue Cabaret', 'All the Way' and 'To have and have not'. 'Gemini', 'It's a Sin', and 'Rebel Rebel' were the newest songs. Now Warren, Hans and Zaine Griff are writing my music for me.

**Hans, I'd like to know more about your background to this.**

**Hans:** I'm German, aged 23, but went to school over here and afterwards met Chris Franke (Tangerine Dream). Chris basically put this 'little dog' in me and I would spend long hours jamming with him. Later, he sold me his huge Moog synthesiser. You could say that this was better than the one he has

now! Chris wanted to do a tour with less gear, but the tour never came about because he couldn't find anything to replace it!

## The Moog

That Moog — the one I now use on stage — is the original instrument built by Robert Moog himself and it was used by Wendy Carlos for the 'Switched on Bach' LPs. I suppose it should eventually end up in a museum, because it was really the first modern patch synthesiser.

*Is it all still functioning?*

**Hans:** It works beautifully, it never goes wrong. I have had it heavily modified so it can run off a computer and now patch leads don't have to be used any more.

I met Warren through Zaine when I was working on the Buggles first album. It took nine months to do the album and three months to do a single — it was major surgery all the way! I learnt to read music after I bought the Roland MC8 Microcomposer, because it then became essential for me. I've been doing a lot of sessions in this country, although before that I had a band in Italy early on doing electronic pop. I've also been producing a lot of TV jingles. Most of our work is done with Richard Harvey (ex-Griffin band) who has built a studio in London with a huge control room including a 24-track recorder and that's where we keep all our keyboards.

*Have you had any training?*

**Hans:** Oh yes — I have had two weeks of



## Ronny's Electro-Music Cabaret

piano lessons! Seriously, coming from Germany has helped me — I went to my first opera when I was three and I attended classical concerts twice a week until I was thirteen. Once in England, I became submerged in the Beatles era. I've learnt music by ear and have picked up most of my technical knowledge through the sessions and gigs.

*Warren, does this new liaison mean that you are moving away from Ultravox?*

**Warren:** Nothing could be further from the truth. Everyone is getting along fabulously. It is just that we are 'workaholics' and outside of Ultravox I like to do things. It's also a lot to do with, the more you learn, the more you realise how little you really do know. I find it very beneficial for Ultravox too, because I am in a position where I can learn things from working with different people and the methods they use in their music.

**Hans:** For instance, I was working with another French artist yet still finding time to write jingles. Doing something completely different has always given me new ideas. That is a holiday in itself.

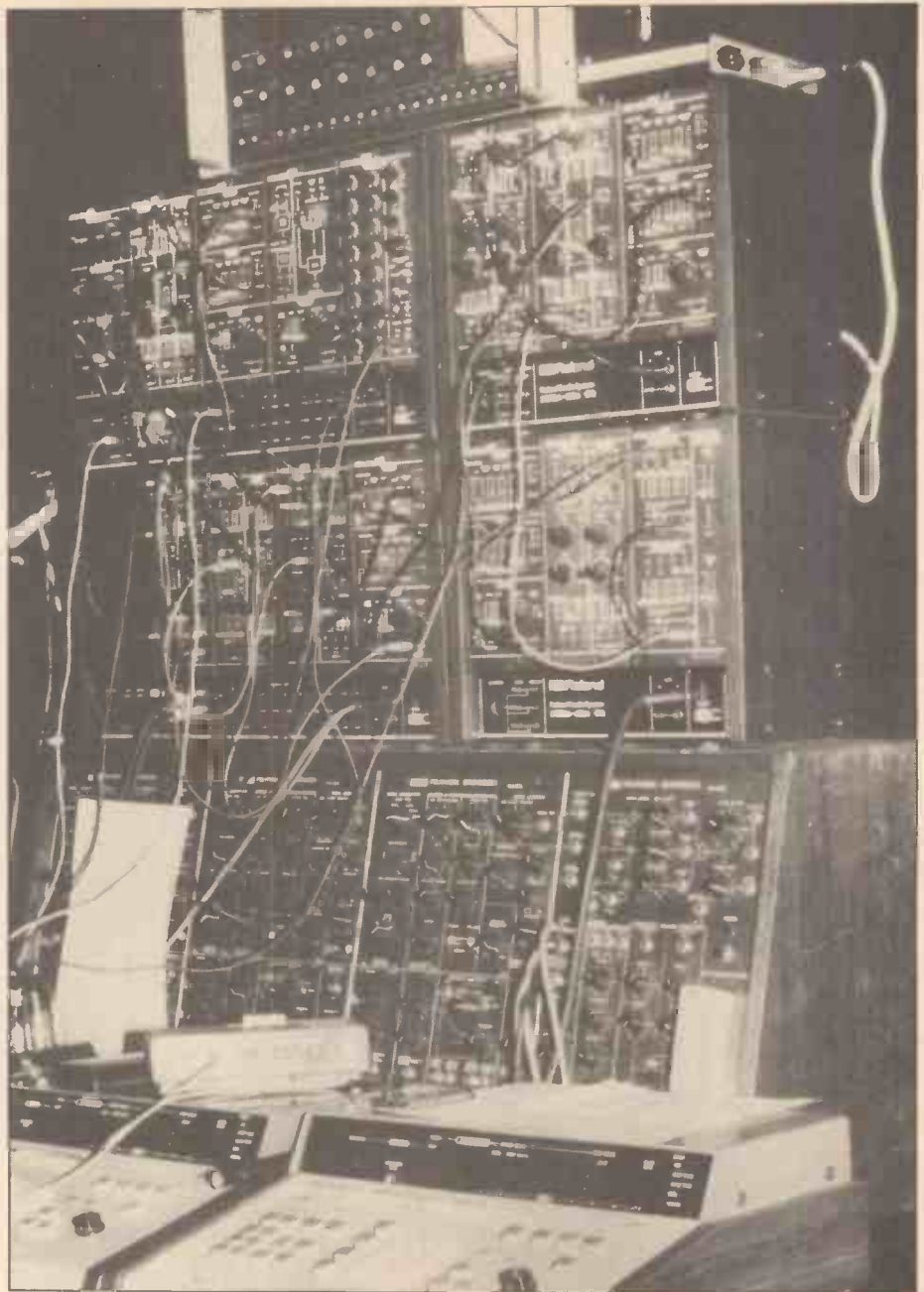
**Warren:** And pays the phone bill! I would like to stress that everything is alright within Ultravox — we all have our own projects and things that we do independently. At the moment, we are writing songs for our next album. I have also been doing an album called 'Spies', with Hans. It's a sort of adventure story in music. The album uses a tremendous amount of multitracking. We are lucky to be able to put this together and then get our management to sell it as a 'complete package' — but it does mean we have to fund it initially.

**Hans:** Our 'band' includes the engineer, Steve Rahms, who operates microcomposers and manipulates the tapes. He often comes up with some incredible effects and so it's really a co-production for Warren and myself, with 'sonic hooks' from Steve. We also have a singer from the Buggles, Linda Jardim. With this album now virtually complete, Warren and I were excited about collaborating with Ronny.

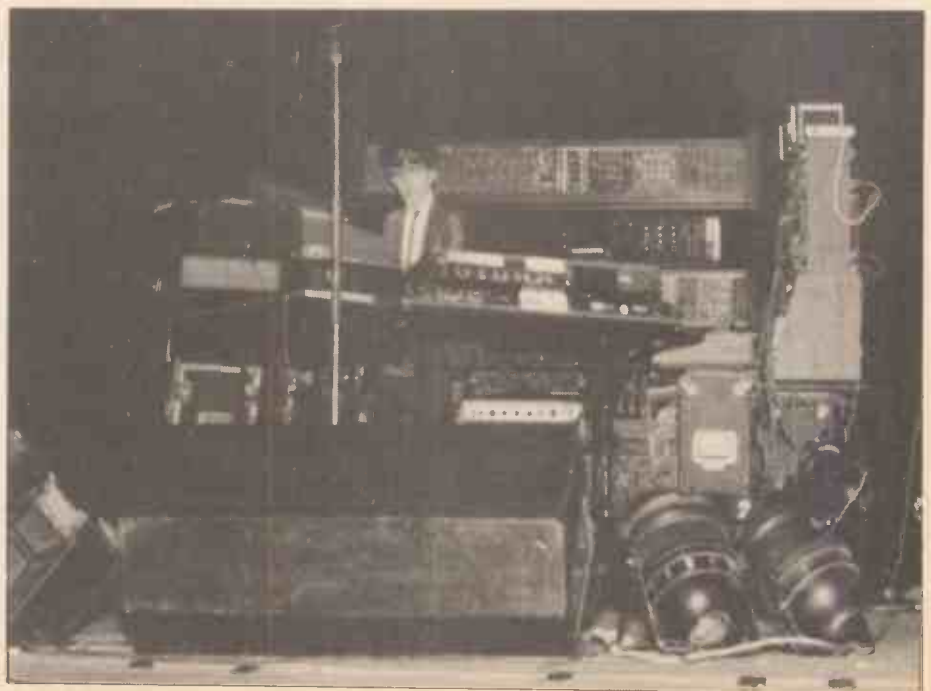
*Do you feel that the Ronny trio replaces the traditional bass, drum, keyboards/guitar line-up?*

**Hans:** I am always in arguments with musicians about that. First, don't think we are replacing anybody. There is always controversy about synths replacing people — not just drums but the Fairlight and so on. I think, if it replaces a musician (I mean your really awful boring session drummer), then all the better. You should be able to get something out of a machine that is better than an average musician. The important thing about music is that it's about individuals. So if I want Keith Jarrett to play piano for me because I like his style, then I am not going to do it on a synthesiser.

There is another advantage I find with our situation working with a lot of machines. My technical ability on say a piano, would not match my controlling a machine to play faster what I can hear in my head, without having to wait eight years while I practised my scales. But it doesn't make putting the music together any easier.



Roland System 100M (top), Korg 3300 Poly plus Roland Microcomposers.



Hans' keyboard set-up.

## Vocals and Performing

*Ronny, have you changed your style of singing to combine with the electronics?*

**Ronny:** Not at all. Hans and Warren like my style of singing and the sound of my voice and I think that what I am trying to put across means that I am not just singing for the sake of singing. I think that they also realise that I was very much into a visual presentation. I



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The Wave 2.2 has 64 waveforms in each of its 32 wavetables making a total of approximately 2000 complex waveforms. Each voice has a 24db/oct filter and so completely new sound variations are possible as well as the conventional analog and purely digital sounds.

Every sound you make on the Wave 2.2 can easily be altered or updated. Over 100 sounds can be stored in non-volatile memory and the Wave 2.2 makes its own memory check when switched on.

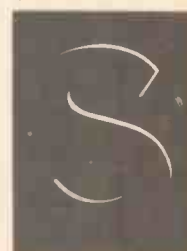
The Wave 2.2's advanced digital recording system allows eight tracks to be recorded, either

in real time or step by step. These tracks can then be edited and the sounds altered during playback. The recording system also has a polyphonic arpeggiator.

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## Ronny's Electro-Music Cabaret

like to think of a song as a little movie in itself. It's very hard to put across in three or four minutes what you want to express. Often people never hear the lyrics clearly or get the atmosphere behind it - they just hear something to dance to and move to. I would like to go further than that.

**Warren:** Because people are basically lazy they go for the immediate attraction of the music. I am more for the music endeavours of the country embracing its own identity. German music never really got anywhere as modern pop music until people started saying let's be ourselves, let's not ape the Americans and the English. The French too seem to be totally discounting the value or merit from anywhere else - they seem to have gone too far the other way.

**Ronny:** That's why I came over here - people say I'm French, but I say I'm European. In Germany you can see electronic music on TV, but in France it's still very much rock and roll, hard rock, and they are against the computer/synthesiser music. I did interviews recently in Paris and they don't seem to understand my concept, but we should have our place with this new music as an alternative.

**Warren:** I also have to say that it's the emotional content that is more important rather than the type of sounds used.

*How do you feel about performing with micro buttons instead of solely playing keyboards or drums?*

**Hans:** The way Warren and I do it is to have a certain amount programmed and then it all runs happily at the press of a button. This gives us time to play on top of it. I can't put expression into playing many keyboards at once - I would panic - but this way I can put most expression into just one or two instruments while the others are controlled by the micros. It's also much easier for me to compose my own songs rather than have to explain to someone else exactly what I want. Of course, the fact that we are using micro-composers gives us great scope for inventing and creating new sounds from the material available. But it all started off with my acquiring a VCS3 without a manual and having to learn to explore this for myself.

**Warren:** Coming back to performance, we have a totally utterly new phenomena without any kind of precedent in the history of making music - a technology which enables us to perform out of real time, and it has never happened before. Whether it was a conductor of a symphony orchestra, an arranger, a lyricist or composer, each produced music that was all cut and dried - it was live and there was no grey area in between. Something new has happened with technology that has enabled the artist or composer to present his music slightly out of real time.

What I am getting at is that we can do things that would be impossible in the normal real time situation. We can programme a lot of things exactly the way we want them to surround us, but the actual process of programming is hard work and we amalgamate that with a live performance that completes the musical picture. The public will have to become acclimatized to the idea that there are new criteria for judging a performance.

**Hans:** Something that is quite interesting is that the normal symphony orchestra might spend an awful lot of time rehearsing for a performance that would always ultimately sound more exciting at the event and with all these machines, we can still go on stage having programmed them before hand and find that our performance too becomes much more exciting on stage.



Warren's electronic drums.

*Ronny, do you see the voice as yet another instrument?*

**Ronny:** Certainly, and at this stage I would like to use my voice naturally rather than explore machines for its treatment, such as the vocoder and so on. I am not against it at all but I am still discovering new sounds with my voice every day.

**Hans:** Warren and I are very lucky to work with Ronny because it's not just the tone of her voice - it is very rare that you get a performer that has enough strength as a person and as a character to be able to compete with all that.

Another interesting point I have found in recent years is that although one can use incredibly expensive synthesisers, what is more important is the variety of sounds you use, which makes a cheap instrument just as viable musically.

*Can you see the new electronic music instruments taking their place alongside*

*traditional instruments of classical music and would you want to achieve the same sensitivity and emotion in your music?*

**Hans:** The question is slightly wrong because you should not put our music against Mozart and other classical composers. I think it is absolutely valuable to express the emotion of what is going on now, for the future of the rock business.

**Ronny:** People always make comparisons and you don't need to.

**Hans:** When you make a record it becomes the history of that time. Whilst an entertainer might always live for the moments on stage, an artist might think 'Oh this is really fabulous and people will love me for centuries' - but at the time of course he doesn't know. Take Salieri and Mozart - who remembers that Salieri was still a great artist of the time? We can't judge ourselves now - I prefer to call myself an entertainer, then an artist.

**Ronny:** So long as you are not expected to



Ronny's first UK performance at the Old Vic, London.



give an explanation to justify your music.

**Hans:** Then you are getting into fashion. Fashion is the greatest enemy of art.

*Don't you find that sequencers and micro-composers often lead you to setting up repeated patterns of notes that sound the same all the way through. Do you have any problems with that?*

**Warren:** Well, synth development is going through another phase now that analogue machines have been fully worked out. Now they're looking at the human engineering side of it - how to come up with ways to narrow the gap between the idea in the player's mind and the length of time it takes to achieve the required results.

It is a fascinating paradox that the most established instruments like the piano and violin can require the most technique. Everyone talks about the capabilities of the synthesiser to do everything, but generally the concept for each instrument is still very narrow - and of course you can pull the plug out of the wall and you have had it!

You have to approach the synth in a certain way and that's not the same way as a classically trained violinist. A peasant can pick up a fiddle and if he is intuitively musical he will gradually work out how to play it, even though his technique may be totally wrong - he can still create music. With the

**Hans:** All our writing is done straight on to a 24-track machine which is a great advantage for us. It means that whatever we manage to capture during our rehearsing is available for the final take - that certain something does not have to try and be recreated in another studio with your chances of recapturing it being virtually non-existent.

**Hans:** I now actually write things out and have basically got myself to the stage where with the microcomposer I can now hear eight parts in my head which I can write down away from a piano, on a tube train or wherever I am. I haven't got perfect pitch but I can hear a complete arrangement and that is really useful. I never store any settings for the Prophet and the banks are always full of rubbish. That means we are doing something fresh when we put down a new track on the recorder. On stage I use the Prophet 5 most of the time because it is so easy to operate (it's the Prophet 5 prototype actually that has been modified so there is nothing 'real' on it any more). The old Prophets have a different sound to the new ones. I have also a Yamaha CP70 electric piano which really is the workhorse for me. There's plenty of Roland System 100M and System 700 equipment, and of course there is the big Moog.

of work out of the way and the programmes are set so that maybe only four are required without much loading to be done. Our engineer would do any extra loading for us if necessary during a performance.

**Hans:** I also use the Korg 3300 Polyphonic Synthesiser and enjoy the microtone tuning on it, the Big Moog is being made completely computer programmable. It wasn't always that way and what I am having written at the moment is some software that enables me to go from one preset to another instead of it going immediately to the following preset. I want to be able to start a song in one mood and end up in another. We have a guy called Roy Gwinn and he is our engineer - he is totally crazy because he takes on my tasks and phones back at four in the morning to say he's cracked it and he can do it! But it saves a lot of time having someone who can translate exactly the ideas that you want.

Wiring up is another problem as well - at the moment we use 65 multiway cables! Everything basically leads into the Moog!

**Warren:** But the major connection is between my Linn drums and the microcomposers. Both these instruments will run perfectly happily together using the same digital code. You can write in timebase 48 or 24, which is equivalent to the Linn sync codes. Timebase 24 counts the clicks on the Linn as crochets and 48 sets quavers.

*Warren, have you changed your gear since our last meeting (featured in the April 1981 issue?)*

**Warren:** I have really the same instruments as before except for a few new additions - there are the two Linn drums which are linked together using the chain facilities so that I can easily go from one to the other. At the Old Vic concert, apart from my basic set-up, I used a Simmons SDS5 with 5 touch pads, including cymbals that were flanged.

**Hans:** We also use in our performance another musician, Brian Gulland, who plays bassoon, oboe, and other instruments. He specialises in antique instruments from the Renaissance period, although he does play synthesisers. It's great to mix the very ancient with the very modern!

**Hans:** What we've tried to do in our recent performance is to perform exactly what goes on to our recordings. Our first concert with Ronny was done completely off the cuff and prepared within the space of a few days. Warren and I were so scared! After a while the excitement carried us through the whole thing.

**Ronny:** But even during those days of rehearsing, I was very grateful for their 100% belief in me even though they had never heard me singing live on stage before. I wouldn't have done it otherwise. I was really very very nervous. But it was exciting to actually go and do something we wanted to do without asking anybody if it was alright and I'm sure a lot of people find this quite hard to do.

**Hans:** I also got married the day before we started rehearsing!

**Ronny:** We are just dying to do another performance, but at present we are working on my album which will have Warren, Hans and Zaine on it.

**Hans:** That's the same people used on the Zaine Griff album and also our album!

**Ronny:** But there's a different atmosphere on each! I'm hoping to do more concerts but nothing is planned yet and I shall be staying in this country for a while. I'm really very happy to have met Hans and Warren - it's really what I have been searching for and gives me the opportunity to realise my ideas by relating and talking to each other, rather than just going into a studio and making a record.

**E&MM**



synthesiser the latitude is much narrower and if you don't do a certain thing, then the sounds will just not happen by stumbling across them.

**Hans:** Basically, what I think happens is that you have to make an instrument part of you. Vangelis, for example, has many keyboards but what he really plays is the Yamaha CS80. I could set up an identical patch on a CS80 and it would sound a load of rubbish - it is the way he plays it.

*How do you put your music together?*

**Ronny:** Once we get to the studio it may take six or seven hours before something will happen that can be used.

**Hans:** The longest time is spent understanding exactly what Ronny wants rather than simply programming microcomposers. We talk about it and it might suddenly happen by talking about something else that an image will make it all clearer.

*Warren, how do you get down to providing the right drum rhythms for your Linn computer?*

**Warren:** I do whatever is right at the time, which may be some prepared rhythm already programmed or something I do on the acoustic drum. Occasionally I notate the ideas and once we finalise the rhythms I always store these on the Linn drum tape interface.

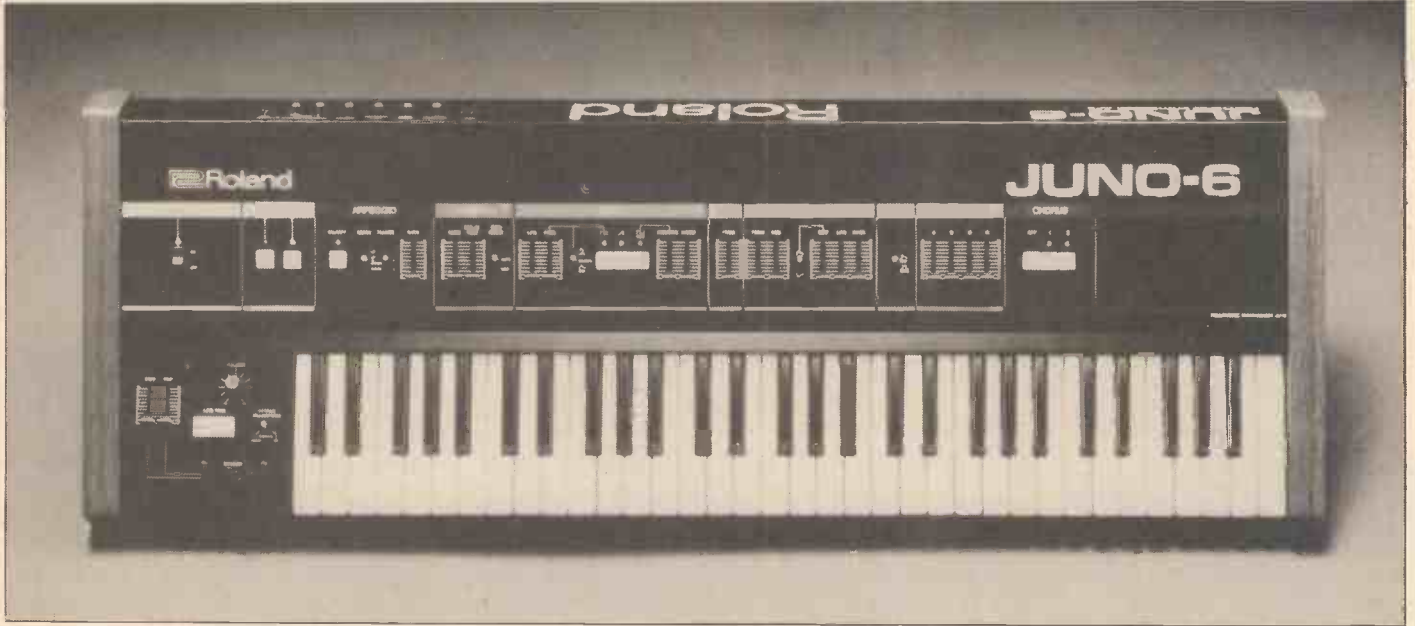
The Moog is basically an 8 voice instrument with 16 oscillators. It has a sequencer bank with three layers of 16 events. These are set in semitones and octaves, which is great for on-stage use - and for inspiration too - because you can have them running and by experimenting with the settings get something really good. There are also the four microcomposers - two MC8's and two MC4's. We are going to get rid of the MC8's now and stay with the MC4's. I think we are one of the first people to use microcomposers freely on stage. Occasionally a sequence may crash and then I'd pick it up on the electric piano or another instrument. It's amazing that often the audience don't realise that anything has happened!

**Warren:** It can be worrying using the electronic equipment too. Perhaps the worse you can do when you play an electric guitar is simply to play a wrong note, but if you don't get your synth settings exactly right you can end up with something that is horrendously different - so different that it just destroys the atmosphere you have worked so hard to create.

*Don't you find that program loading and setting for the piece following becomes something you think about whilst performing?*

**Warren:** No, we try to get the bulk of that sort

# Roland Juno 6



In designing polyphonic synthesisers an important balance must be struck between price and specification, with particular reference to the number of simultaneous notes available. The Teisco SX400 and Yamaha CS50 boast a large number of performance features including keyboard touch-sensitivity but are limited to four notes at a time; the Jupiter 8 or Polymoog offer more notes but at a much greater price. Two recent polysynths, the Korg Polysix and the Roland Juno 6, have attempted to establish a new standard, a six-note synth with a single oscillator assigned to each note, and it is refreshing to see that the trade-off of specification against price has for once worked well.

The major differences between these two synths is the Juno's lack of programmability, which enables it to be sold for some £500 cheaper than the Korg at about £700. Rather than producing a scaled-down version of their Jupiter 8, Roland have chosen to expand their popular SH09 monosynth into a polyphonic version, and the finished product boasts a five-octave keyboard and highly stable digital versions of the SH09's oscillators - no tuning problems here! Operation is extremely simple, the six DCOs (digitally controlled oscillators), VCFs and VCAs being controlled by common sliders, and a built-in chorus and arpeggiator provide a selection of unusual effects.

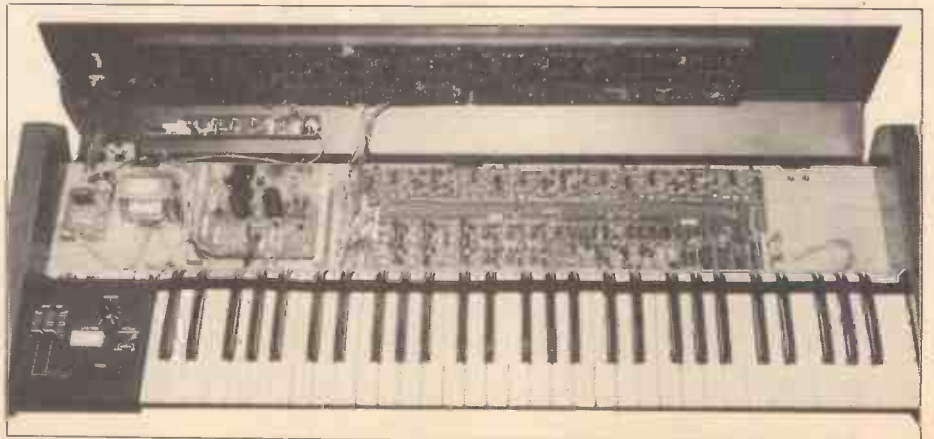
The oscillators offer triangle, square and pulse width modulation options, together with sub-octaves which thicken up the sound considerably. A high pass filter makes creation of thin reedy textures possible, while the single ADSR envelope shaper assigned to the VCAs and/or VCFs gives the usual range of sound shapes and effects. Particularly impressive is a slow attack and sharper decay used on notes picked from all over the keyboard, since each note has its own VCF and VCA. A horizontal sprung lever on the left of the keyboard can be used to

control the oscillators and/or filters to any desired amount, giving a maximum possible pitch bend of around a fifth, and nearby there is a white button which introduces modulation for as long as it is held down, as an alternative to the delay modulation, also available. The chorus on the extreme right provides two fixed chorus modes already familiar from the RS09 strings and SH09 hybrid keyboard. This section certainly does a lot to improve the texture, particularly of string sounds, and the combined effect of chorus, sub-octave pulse width modulation and vibrato is quite stunning!

The remaining major feature is the arpeggiator which plays in series up, down or up and down the keyboard any notes which are held down, at any speed. The arpeggiator can be latched so that it plays with "hands-off", and can be driven from an external clock such as a rhythm box, the arpeggio changing as soon as a new set of notes is touched. The top and bottom notes are always played twice in "up/down" mode, yet it is still possible to create a wide range of sequencer-like patterns.

## Circuit Features

The heart of this synthesiser is an 8049 8-bit microprocessor, running at 1MHz. It has a 2K ROM area which has been programmed by Roland's software engineers. The device accesses keyboard data representing the keys pressed (up to six at once) via input Port 1 and this is outputted as multiplexed 8-bit data for conversion to a key control voltage (through a ladder resistor network) and gate pulse (through a 4099 8-bit addressable latch). Four 4051 8-channel analogue demultiplexer/multiplexers are controlled by Port 2 of the 8049 and synchronise the DCOs with pulsewave and sawtooth waveforms, and also the VCF. Both VCF and VCA have ADSR control from a dedicated device, IR3R01. All this circuitry is on one large CPU board located in the instrument base (see photos). Next to it is the power supply (+5, +15, -15V). The performance controls have their electronics directly underneath. The neat layout is completed by two main control front panel boards which send control information to the CPU board. White noise is



Internal layout.





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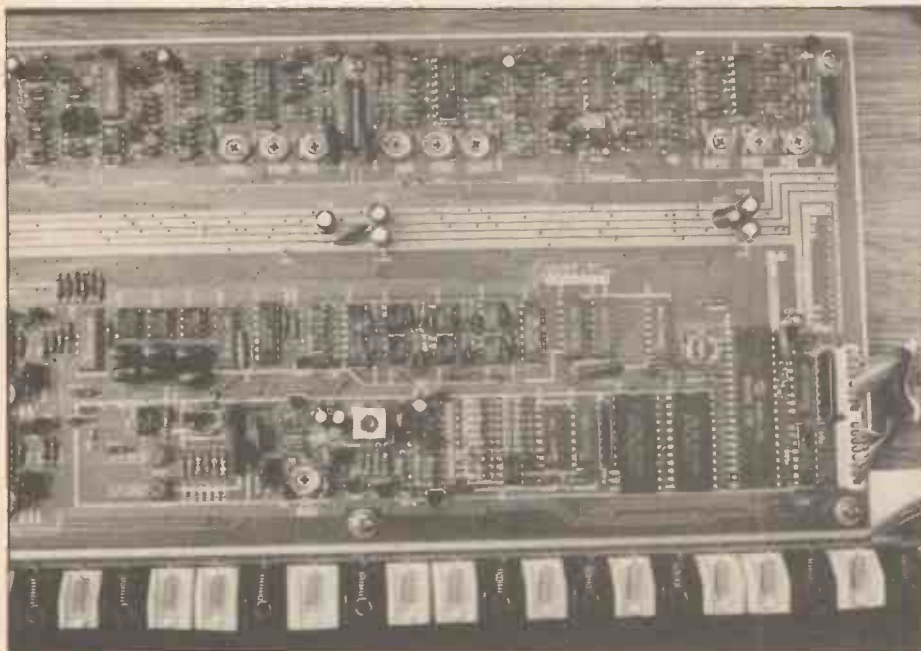
The final screening will take place on 2 December 1982 in Tokyo.

**For further information and application forms please write to Roland (UK) Ltd, 983 Great West Road, Brentford, Middlesex, TW8 9DN or telephone 01-568 4578.**

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# **Roland**

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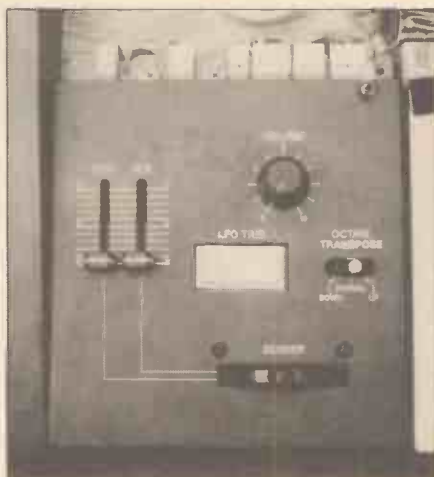


Close-up of CPU board showing 8049 microprocessor (far right).

generated by an amplified selected transistor (2SC945) while Arpeggio (modes, range) and Key Transpose are operated by setting the initial data lines into Port 1. A rear jack panel gives screwdriver adjustment Tuning ( $\pm 50$  cents), pedal Hold of keys played (a make/break pedal such as Roland DP-2), external VCF cut-off control (using a Roland FV-200 pedal), stereo phone socket (8-200 ohms) and mono or stereo (the latter really essential for best results), switched for -30dB, -15dB and 0dB.

There is also an external socket for control of Arpeggio rate which is a useful feature (one step per pulse over +2.5V). Any problems in finding a suitable control trigger can be overcome with this month's trigger project - the E&MM Synclock in particular gives rhythmic variety and, if selected to give a three pulse sequence length (running at a fast rate from a separate slow oscillator) will play three note chords. The Arpeggio mode can be up, up and down or down over a range of 1, 2 or 3 octaves, with internal clock rate variable from 1.5Hz to 50Hz.

A standard keyboard of 61 keys covering 5 octaves can be switched up one or two octaves. DCO pulse width modulation is effective from 50 to 97 per cent and LFO modulation of the oscillators is a maximum 300 cents. Filters in the Juno, as with most



Controller section.

Roland equipment, are very smooth in operation, with versatile control of the low pass VCF as it goes into oscillation with Resonance increased. The Cut-off frequency of the LPF covers 4Hz-40kHz and envelope modulation covers the normal 10 octaves (whilst LFO modulation covers 6 octaves).

The keyboard control voltage follower will open the LPF from 0-100 per cent for precise tonal shaping over the whole keyboard range.

A 'gate' keying option on the VCA adds a quick change of organ style touch to the

standard ADSR controls. The latter can be set for Attack (1mS - 3S), Decay (2mS - 10S), Sustain (0-100 per cent) and Release (2mS - 10S). The extremely short time settings give the Juno great clarity for percussive effects and, in conjunction with filter control, can produce dramatic harmonic changes. The maximum settings are acceptable, although special effects need longer times but are necessarily limited to feasible control pot spread.

LFO rate is from 3 cycles every second to 20Hz and delay is adjustable from 0 to 2½ seconds.

The control section to the left of the keyboard offers volume and octave transpose setting plus slider adjustment of DCO and VCF bend sensitivity via a left/right spring-loaded lever. The DCO control is limited to  $\pm$  fifth interval. Octave jumps here are always preferable as maximum parameters but not easily achieved. A novel addition (reminiscent of the early EMS synthesisers) is an LFO trigger button that provides manual control rather than continuous vibrato etc.

The Key Transpose is an interesting feature for musicians who want to play in a variety of keys but find the task difficult! By pressing any note on the keyboard (except C, which brings you back home again), a touch of the Key Transpose button will put the keyboard white note scale in your new key selected. Of course, you will have to turn the volume down while you do the setting on stage! The top octaves have limited transposition and its main use may be for playing from scores with orchestral transposing instruments. Nevertheless, the circuitry is all there and this control is provided via a single contact switch to two Port 1 input lines.

The Chorus effect is fast becoming a permanent feature on polyphonic synthesisers and Roland were probably the first to put it there. Three speed control of the ensemble rate is possible by switching in or out two push buttons, giving slow rates of 0.4Hz and 0.6Hz plus (together) a faster 8Hz tremolo chorus effect. The chorus is based around two identical circuits incorporating two ICs (MN3009 and MN3101).

The instrument is superbly finished, with veneered wood end pieces and logically laid out black metal control panels in a very slim case measuring 1060(W)x113(H)x378(D) mm and weighing 11kg.

The first impression of the Juno 6 is that it simply doesn't have many knobs on it, but it soon becomes clear that this keyboard can produce all the standard polysynth sounds and more, including strings, organ and a very respectable lead synth. The overall sound is crisp, clear and powerful, with a very smooth filter, and the price is reasonable. What more could anybody ask?

**Mark Jenkins**  
**Mike Beecher**

**E&MM**

The Roland Juno 6 retails at £699 inc. VAT and is distributed in the UK by Roland (UK) Ltd, Great West Trading Estate, 983 Great West Road, Brentford, Middx. TW8 9DN. Tel: 01-568 4578.



Rear connections.



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## Rod Argent



"I tend to be more of a player than someone who likes to get involved in technology. It's wonderful what you can do, but they're only tools. I'm always impatient to start playing rather than getting hung up on technical things. I'm finding writing for the theatre interesting ('Masquerade'), and I'll be doing a solo album soon."

### Keyboards

Fender Rhodes Suitcases 73; Prophet-5 Rev 3.1; Roland RS-202 string machine. "I find the Prophet the best basic, high-quality, polyphonic synth in terms of what you can get from it, and for transportation it's very light. I find it less coloured than the OBX, and it's really the Prophet or the OBX. I more or less tossed a coin: I like the OBX's meatier sound, but the Prophet I find truer. I didn't like the factory presets much, but it's marvellous once you start committing your own sounds to the memory. The Rhodes is a standard. Sometimes I use a Yamaha electric grand live, I tend to use my shop's facilities for bits and pieces.

"A few years ago, at the onset of the Prophet, synths reached a sort of plateau where it was good for the working musician. Now there are other things going on, like the computers, I mean to get into that more heavily. So synth technology is progressing fast, it's just a question of coming to terms with it all."

### Sequencers

Has used on sessions — no favourites.

### Playing Live

"I try to use as little as possible — last time a couple of Roland Cubes for personal monitoring, all fed into the desk."

### FX

Boss Chorus, mainly on Rhodes.

### Drum machines

Roland CR-78. Has used Linn/Simmons combination on 'Masquerade' demos, and on an (unfinished) track with Colin Blunstone.

### Favourite studio/engineer

Morgan/Martin Webster. A "marvellous engineer" who worked on Argent/Thompson/Hiseman's 'Ghosts' LP.

### Home recording

Ampex 1100 8-track on 1in ("a big old one"); RSD desk; EMT echo plate "lodged in the basement".

## Andrew Clark



"People tend to use me when they're trying to make unusual, 'organic' uses of synths combined with commercial propositions — Toyah, for example. I seem to get asked for manic Chinese violins — I like stretching. I think a lot of pop musicians take themselves too seriously, which is one reason I don't do that sort of thing any more."

### Keyboards

Minimoog; Yamaha CS80; PPG Wave 360A computer. "The Mini is from about 1967 and works wonderfully, great for funny noises. I've still got the CS80, which has gone out of fashion a bit lately, it's a horribly expressive thing. The Wave — which is the first one, without the analogue filter on the end, all digital — I bought from singer/songwriter Phierry Matsioszek. It was a prototype, number 44 in fact. It's a most startling machine: the design is awful, but it sounds fantastic, it gives me sounds I'd never even imagined.

"Most synths rely too much on smoothness. Beauty comes from imperfections, the ugly bits and wobbly parts, not absolute perfection. There's no tension in synths, no string vibrating in the air. Makers should take a risk and design something that has that in mind — my Wave does, with its 64-segment wave. As you move along, they've messed up the sound source so that it's still electronic, but in a way that you can't get from other synths."

### Sequencers

Uses a "beaten-up old analogue sequencer" occasionally, feeding the Minimoog.

### FX

"An expensive hobby for the studio player, but, I suppose, necessary for on-stage."

### Drum machines

"Luckily enough, someone paid for me to use a Linn on two whole albums, and on stuff for TV. It's not a drummer, but a very good drum machine."

### Favourite studio/engineer

"There are some places I look forward to going to: Good Earth, for example, all you want to do is play. I used to like Abbey Road and Hayden Bendall, and Steve Allen is good for my TV things."

### Home recording

Fostex A8 8-track "very good value". Gelf 12/4/8 mixer, plus graphic eq and echo.

## Michael MacNeil *Simple Minds*



"I'm a musician, not particularly a keyboard player; I don't think anyone thinks of me as 'a good keyboard player'. I'm more someone who creates music. We're not a synthesiser band. Keyboards give us unique sounds, and then I base what I play around that — so if I get a horn sound, I try to play what a horn would play."

### Keyboards

Roland JP4; Oberheim OBXa; Korg 770. "The Korg's second oscillator gets you some really weird sounds. It sounds cheap unless you play it through good equipment — it's good in the studio. I'm pleased with the JP4's stereo ensemble facility, but there's not enough memories. I'm going to try to get Roland to split the eight memories into four groups, giving 32: you soon run out on stage with just eight. The arpeggio's good, using trick timings with echo. The OBXa I got very recently — it really sticks out when you record it, piercing without needing volume. The first one I got kept wiping memories, a real worrier because all I kept getting was white noise and people thought I was doing it deliberately!

"There are that many new things coming out it's difficult to know what to get, something'll almost come out next week with more things and greater reliability. I like the idea of the Fairlight, but there must be some way without paying £32,000."

### Sequencers

"The Oberheim polyphonic could be interesting, but I haven't used sequencers so far."

### Playing Live

"I just got the Roland PA150 amp/mixer, and I feed it into my two Yamaha bins."

### FX

Roland 501 chorus/echo. "Nothing else — straight or echo, which I use a lot."

### Drum machines

"We use a cheap Electro-Harmonix quite a lot — it's got a whole mood of its own. We've got Doctor Rhythms and a new Roland, the 8000. Programmable are best — presets get boring."

### Favourite studio/engineer

Rockfield/Hugh Jones, Steve Hillage.

### Home recording

"We use a Portastudio, often with a couple of mics in rehearsal and then overdubbed later."





# Rod Argent's Keyboards

## OBERHEIM

The Oberheim OB-Xa programmable polyphonic features eight voices, a five octave keyboard, 120 memory locations, 8 patch memories, variable split and program layering, a comprehensive array of performance controls, high speed auto-tune, mono and stereo output, cassette and computer interfaces, and many useful rear panel inlets/outlets. Each voice has 2 x VCOs, noise, low pass VCF — switchable between 2- and 4-pole modes, 2 x ADSR envelopes, LFO, and VCA, and in addition there is an extra LFO associated with the performance controls. The OB-Xa is housed in a smart case with solid wooden end panels. And recently released by Oberheim is the DSX digital polyphonic sequencer, and DMX programmable drum machine which can be linked up to the OB-Xa to provide a complete music generation system.

## KORG

The Trident is Korg's excellent polyphonic ensemble, consisting of three main sections — an eight voice programmable synthesiser, a brass section, and a string synthesiser. The polyphonic synthesiser utilises a 16 bank program memory, with each voice incorporating 2 x VCOs, low pass VCF, VCA, and an ADSR envelope generator. The brass and string sections provide many variable parameters so that the voicings can be tailored to suit personal taste. The Trident features a five octave keyboard, with split, and is probably the best polyphonic ensemble currently available.

**R.R.P. £2,310. AGENTS PRICE £1,750**

## KORG

The Mono/Poly is a brand new monophonic from Korg which, as its name implies, also offers polyphonic performance; this is because it has four separate voltage controlled oscillators which can be assigned to four different notes played on the Mono/Poly's 3½ octave keyboard. However if you decide to layer the four oscillators in unison mode, then a phenomenal range of powerful and complex sounds can be created. Other features include a noise source, low pass VCF, 2 x ADSR envelopes, VCA, synchronization and cross-modulation, polyphonic portamento, chord memory, wheel controllers, and much more.

**R.R.P. £689. AGENTS PRICE £565**

## MOOG

Moog Source £662; Moog Opus III £529; Moog Rogue £223. We are Britain's largest Moog dealer and service centre. For an unbeatable deal on all Moog products come to Rod Argent's Keyboards.

## YAMAHA

In stock now — the incredible GS1 and GS2 digital synthesisers from Yamaha. Using digital FM tone generation these instruments can produce an incredible array of natural and unique sounds. The superb keyboard action is velocity sensitive and offers touch control of volume and timbre. These instruments are the ultimate in performance oriented digital synthesisers.

## SERVICE DEPARTMENT

Our Service Department exists for the benefit of all our customers. When you purchase an instrument from us you have the security of knowing that our fully staffed Engineering Department will at all times service and maintain your equipment in perfect order. We are an authorised service centre for most leading Synth manufacturers and also specialise in modifications to Moog, Oberheim and Sequential Circuits products.

## ROLAND

We are the largest Roland stockist in the U.K. and can at all times offer the latest product from this incredible organisation. Come and see the fantastic keyboard range that Roland are currently offering — great new pianos, organs and string machines and their superb polyphonic synthesisers, the Jupiter 4 and Jupiter 8. We also stock all Roland Drum Machines — DR55, CR5000, CR8020, TR606, TR808. Come and see our Electronic Percussion Specialist who will advise you on the unit which best suits your needs. For an unbeatable deal on advice, service and price on all Roland products, come to Rod Argent's Keyboards.

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## SIMMONDS S.D.S.V.

The Simmons electronic drum kit is the first full scale kit to be commercially available anywhere in the world. It has been designed to replace conventional drums and to expand the sounds available to the modern drummer. The drums consist of visually exciting perspex surfaces which are mounted on two stands with a freestanding bass drum. The whole kit will pack away into next to no space. The drums are wired to a central control unit, which programs the sounds and dynamics for each drum individually. The response of these drums is fantastic, surpassed only by the mind-shattering sounds produced by the kit itself.

## KORG POLYSIX

This incredible new polysynth from Korg offers the following features: Six voices, 32 memories, cassette interface, chorus/ensemble circuitry, arpeggiator, 61-note keyboard, chord memory and many other features that make this instrument the only choice for a polysynth around £1,000.

## LINNDRUM

Following the success of the LM-1 Drum Computer, Linn Electronics announce the new LinnDrum programmable drum machine. This unit uses studio quality digital recordings of real drums, including cymbals (a total of 16 percussion voices). There is enough memory available to store 49 rhythm patterns, which are programmed in real time, with adjustable error correction. The patterns can then be linked together to provide a complete percussion track. Dynamics are programmable, and the drums may be tuned from controls located on the front panel. The LinnDrum is simplicity itself to operate, and is available at a remarkably low price.

## AMPLIFICATION

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## SEQUENTIAL CIRCUITS SEQUENTIAL CIRCUITS SEQUENTIAL

### PRO-ONE

The Pro-One is a high performance monophonic synthesizer from the Prophet people. The Pro-One has all the facilities that you will ever need in a monophonic — a three octave keyboard 2 x VCO's, a noise source, a low pass VCF, 2 x ADSR envelope generators, VCA, an extremely versatile modulation section, arpeggiator, and a 40 note sequencer. The Pro-One can be interfaced with most makes of ancillary equipment, and the audio inlet enables you to trigger the envelopes from an external source, and simultaneously process that signal with the synthesizer's VCF and VCA. What more could you want from a monophonic?

The SCI Prophet 5 is a programmable polyphonic that has become the standard against which other instruments are judged. Each of the Prophet's five voices boast: 2 x VCO's, noise, low pass VCF, 2 x ADSR envelopes, a comprehensive LFO and poly-modulation section, and VCA. This Poly-Mod facility enables the Prophet 5 to create unique modulation effects, and helps to add that extra dimension to the sound for which the Prophet has become famous. Other features include a five octave keyboard, new 120 bank program memory, voice defeat, cassette interface, user determinable scale tempering, and much much more. The Prophet's uncoloured sound quality gives it an astounding imitative capacity, which makes the Prophet a particularly impressive studio tool. Sequential Circuits have recently announced two new products which are designed to work alongside the Prophet — the Remote Prophet is a portable keyboard weighing less than ten pounds, and can be worn, like a guitar, so that you can walk around stage whilst playing your Prophet. It features a four octave keyboard, program select switches, and performance controls. The new Poly-Sequencer, now with 10,000 note storage, is a comprehensive polyphonic digital sequencer with an integral cassette recorder for sequence and program storage. So, with such performance qualities, and these extra control devices, it isn't surprising that the Prophet 5 is the current market leader.

Sequential Circuits Prophet X.....	} PRICES ON APPLICATION
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# MUSIC MAKER EQUIPMENT SCENE

## New Portastudio Launch

May saw the much-awaited launch of Tascam's new Portastudio, the M244. Speculations preceded the unveiling by several weeks and while maintaining the basic package idea the new developments and incorporations run into quite a list.

Major changes include: 4-channel recording ability; parametric EQ control; electronic 4-digit counter; stereo auxiliary circuit with pan controls and pre/post EQ and fader select; stereo or 4-channel tape output; monitor

circuit for cue, remix and auxiliary; front panel and remote record 'punch-in'; and three-motor logic-controlled transport. New features include overload input and overload output buss LEDs, mixer input break jacks and improved controls.

Significant, too, is the inclusion of DBX II noise-reduction which, say Tascam, gives a signal to noise ratio of -90dB.

The M244 should be available from June.

For more details contact your local Tascam retailer or Harman (Audio) U.K. Ltd., Mill Street, Slough, Berks SL2 5DD. Tel: 0753 76911.



## Siel

Siel have just launched four new synthesisers, three of which are available in this country.

The Sielorchestra produces a range of orchestral presets from brass and strings to piano and reeds with controls for brilliance, attack, sustain and vibrato.

The Mono produces 10 voices: brasso tuba, trombone, trumpet, flute, piccolo, sax, clarinet, violin, bass and guitar. There is a free/

preset select button and substantial control over the various sound parameters.

The Cruise is a mono/poly configuration which combines the ideas behind the Sielorchestra and the Mono into a more variable instrument. The two sections can be played separately or combined and the Cruise offers split keyboard facility. Recommended retail price is £699.

More information from Minns Music Ltd., 5/7 Gervis Place, Bourne-mouth BH1 2AL. Tel: 0202 291277/8.

## Sennheiser Phones — Easy On The Ear

Two new headphones from Sennheiser are the HD40 and the HD230.

The HD40 are light (60g) and comfortable to wear and have a two-colour indicator system to indicate right and left channels. The phones slide up and down a rod and click stop every 4mm and the ear pads are easily removed for washing.

The HD40 needs a fairly high output to drive them and it may be worthwhile checking it out with equipment it is going to be used with. Frequency response is very flat. Nominal impedance is 170 ohms.

The HD230 are constructed with a two-way transducer consisting of a wideband driver and a special treble driver. The construction is such that a close seal is made between the ear pads and the ear; the pads simply pull



out for cleaning. Colour coded leads indicate left and right channels and weight is low (260g) compared with similar types of headphone. A central click-stop band gives non-slip adjustment and the phones sit comfortably on the head.

Frequency response is quoted as 10-30,000Hz and impedance is 600 ohms.

Further information is available from Hayden Laboratories Ltd., Hayden House, Chiltern Hill, Chalfont St. Peter, Gerrards Cross, Bucks SL9 9UG. Tel: 02813 88447/89221.

## Colour up by Chandler

Chandler Guitars have a new range of custom guitars in their Schecter Custom Series — Strat type, Tele type and P Bass type — and each type is available in 'this year's colours' which range from stark 100% black

with cream binding to pearlescent coloured instruments with bright chrome parts.

They also have new items from the E.S.P. company including a range of vintage-style replacement pickups.

Details of new and existing items from Chandler Guitars, 199 Sandycombe Road, Kew, Richmond, Surrey. Tel: 01-940 5874.



## New LinnDrum

Linn Electronics, manufacturers of the 'real drums' digital computer, the LM-1, have developed the LinnDrum which, they say, is an improved model at a cheaper price.

It stores as many as 49 different rhythm patterns, all programmed in real time with adjustable error correction and complete editing facilities. Dynamics and 'human-feel' are programmable, too.

Separate outputs for all sounds are provided and a stereo mix can be arranged by the integrated front panel mixer.

The drum sounds can be changed by using alternate 'chips' supplied by the factory. Custom prepared sounds are also available.

Prices range from £1,950 to £2,700. (The LinnDrum will be reviewed soon in E&MM.)

Details from Syco Systems Ltd., 20 Conduit Place, London W2. Tel: 01-723 3824/44.



Bose 601  
Series II  
Loudspeakers



Bose 802  
Professional  
Loudspeakers

## More Speakers from Bose

Several new speaker systems have been launched by Bose U.K. Ltd.

The 802 and 802-W Articulated Array loudspeaker systems are designed for professional use. The 802-W system features a wood enclosure with modified input connectors and is designed to meet the needs of permanent installations.

The Articulated Array system contains eight Bose D-11A full-range drivers mounted on a faceted three-dimensional baffle to provide smooth horizontal and vertical dispersion and eliminate hot or dull spots.

They are designed for use with most material including that containing low-frequency energy such as bass instruments and drums.

The 402 and 402-W speakers share much of the same technology as the 802 system but are designed for use with limited-range program material such as vocals, guitar and wind instruments. They use four

D-22A drivers and are also mounted on a baffle placement for even, round dispersion.

Both systems require their own specially-designed equaliser. Suggested retail prices including equalisers are £825 per pair for the 802-W and £550 per pair for the 402-W. Prices include VAT.

On the domestic front Bose have launched the 501 Series III and 601 Series II Direct/Reflecting Speakers. Each will work efficiently with amplifiers of 20 watts per channel. The 501 will handle up to 100 watts RMS per channel and the 601 will take up to 150. Each features Bose's Dual Frequency crossover network and the speakers are designed to give a broad stereo image from almost anywhere in the room.

Suggested prices for the 501 and 601 are £395 and £825 respectively, including VAT.

More details and information are available from Bose U.K. Ltd., Trinity Trading Estate, Sittingbourne, Kent ME10 2PD. Tel: 0795 75341/5.



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# Peavey Heritage VTX



I got a letter the other day — sounds like a good idea for a song, doesn't it? Remind me to make a note of that. "We're sending you a 130 watt Peavey amplifier to review," this letter said, and whereas I would normally cringe at the idea of using such a powerful device in my little studio, I wasn't worried about this one, and for once I didn't have my preconceptions shattered. I already knew about Peavey's 'Classic' (not to be confused with Ruddle's Classic) and the Heritage is equally small and neat; I carried it upstairs single handed, the floor didn't need to be reinforced, and it wasn't a rampaging uncontrollable beast — the sort that blows the windows out even with the volume on zero.

Having said that, the Heritage is loud enough for anything; any gig that it can't handle by itself will almost certainly have a PA to help it out. The amp measures 26½" by 20¼" by 11" deep and weighs about 65 lbs. Before we get too far from the subject of carrying the thing upstairs, although the single handle on the top is adequate for one person doing a short haul, an additional handle at each end would make it possible for two people to combine their efforts for longer journeys (these people could even be of the much maligned 'roadie' breed if necessary). The amp is sturdily built, with metal corner caps, and the control panel is recessed to afford protection from most combinations of low brain and high brawn.

## General Arrangement

The workings of the Heritage are explained in the instruction leaflet with the help of a reasonably lucid signal-flow diagram. There is a choice of two input jacks, one half as sensitive as the other (10mV as opposed to 5mV) and these combine to feed two input channels, each with its own volume and tone controls. Both channels may be used together, or selected by a plug-in footswitch. This signal then feeds a phaser, a spring reverb, and finally the power amplifier stage; this sports valves, in contrast to the rest of the circuitry which uses semiconductors.

The speakers are two of Peavey's Scorpion 12" units in an open-backed enclosure. These have 2" voice coils and are rated at 150W each; if you somehow manage to blow them up, they're designed to be easily fixed. "Unique field replaceable basket assembly makes the reconing process a thing of the past," it says here. "Unique" isn't strictly a truthful claim though, because Vitavox have manufactured 'field-repairable' cone speakers for many years.

Two speaker jacks are provided so that an extension cabinet can be used, either with or without the internal speakers. Also on the back panel is a line output socket, which feeds an attenuated version of the power amp's output to a recording console or PA mixer; this signal is also specially equalised to approximate the frequency response of the speakers. Unfortunately, it can't simulate the complex interaction between a moving speaker coil and the output impedance of a valve amplifier (Richard Elen's and George Chiantz's 'Richocet effect'), which is one of the essential ingredients of the valve sound. It's not just distortion that does it, and this may be one reason for Peavey's choice of a valved output stage even though they've developed a perfectly adequate solid state valve overload simulator for this amp.

Sockets are provided for the connection of effects units etc. between the pre-amp and power amp sections; a position which gives lower noise if your effects can take the higher signal level. My Carlsbro echo certainly worked well here. Finally there's a ground lift switch, a hangover from the disgraceful and lethal American bonded-earth system; mercifully this switch doesn't do anything on the 240 volt export model, which is provided with a captive three core mains cable of a decent gauge.

## The Controls

There are quite a few knobs round the front of the Heritage, but they're not as daunting as they first appear if approached logically. It's intended that the amp's two channels will normally be set to give a distorted 'lead' sound on one channel, with a 'clean' sound on the other, and the first seven knobs (staring on the left) belong to the lead channel. There are two gain controls, and these work in conjunction with the 'saturation' control to affect the distortion characteristics of this channel. I have to report that Peavey's valve simulation circuit, although a strange thing to find on a partially valved amplifier, works very well indeed. Once I'd set the controls to my taste, it really sang and long notes held on beautifully right to the bitter end; the circuitry is sensitive enough to enable any guitar to achieve the required effect. There is also a 'bright' switch operated by pulling out the input gain knob, but this interferes with the smoothness of the distortion and I left it pushed in.

The low, mid and high tone controls are passive, the sort you find on the older type valve amplifiers. By modern circuit standards, these controls are terrible — they interact with each other and don't do what you might expect, but many guitarists are used to this and find they can get what they want more easily from this style of EQ. They are certainly gentle and all settings are useful, unlike the presence control which is active and can cause earstrain if turned up too much. The most useful feature of this section is brought in by pulling the 'high' EQ knob; this actuates an effect which is called 'thick' for some reason. In fact it's an upper midrange boost which goes especially well with a maximum saturation distortion sound.

Moving on to the 'normal' (clean) channel; this does not have the saturation control, just input and output gain. Distortion can still be obtained, but not with the smoothness and controllability of the lead channel; this section works much better in the clean mode. In fact, there is some breakthrough from the lead channel if it's set for maximum distortion; this isn't normally troublesome, but you might want to turn the lead channel down if you're making a recording using the clean channel. There is also a 'pull bright' facility on the input knob, as on the lead channel.

The tone controls here are active, and have much more cut and boost available; 15dBs worth each way in fact. Low and high EQ are as normal, but an interesting feature is the 'parametric' (strictly 'sweep') midrange control. This is on two concentric knobs, which are rather small and tricky to get a grip on in consequence; the inner one gives cut and boost, the outer shifts (or sweeps) the centre frequency from 150Hz to 1.5kHz. A good idea, but I would have preferred the shift to go down to 80Hz to cover the whole frequency range of a guitar, like the JHS amp reviewed in February.

Next comes the phaser, with depth and speed controls (called depth and range on the amplifier). By pulling out the range knob, you can stop the sweep and position it manually with the same knob; this gives a whole range of new sounds and is, as far as I know, unique. As it happens, I wasn't all that keen on the phaser, it made too much of a

'churning' sound unless it was turned down to a very subtle level; maybe I'm just fed up with phasing, which seems to be getting as much overuse as wah-wah did in the late sixties.

Let's put a stop to all this nitpicking and pass on to the reverb, which is very good; in fact I left it switched on about halfway all the time. The spring unit sits in a bag fixed inside the bottom of the cabinet, and I think my sample must have been disturbed in some way (the carrier delivered the amp upside down, despite 'this way up' signs on the box) because the reverb tended to build up into a background whine rather like a quiet form of feedback. The noise went away after I'd moved the spring line about a bit.

The final controls are the on/off switch, which turns on the pre-amp and the valve heaters, and a three position standby switch which gives the options of 'off', full or quarter power from the power amplifier. Red and green LEDs tell you which state the amp is in.

## Footswitches

A wedge shaped unit carries four footswitches, and connects to the back of the amplifier via slightly over 3 metres of cable and an easily squashed DIN plug. How do I know it's easily squashed? Simple, I trod on it. Sorry, Peavey. Two of the footswitches (which are OK to tread on) switch the phaser and reverb in and out, and the other two determine which input channel is used. The 'selector' offers either lead or normal, whilst 'combiner' gives you both at once, and LEDs tell you which channel(s) are working. An interesting mode of operation is possible with the combiner if you set up the two channels carefully. Because the saturation effect tends to compress the sound, the lead channel will be the loudest one if you play quietly; but if you play hard, the normal channel will come through and change the sound radically.

Apart from the quality of construction and the excellence of the saturation effect, the major quality of the Peavey Heritage is its controllability. This is nothing to do with there being lots of knobs to twiddle; quite the opposite. Once you have found the control settings that suit you, the amplifier can be left alone; the foot switches, the guitar controls and your own technique will take care of most of the variations you'll require.

I left the amp set up in my studio, and I found myself switching it on at odd moments just so I could hear my guitars working so well. I used a Gibson L6S with DiMarzio pickups, a home built solid fitted with Gibson humbuckers and a Fender electric XII, and they all sounded good; there was an extra something, hard to describe, that made what went into the guitar come out of the speakers. Nothing to do with high fidelity, but a more direct connection between the idea and the sound, perhaps.

Be that as it may, the Heritage carries a suggested retail price of £432.50 — it may be less if you shop around — and you get an amplifier that will serve you long and well, on stage and in the studio. I shall be sorry to see it go. I may barricade myself in with it — or would someone lend me 400 quid?

Peter Maydew

E&MM



# Hot Wiring your GUITAR

Peter Maydew

## Stereo Part 2 — Hexaphony and the Split Precision

In May's gripping instalment of *Hot Wiring Your Guitar* we described two channel wiring of guitars, popularly known as stereo, and explained why this arrangement doesn't give much of a stereo image. In order to cause the sound of each string to come from a different point would require a very special pickup, and the simplest form of this — although simple is hardly the correct word — is the hexaphonic pickup. This has a separate coil for each string, and is effectively six completely independent pickups in one case. Each string's output can thus be panned to the required stereo position.

The hexaphonic pickup has more advantages than just stereo, however. Once you have the ability to deal with each string absolutely separately, there are virtually no limits to what can be achieved. One spectacular effect is 'hex fuzz', which is simply six separate fuzz or distortion units, one for each string.

Whenever any form of distortion is used to alter an ordinary guitar's sound, two or more notes played at once interact with each other due to a phenomenon known as intermodulation. The result is that when two tones try to elbow their way through a fuzz box, more than two tones come out, and the extra ones needn't necessarily be harmonically related to the original two. With hex fuzz, however, none of this unpleasant rivalry occurs, and the end product sounds more like several guitars playing single notes in harmony.

There are many, many more things you can do once you have a hexaphonic pickup, but before I build up your expectations any more, I'd better deliver the bad news. The only commercially available hex pickup that I know of is the one that ARP used to sell to go with their Avatar guitar synthesiser. ARP are now out of the running, of course, and their pickup cost over £100 back in 1978, so it's obviously not for everyone. There may be other alternatives. Making your own is liable to be tricky, however, since there isn't much room for a coil and magnet in a normal guitar's string spacing. On a brighter note, I see that RS Components, who distribute a myriad of electronic bits to the trade, now stock a magnetic pickup meant for industrial motion sensing. (*Equipment from RS Components is only available through established retailers.*) It's in the form of a cylinder about 6mm in diameter, and might be usable as one channel of a six-way pickup.

### The Split Precision

There is one very common instrument which goes part way to true stereo — the Fender Precision bass. This has a split pickup, with each half picking up two strings, and it's fairly easy to feed each 'semi-pickup' to its own channel. Since the advent of DiMarzio *et al* quite a few instruments have this arrangement, and they should all be convertible.

Using the split wiring, you can have a simple stereo effect where each pair of

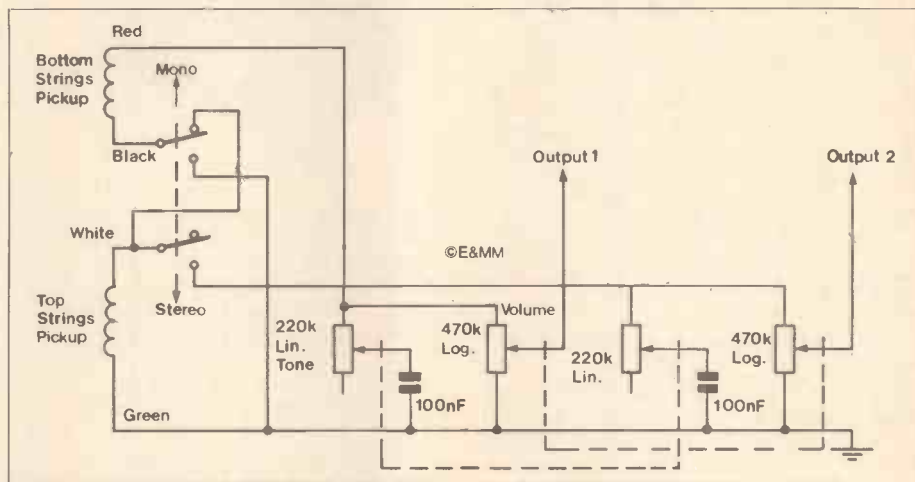


Figure 1. Circuit showing split stereo wiring.

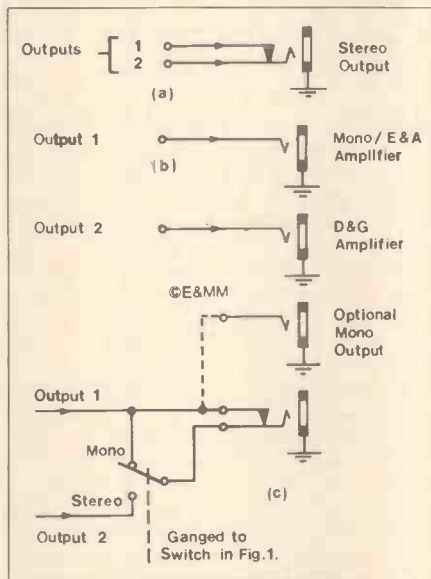


Figure 2. Output jack options.

strings has its own amplifier; this benefits from careful playing to keep the notes leaping about between the speakers. Alternatively, you can get really fancy and put separate processing on each channel. For example, with distortion and/or treble boost on the top two strings you can swap instantly between 'solo' playing and straightforward bass sounds from the lower strings.

Unfortunately, hardly any guitars have this split pickup arrangement; the only ones to spring to mind are the Fender Electric XII and the same company's very rare Custom.

Figure 1 shows how to connect a Precision style bass for split stereo, using a DiMarzio Model P pickup pair. Users of other pickups who don't want to use the DiMarzio will, I regret, have to figure out the wire colours appropriate to their own unit. In some cases, extra wires will need to be added to extend all four connections to the control cavity. Ganged controls are called for on volume and tone — there seems to be

little point in having separate volume controls, although a case could be made for having separate tone controls. On my own bass the tone control is a single ganged component which works on the lower strings only in stereo, and on all four in mono.

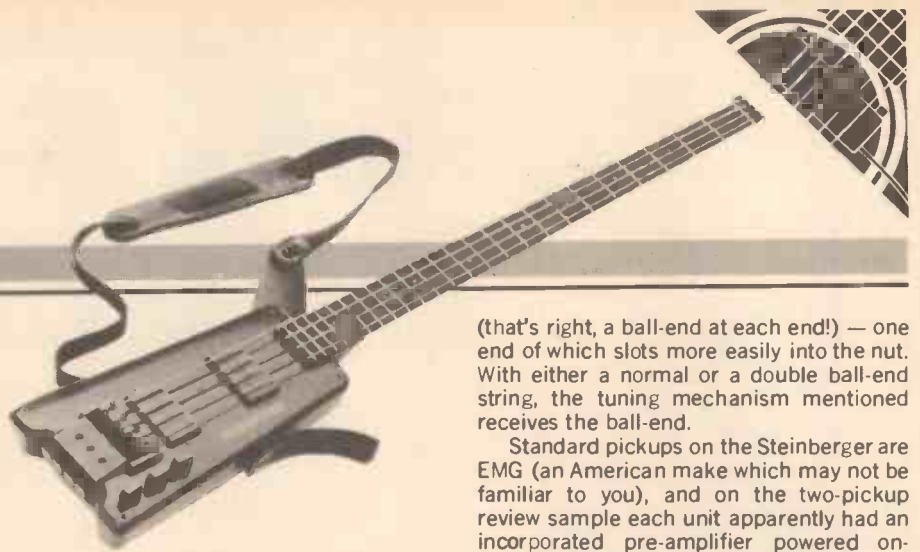
As in the last article, there is a choice of output arrangements, three of which are illustrated in Figure 2. The simplest is a single stereo jack as shown in Figure 2a, with an ordinary DPDT mini-toggle used for the mono/stereo switch on the main circuit. In mono, the wiring of the bass is perfectly conventional and a mono lead may be used. With a stereo set-up, all four strings are heard from the channel connected to the tip of the jack plug. When switched to stereo, the E and A strings remain on this channel, but the D and G strings are sent instead to the second amplifier which is fed from the ring of the stereo jack plug. Alternatively, two mono jack sockets may be used if there is room, connected as shown in Figure 2b. The effect of the switching remains the same.

In Figure 2c, an extra pole is needed on the mono/stereo switch, which will thus be a 3 pole component, or more likely 4 pole with one pole ignored. This ensures that both amplifiers are fed with the same signal when the bass is in mono, instead of one being switched off. If it is required to use a mono lead with this set-up at any time, a separate mono jack will have to be provided (as shown dotted) to avoid shorting everything out. The alternative is to make up a special lead using stereo jacks, but leaving the rings unconnected.

Players who want to put extra processing on the top two strings for 'solo' playing would use arrangement a) or b), whilst those who want the stereo effect would probably use arrangement c). Just to end on a note of caution; in stereo, the two halves of the pickup are no longer in series, and so there should theoretically be a slight volume drop. More seriously, perhaps, the combination will no longer be humbucking. Although I haven't noticed either of these ill effects, they should be borne in mind when converting.

E&MM

# Steinberger Bass



There's not much you can do with four strings, you might argue. Bearing in mind how much Leo Fender got right when he introduced the concept of the bass guitar to an unsuspecting world in 1951, it seems like a fairly reasonable argument. There's little doubt that bass guitar playing has improved and developed in leaps and bounds, from the first hints that melody could spring from the rhythmic thumps associated with early styles, to the percussive thwacking and ringing melodic changes of the funksters and beyond. But what have the bass guitar makers been up to? Just how much has changed in the bass guitarist's instrument?

An instrument that does seem to depart radically from previous conventions is the Steinberger Bass, which eagle-eyed readers will have seen in a news page and in an *America* report in previous issues of *E&MM*. I can now report back to base, having gone out to sunny Romford to try the instrument. Despite initial shrieks of dismay, I can say with some certainty that the Steinberger is quite a little stunner.

It looks odd, and if you've seen those pictures of it you won't have forgotten it. There's no headstock at all, and the token body is barely large enough to take the pickups, controls, and bridge. I found myself thinking of the Vox Winchester, a strange thing from the strange 1960s, and similarly small-bodied. There was also, more recently, that horrific Colt gun-shaped guitar with a minuscule body — that, too, seems to have been the resounding failure it so richly deserved to be. But a bass with no headstock? My brain's patent department could come up with no legal precedents. And it's not just the looks of the Steinberger that stun — the bass dispenses totally with wood: it is of an all-plastic construction.

Electric guitar makers have toyed with thermoplastics for many years now — as early as the 1950s when some Hagstrom guitars boasted an 'acrylite' fingerboard — but this is the first totally plastic bass I've come across. Ovation is probably the best-known maker to use plastics, in their fibreglass and polyester resin round-backed acoustic-electric series, and more recently in their solid electric UK11. Some experiments have fared less well, like Dan Armstrong's 1960s see-through Lucite-bodied guitars and basses (see also Mik Sweeney's comments on Armstrong plastics in the *Classix Nouveaux* interview in the June 1982 issue of *E&MM*), and Peavey abandoned their tests on 'Sustanite' (urethane and styrene) when they realised that escalating oil prices had robbed them of their intention of making plastic guitars more cheaply than wooden ones.

Ned Steinberger, designer of the Steinberger Bass, is described in his New York company's literature as 'an industrial engineer'. Young Ned had apparently made a conventional wooden-bodied bass for fellow New York company Spector in 1977, became interested in the bass guitar, and went on to consider the instrument more closely. After three years of experimentation, the Bass was finally completed, after Steinberger had 22

realised that the all-important constituent of an electric bass is the neck, and that a headstock slapped on the end of it is unnecessary and likely to cause nasty colouration in the eventual sounds. Steinberger has been quoted as saying, "Solidity of a stringed instrument is the key to sustain, clarity and brilliance," (*Guitar World*, November 1980) and in his chosen materials he seems to have clinched his argument.

The thermoset material Steinberger uses is an epoxy resin reinforced with glass-fibres and carbon-fibres, from which the one-piece neck and 'body' are compression-moulded in fibreglass dies, incorporating all the necessary cavities at this stage. A two-octave phenolic fibre fingerboard with conventional fretting is added separately, and the Bass is given a hard coat of polyester gel finish to toughen it up. The reinforced epoxy is said to give up to 12,000,000 psi elastic modulus 'in critical sections', and certainly the resulting instrument is as stiff and tough as you'll find.

And it's light, too — I didn't have my handy Acme scales with me, but I'm assured that the Steinberger weighs in at just over 8lbs, around a pound lighter than your average forest-derived Precision. Yet another nice touch is the instrument's strap-holding projection, a plastic (natch) strut which pivots at the instrument's centre of gravity and is clutched to stay just where you make it stay. There's also a plastic knee-rest you can fit on to stop the instrument slipping around if you choose to play the bass sitting down. Even before you play a note, then, it's clear that someone at Steinberger is thinking clearly and logically about all this, despite how strange it all seems at first.

What about tuning, I hear you cry? Well, the strings are locked at the nut end and fed beyond the bridge into the tuning mechanisms which thread directly on to each string. Each large knurled tuner thus controls its string with a remarkable 40:1 ratio gear — needless to say, tuning is almost frighteningly accurate. The bridge itself is of a standard quality which will be familiar in operation to most bassists — once set, the intonation and height are locked by a couple of screws. The strings themselves can be of normal type — that is with a ball-end at one end and the other end clean. With this sort of string, the clean end (usually wrapped around archaic machine heads) is locked into what remains of the nut by a special headless Allen screw, while this is perhaps easy to lose, it does enable you effectively to fit any string of your particular choice to the Steinberger Bass. If you like Rotosound strings, as many bassists seem to, then you will be pleased to hear that Rotosound have made a special double ball-end string —

(that's right, a ball-end at each end!) — one end of which slots more easily into the nut. With either a normal or a double ball-end string, the tuning mechanism mentioned receives the ball-end.

Standard pickups on the Steinberger are EMG (an American make which may not be familiar to you), and on the two-pickup review sample each unit apparently had an incorporated pre-amplifier powered on-board by a single PP3 battery. Controlling the sound were three marked knobs set up like those on a Fender Jazz Bass, i.e. an individual volume control for each pickup and an overall tone control giving, I would guess, somewhere in the region of 15dB cut and boost.

So what we have here is a bass guitar unlike any other bass guitar you've ever played. The impression that comes across is that the bizarre aspects of the Steinberger are, in fact, its greatest virtues. The materials are odd, certainly, but one wonders how many competitors who laughed at Charles Kaman's Ovation round-backs in 1966 are still smiling now. Steinberger's materials are odd, sure, but there is a method in the madness.

It's also very odd not to have a headstock. Once again, one has to concur that there is no harm done by removing it, and while it would obviously require a headstock-equipped Steinberger to test the complete validity of the company's no-deadspots claims, the headless beast as it is delivers a clear, powerful, sustained, and uncoloured signal. What more could a bassist want?

My forewarning of the technology involved led me to some preconceptions of how the thing would sound. I figured it must lose some of that wooden warmth so beloved by Fender fans. Not so — there is warmth there, although one can tie up a considerable amount of time exploiting the devastating top and sustain that is inherent to the instrument. I was determined to catch the Steinberger out — I even ran painstakingly up every single fret, two octaves on each string, in a vain attempt to locate a deadspot. Not one — and the thing was, each note seemed perfectly equal in tone and power to its predecessor and its follower. Thus the bass responded beautifully to any slight changes of playing attack and speed.

One rather large problem facing Soundwave, the sole U.K. suppliers and trade distributors, is the enormous price of £950 (inc. VAT). Yes, isn't it a lot! I've spied rich chaps on this side of the pond like Pete Briquette and Tony Levin with the device, and there would seem to be a demand at that end of the market. But, bring the price crashing down, and the Steinberger could be a worldbeater. With things as they are, it's no surprise that there are copies already in the offing, with Kramer, at least, being mentioned as a likely source. Mass production would seem to be one of Steinberger's goals — do let's have products of this quality that the masses can afford. In the meantime, only bassists with Top-20 singles need apply.

**Tony Bacon**

**E&MM**

For more information contact Soundwave, 66 Victoria Road, Romford, Essex. Tel: 0708 25919.

JULY 1982 E&MM



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### 1981

**MARCH** Matinée Organ ★ Spectrum Synthesiser ★ Hi-Fi Sub-Bass Woofer ★ Balanced line system ★ Yamaha SK20 review ★ BBC Radiophonic Workshop

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

**MAY** Noise Reduction Unit ★ Lowrey MX-1 review ★ Apple Music System ★ Matinée ★ Spectrum

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

**JULY** Alphadac 16 Synthesiser Keyboard Controller ★ Synwave effects unit ★ Matinée ★ Atari Music ★ Duncan Mackay ★ PPG Wave 2/Wersi Pianostar reviews

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

**SEPTEMBER** Partylite ★ Tape-Slide Synchroniser ★ Synpac 9V effects supply ★ Noise Gate ★ PA Signal Processor ★ Digital Keyboard ★ One-handed Guitar ★ Chromascope & Linn Drum reviews ★ Kraftwerk revealed

**OCTOBER** Harmony Generator ★ Securigard burglar alarm ★ Effects Link FX-1 ★ Music at City University ★ dbx noise reduction



SEPTEMBER issue — SOLD OUT. Photo copies of individual articles are available from E&MM at 50p each inc. p&p.

& Blacet Syn-Bow reviews ★ Micro interfacing ★ Disco equalisation

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

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

### 1982

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

**FEBRUARY** Ike Isaacs ★ Digital Audio Discs ★ Yamaha GS1 & 2 ★ Reviews: Korg Trident, AKG D330BT & D202 Mics, Menta Micro, Roland TR606 Drumatix, JHS C50PM & C20B amps, Fostex A-8 8-track Recorder, Tokai ST50

& PB80 Guitars ★ Vocal PA ★ ZX81 Music ★ Projects: Digital Delay Effects Unit, Spectrum Synth, Percussion Sound Generator ★ Resonant Filters

**MARCH** Klaus Schulze ★ Robert Schröder ★ Kraftwerk Music to play ★ Killing CB Interference ★ Reviews: Firstman SQ-01, SC1 Pro-One, JHS Pro Rhythm Mini Synth, Tascam 124AV, Wersi Comet, Hamer Prototype, Shure 517SA & B ★ Synth Buyers Guide ★ Projects: Power 200 Speakers, 1.6 sec Digital Delay Effects Unit

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

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

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



# BOOK REVIEWS

## B.B. King The Authorised Biography

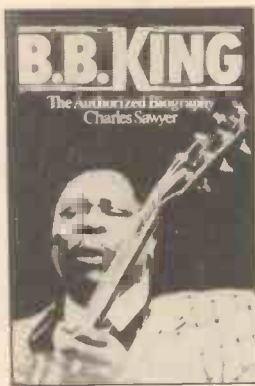
by Charles Sawyer  
Published by Blandford Press  
Price £5.95

B.B. King is hardly a household name, yet ask any blues aficionado to name his three favourite artists and the chances are B.B. King will be in there.

The very word, 'blues' carries with it a snobbery by which it is often relegated to the lowest musical art form — a view held by many people, including musicians, even today — and, having adopted this music as his own, B.B. King has devoted his career to making it more acceptable.

The book, described by the author as a social biography, traces King's growth and upbringing from his days on a plantation farm through his 'arrival' in the 1960s to his present position of respected performer, 'King of the Blues'.

Sawyer confesses to having an axe to grind: "in telling B.B.'s story, I want to celebrate the death of Jim Crow, the mythic personification of racist segregation, the cancer afflicting the



American soul on both sides of the Mason-Dixon Line". References are further made throughout the book but if you are unaware of the significance you will hardly be any the wiser when you finish the book. This area is possibly of more concern to American readers who, some say, have not forgiven themselves for their past treatment of the 'blacks' but King's relationship with all his friends, employers, employees and associates in the early days (and, inci-

dently, throughout his life) has always been extremely amiable. Sawyer says: "After thirty years as an entertainer, there are few people he has known who bear him any ill will..."

Insights into the resources and motivations of people, especially 'great' people and musicians and creative souls in particular, are always fascinating. B.B. King's decision to stay with the blues instead of branching out into jazz or more popular music was the rein which held him back as he fought the social and musical standards of the time. It was only his relentless stamina and durability which enabled him to survive an amazing life-style which involved more tours than a dozen bands combined. In 1956 he played 342 one night stands and he always accepted that his popularity rested mainly upon live performances.

Details of social patterns are essential in describing B.B. King's life and his eventual rise to musical recognition. The music and the man are inseparable and he is a result of his upbringing and experiences. The facts are noted plainly and fairly and Sawyer makes little attempt to pass

judgement upon yesterday's standards; rather he sees himself as a historian and biographer and combines the two very successfully in this book.

Details of King's personal and moral standards are very clear but other aspects of his life, i.e. with his family are scant. Perhaps, being a friend, Sawyer declined to investigate or print this side of the man and concentrated the intimate details on his music.

The book contains over 80 photographs of B.B. King and those involved in his story and several appendices chronicle plantation life, lynchings, the problems of oral history and conversations with contemporaries of the man. There is also a detailed analysis of a B.B. King guitar solo and a detailed discography which lists the songs included on the numerous albums.

The blues is a branch if not a root of modern music and B.B. King is certainly instrumental in its growth and development. The details are recorded here and form an excellent story.

Ian Waugh

## Chase The Fade

by Anne Nightingale  
Blandford Press  
Price £5.95

There's little doubt that the Old Grey Whistle Test has improved considerably since Anne Nightingale took over the limelight from whisperin' Bob Harris. This doesn't mean that I always support the horses that she backs — there have been some mind-bogglingly misguided eulogies at the end of some really inane sets in the OGWT studio — but, occasional touches of gaucherie apart, she's a good rock journalist with plenty of experience behind her.

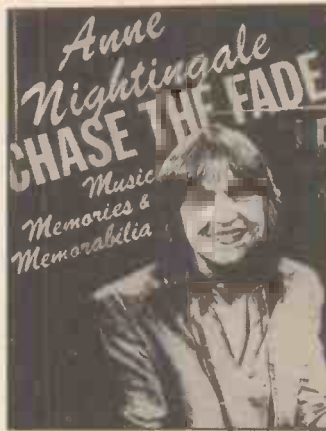
'Chase the Fade' starts off with an introduction explaining how the lady was persuaded to put pen to paper, and succeeds in getting a camel through the eye of a needle seem child's play in comparison. And, whilst I think I appreciate her devotion to Binky, her outlandish d'amour (alias Randy Grope, The Memphis Blueswailer, etc), I've never met him, seem him, or even heard of him before now, and so this review is, very definitely not for BOOBS, the British Organisation of Binky Supporters. Mind you, he can't be all that bad if he had the presence of mind to pour port and brandy over Tony

Blackburn's head and write a single entitled 'Toe Knee Black Burn'.

The book also carries the subtitle 'Music, Memories & Memorabilia'. There's really very little in the way of the former, as Anne Nightingale has obviously decided that the 'genius' of those mentioned within this slim volume may be taken for granted. There is, however, oodles of the latter two and this makes for some good chuckles.

On the more serious side, there's her reaction to the death of Jimi Hendrix and the split of The Beatles. Judging by the attention she gives The Police in this book, she obviously regards them as those most likely to succeed in the way that The Beatles did almost fifteen years ago. I think she's on a safe bet, there, but the excess of adulation and lack of criticism is somewhat wearisome. Still, I don't suppose that it's really on to accompany a group like Sting & Co. on their world tour and then bite the hand that fed you.

Disregarding any musical comparisons between The Beatles and The Police, one aspect of The Beatles experience that would be hard to envisage today was their short-lived excursion into egalitarianism, the ill-



fated Apple Corp. Ltd, an organisation which one commentator saw as a real-life magical mystery tour.

As Anne Nightingale says, "Apple wasn't a place, it was an experience. I believe they really intended it to work like a dream factory. Their dreams had worked — they were the four most famous people in the world — so why not help other people achieve their ambitions?" The early Seventies saw the collapse of the Apple empire in a cloud of lawsuits, and Anne Nightingale moved from the Sunday

Splash side of journalism to the respectable slot of a Sunday request show at the Beeb (no causal connection implied). In her time in the corridors of power at Radio 1, she made life difficult for herself on more than one occasion: there was the time when she bet Joe Strummer of The Clash a Cadillac that 'London Calling' would make the Top Ten (he won); and there was the slight *contretemps* between the airwaves and some frightfully naughty words as a result of her playing the track 'Star Star' from an album by The Rolling Stones.

All this seems tame in comparison to the antics of Keith Moon, The Who's indefatigable drummer, which she recounts with relish: "Another of Moon's combination stunts required someone to dress up as a vicar and stand at a crowded bus stop. Then he'd drive up in the car, jump out and mug the vicar, and pull him into the car and drive off." *Très amusant*, as she would say. I enjoyed this book. It's hardly a reference book to past decades of rock music, and it is full of the sort of hyperbole that only rock journalists seem to be able to get away with, but it is fun, and who's complaining about that?

David Ellis

## Semiconductor Data Book 11th Edition

by A. M. Ball  
Published by Newnes  
Technical Books  
Price £5.50

There are so many semiconductor devices available today from different manufacturers, that the amateur would need a very large bookshelf if an attempt was made to keep detailed data on everything. The idea of a reference manual is therefore extremely attractive.

I found the general format of this book to be very well thought out and Mr Ball has obviously taken time to

make it easy to use. The contents are divided into sixteen sections, starting with a very brief introduction and explanation of the tables (excellent, if this is long and complex it defeats the whole object of the book), followed by a list of manufacturer's codes and addresses in this country.

The following twelve sections contain data under the headings of: Transistors, General; Multiple Transistors; Silicon Field Effect Transistors (FETs); Unijunction Transistors (UJTs); Diodes, Low Power (Signal); Diodes, Variable; Diodes; Power Rectifier; Silicon Reference Diodes (Zener Diodes); Light Emitting Diodes (LEDs); Photodetectors; Triacs and finally Thyristors (SCRs). I thought the choice of section headings was good, guiding me to the

appropriate section with ease, although "Diodes, Variable Capacitance" would have been preferable to "Diodes, Variable" in the contents list.

As with any concise data book, it is only possible to define a limited number of parameters for each device and I think in most cases the author has made the right choice. For example in the section under Transistors, data such as polarity, cut-off frequency and maximum voltage ratings are all useful. However, I would have liked to see thermal resistance (junction-case) stated for power devices, otherwise the maximum junction temperature figure given is not really of any use at all. I was also disappointed to find thermal data, vital for heat sink design completely absent from the sections

covering Triacs and Thyristors (SCRs), in which I also notice there appears to be a misprint in the gate trigger current parameter which is quoted as being in Amps. I feel sure the author means mA.

The final two sections are devoted to a very clear set of case drawings showing connections, followed by a cross reference of Transistor Comparable Types listing devices that are electrically similar.

Overall I think it is an excellent book with clear, well spaced text and a layout that will enable you to find the device that you are looking for within seconds. A very useful addition for anyone needing semiconductor data quickly. The book fulfils its purpose admirably.

Paul Conway



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Since 1972 Clef Products have consistently produced leading designs in the field of Electronic Musical Instruments, many of which have been published in technical magazines. With musical quality of paramount importance, new techniques have been evolved and the latest musically valid technology has been incorporated into projects which have been successfully completed by constructors over a wide range of technical capability. Back-up TELEPHONE advice to our customers is available from the Designer of all Kits advertised.

## "THE COMPUTER BAND-BOX"

*(As Published in conjunction with 'Practical Electronics')*

**Complete Kit £289**



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**A MUSICIANS INSTRUMENT FOR SOLOISTS — SINGERS — RECORDING PRACTICE — LIVE PERFORMANCE — COMPOSITION**

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*(As Published in conjunction with 'Practical Electronics')*

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available to twelve, grouped into sounds typical of playing with Drumsticks, Brushes, or Latin American Bongos and Claves.

Sequence operation allows two rhythm sections to be coupled with the second (B) section appearing at four, eight or sixteen Bar repetition. All drums can be adjusted for level and resonance on internal controls to suit individual taste, thus producing good musical sounds in a battery driven unit 8 1/2" x 5" x 2 1/2".

The Clef Master Rhythm is capable of storing 24 selectable rhythmic drum patterns, invented, modified, and entered by the Operator on to Eight Instrumentation tracks. A three position Instrumentation control expands the number of instruments



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*(As Published in conjunction with 'Practical Electronics')*

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Comprehensive two speed organ rotor simulator plus a three phase chorus generator on a single 8" x 5" pcb. The kit includes all components for mains operation and a stereo headphone driver pcb. Easily integrated with existing organ/amplifier system.

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# CLEF PRODUCTS (ELECTRONICS) LIMITED

**(Dept. E&MM/7/82), 44a Bramhall Lane South, Bramhall, Stockport, Cheshire SK 1AH 061-439 3297**



# DRUM MACHINES BUYERS GUIDE

Time for another Buyers Guide, and this month we look at the percussive world of drum machines, fast becoming a necessity for the complete electro-musician and an almost essential item in any home recording set-up. If you are looking for a drum machine, you'll need first to consider the most important parameter: how much cash is there rattling around in the piggy bank? In our selection of all the relevant drum machines available that we've listed here, you could quite easily spend anything from 70 quid to over two grand, so it's well worth considering next just exactly what it is you want the machine to do.

Will it, for example, just have to bash out a reasonably consistent bump-thwack all the way through your fabulous ditties, or do you want to be able to program intros, breaks, fills, outros, and all those other twiddly bits? Do you need to control accurately the individual sounds of the 'drum kit', or do you just want a loud-ish dln in the cans?

Only you can answer these heart-rending questions, and all the other intricate self-analysis involved in Buying Something. The Buyers Guide is here simply to aid and abet you in the task: here you will find just drum machines — no drum synths, no sequencer-family add-ons, but pure and simple (and not-so-simple) drum machines.

As ever, the prices shown are **INCLUSIVE OF VAT**, and we suggest that you check further with distributors and suppliers for additional information that lack of space prevents us from printing. Remember to mention **E&MM** when making your enquiries — and good luck!

## ABBREVIATIONS USED

AN — alpha numeric; inc — including; pres — preset; prog — programmable; RR — Roy Rogers; trig — trigger; var — variation; x2 — two locations per 'memory'.



**BOSS**  
Roland (UK) Ltd., Unit 6, Great West Trading Estate, 983 Great West Road, Brentford, Middlesex TW8 9DN. 01-568 4578.

DR55 'Doctor Rhythm' Prog: 4 voices, 8 memories (x2), Trig in/out 99.00

**CLEF**  
Clef Products (Electronics) Ltd., 44a Bramhall Lane South, Bramhall, Stockport, Cheshire SK7 1AH. 061-439 3297.

Master Rhythm Prog: 7 voices (each with 3 var), 12 memories (x2), fill-ins, internal independent adjustment. Kit form, direct 79.00  
Manufactured, direct 119.00

**EKO**  
John Hornby Skewes & Co. Ltd., Salem House, Garforth, Leeds LS25 1PX. 0532 865381.

Ritmo 12 Pres: 12 rhythms, trig out. 120.00  
Ritmo 20 Pres: 8 voices, 20 rhythms, conga-tom sustain, intro/fill-in, start/stop (also remote), 6 gains on voices. 180.00

**ELKA**  
Elka Orla (UK) Ltd., 3-5 Fourth Avenue, Bluebridge Industrial Estate, Halstead, Essex. 0787 47 5325.

Sidekick 32 Pres: 10 voices, 16 rhythms (x2), fill with optional foot-pedal control 250.00

**GODWIN**  
Sisme UK Ltd., Wembley Commercial Centre, Unit 3-8, East Lane, Wembley, Middlesex. 01-908 2323.

Drummaker 45 Pres: 15 rhythms (each with 3 var). Adjustable var every 1.4 bars. Includes keyboard or pedalboard for auto accomp. Bass, chords, arpeggios plus memory and pitch control with keyboard or pedalboard 625.00

**HAMMOND**  
Hammond Organ (UK) Ltd., 19 Denbigh Hall, Bletchley, Milton Keynes MK3 7QT. 0908 79561.

AV64 Pres: 9 voices, 16 rhythms (each with 4 var). Adjustable for var every 1.4 bars plus fill 425.00

**KORG**  
Rose-Morris & Co. Ltd., 32-34 Gordon House Road, London NW5 1NE. 01-267 5151.

KR33 Pres: 12 voices, 48 rhythms, trig out 235.00  
KR55 Pres: 12 voices, 48 rhythms, trig out, + var, gain and output per voice 325.00

**LINN**  
Various suppliers, including: Argent's Keyboards, 20 Denmark Street, London WC2. 01-240 0084; Scenic Sounds Equipment, 97-99 Dean Street, London W1. 01-734 2812; Syco Systems, 20 Conduit Place, London W2. 01-723 3844.

LinnDrum (new so-called 'LM2') Prog: 16 voices (inc. cymbals), 49 'rhythm patterns', external triggering, trig in/out, cassette dump, gain output and pan per voice, user-changeable voices. Quoted prices range from: 1950.00 to 2700.00

**MCS**  
Movement Audio-Visual, 61 Taunton Road, Bridgewater, Somerset. 0278 424560. London showroom/studio: Ferdinand Street, off Chalk Farm Road, NW1.

Percussion Computer Computer's drum option: set time/real time (external triggering), 14 voices, 10 memories (+ cassette dump), trig in/out, multiple control functions per voice 2068.85

**OVERHEIM**  
Argent's Keyboards, 20 Denmark Street, London WC2. 01-240 0084.

DMX (new) Prog: 24 voices, 50 'pre-programmed rhythm sequences', trig in/out, cassette dump, output per voice, 16-character AN display 1650.00

**ROLAND**  
Roland (UK) Ltd., Unit 6, Great West Trading Estate, 983 Great West Road, Brentford, Middlesex TW8 9DN. 01-568 4578.

CR8000 14 voices on voice-card, 24 preset rhythms, 7 preset intro/fills, 8 prog memories, 6 gains to summed output 399.00

CR5000 Pres: similar to 8000, but without prog functions 299.00

TR606 Prog: 7 voices, 16 memories (x2), trig in/out, 5 gains to summed output 199.00

TR808 16 voices, 16 memories (x2), trig in/out, gain and output per voice 699.00

**SOUNDMASTER**  
Strings & Things Ltd., Unit 2, Chapel Road, Portslade, Brighton, Sussex BN4 1PF. 0273 420704.

SR88 Prog: 4 voices, 8 memories (x2), trig out, fill-ins 72.95

ST305 (new) Prog: 8 voices, 8 memories (x2), trig in/out, gain and output per voice 124.95

**WERSI**  
ElectroVoice Ltd., Maple Cross Industrial Estate, Denham Way, Rickmansworth, Herts. 09237 75381.

Aura Sounds, 14-15 Royal Oak Centre, Brighton Road, Purley, Surrey. 01-668 9733.

Wersimatic WM24 Pres: 15 voices, 24 rhythms, fill, snare roll kit 327.00  
built 587.00



# NEW PRODUCTS



## DOUBLE DOLBY FROM REVOX

The Revox B710 Mk II Cassette Deck incorporates Dolby C noise reduction in addition to Dolby B. It retains all the features of the B710 but has expanded headroom on the meter display to cater for the Dolby C system, and Bias and Equalisation are now all linked to a pushbutton control under the flap.

Also from Revox is their B791 Turntable. Similar to the B795, the B791 has a digital display for variable speed and control buttons which permit deviation from nominal speed

in 0.1% steps. The speed is quartz-crystal locked.

An optional PC board gives the desk 'discostart' capability.

New speakers from Revox are the Plenum B and Forum B. These three-way, bass-reflex speakers are rated at 90 watts (Forum) and 120 watts (Plenum). Both systems incorporate new woofers with specially developed magnet/voice coil assemblies for flat frequency response.

Details of all Revox items from F.W.O. Bauch Limited, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ. Tel: 01-953 0091.



## MICRO CONTROLLED CASSETTE DECK

The D-E66 cassette deck from Hitachi incorporates a double Dolby noise-reduction system and features micro-computer control over many functions.

Switching between Dolby C and B is by a front panel button and the auto rewind switch will automatically play a selected part of the tape over again up to 16 times.

The deck also features a close gap

R&P head which combines two separate gap widths for both recording and playback in a single housing.

The D-E66's acceptance of metal tapes is claimed to give a greater dynamic range, better signal to noise ratio and improved frequency response. Normal, CrO2 and FeCr tapes can be used.

Recommended retail price is £299 inc. VAT.

Details from your local Hitachi retailer or from Hitachi House, Station Road, Hayes, Middlesex. Tel: 01-848 8787.



## THANDAR SCOPE

The SC110A is a new oscilloscope from Thandar Electronics Limited. It has a 2" screen, is powered by mains or battery, has a bandwidth of 10MHz

and a sensitivity of 10mV per division. It is priced at £149.00 plus VAT.

Contact Thandar Electronics Limited, London Road, St. Ives, Huntingdon, Cambs PE17 4HJ. Tel: 0480 64646.

## MORE BRIGHT LIGHTS FROM BOSS

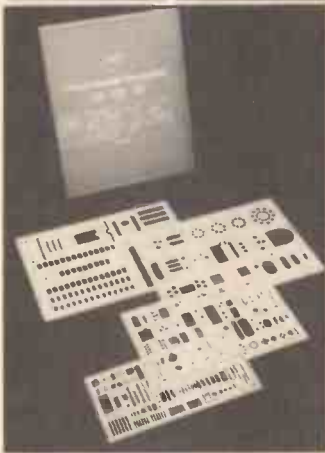
Prolific 'LED' and 'light' manufacturers, Boss Industrial Mouldings Ltd., have a new range of polycarbonate miniature indicators. Designed to accept any of over 35 different

styles and ratings of filament or neon bulbs, this 'M' Series indicator is fitted with 150mm long PVC standard lead-out wires and incorporates the ballast resistor for the neon versions within the lead-out assembly.

Details from Boss Industrial Mouldings Ltd., James Carter Road, Mildenhall, Suffolk IP28 7DE. Tel: 0683 716101.

## TELEFUNKEN

The APRS '82 Exhibition will see the launch of many new items including a range of Telefunken digital equipment. In addition to the stereo recorders MX-80 and MX-80A a new 32-channel multitrack, the MX-800 and the MXE-1 digital editing system will be demonstrated.



## LINEX LAYOUT

A new range of electronic layout templates for printed circuit design has been introduced by Linex of Denmark.

The templates are available in the scale of 1:1 (one template), 2:1 (set of 2) and 4:1 (set of 4) and contain the most commonly used figures for printed circuit layouts, circuit views and component views.

For a free leaflet, or any other information, contact Peltech Ltd., Station Lane, Witney, Oxon. Tel: 0993 72014 or 72130.



## STAND AND DE-SOLDER

A new stand for the Antex range of soldering irons, the ST4, contains a large sponge with a hole to collect the surplus solder when cleaning the soldering bit. The stand is fitted with four feet but it can also be screwed to a workbench. The steel spring forms a safe receptacle and heatsink for a hot soldering iron. It retails for £1.60 plus VAT.

Contact Antex, Mayflower House, Plymouth, Devon. Tel: 0752 67377/8.

## NEW EUROCARD FROM ASTRALUX

Astralux Dynamics Ltd., of Brighton have launched a new range of circuit boards comprising of single and double Eurocards together with extender boards. Single and double cards are available with the 'Quick Connect' hand wiring system or conventional integrated circuit sockets.

The Quick Connect system provides an insulation displacement connector on one side of the board with a precision socket on the component side, providing a quick method of wiring.

An introductory offer is available comprising Single or Double Quick Connect boards with wire and wiring pencil.

Details from Astralux Dynamics Ltd., Red Barn Road, Brighton, Colchester, Essex CO7 0SW. Tel: 0206-30 2571/5.

## COMPUTER COVER UP

Mr G. Rozbicki of C.H.S. has developed cases for housing computer boards and discs such as the UK101 and the Nascom range. They are cheaper than existing cases, he claims, and start at £86.75.

Further details from C.H.S., 27 Wycombe Road, London N17 9XN. Tel: 01-801 3014.



## A CASE FOR POWER

West Hyde Developments Ltd. have introduced a range of cases for the housing of power supplies for low-voltage equipment such as calculators, radios and TV games.

The housing features a plastic earth pin and brass live and neutral pins to plug directly into a 13A socket. Available in two sizes, the cases will accommodate the components of a power supply including the transformer.

Details from West Hyde Developments Ltd., Unit 9, Park Street Industrial Estate, Aylesbury, Bucks. Tel: 0296 20441.



## Dividers or Free Phase?

Although the choice of commercially made instruments is enormous, many enthusiasts prefer to construct rather than buy an organ.

Differing musical tastes and needs are such that no two constructors will have precisely the same specification in mind. Consequently, discussions on design tend to be endless; indeed, for this reason many, self-designed organs never get further than the drawing board! One topic that is a hardy perennial is whether to employ bistable frequency dividers or turn to free phase methods of tone generation.

## Frequency Division

A large proportion of commercial organs are based on bistable dividers in one form or another. The advantages of this form of frequency divider are that each stage is identical, the system is highly reliable and it is relatively cheap to manufacture. Figure 1 shows a typical bistable stage which, if set up on a breadboard and fed with a square wave, will produce  $f/2$  at its output. The circuit is ideally suited to fabricating several stages on one chip, the SAM 77 CMOS seven-stage package being typical.

The output is normally a square wave but the mark-space ratio can be changed by unbalancing the crossover components; employing a network at the output to modify the waveform will also alter harmonic content.

Several bistable divider stages are cascaded, the first stage being fed with a master frequency and successive octaves below being derived from the chain. The Top Octave Synthesiser outmoded this system in finding 12 or 13 correctly spaced semitones to feed into the divider strings and reducing the tuning requirement to one overall adjustment. This topic was covered in the May 1981 edition of E&MM.

The current method of TOS and divider strings therefore employs only one true oscillator, the remainder of the system being binary switching. The single tuning adjustment has given us even greater reliability, particularly in cases where the organ is frequently carted about by its owner. This feature can also be very useful if faced with playing with another instrument whose pitch cannot easily be shifted.

The divider stages are often encapsulated with switching circuitry so that the keyswitches handle DC rather than audio signals, thus reducing 'beehive' (the general hash resulting from capacitive pickup from wiring in a tight harness).

The square wave contains odd harmonics but is lacking in even harmonics. Normal practice is to amend the waveform by one of the methods mentioned previously.

Another approach is to mix the outputs of several divider stages resistively, using resistor values roughly proportional to frequency. This will result in a step-waveform or staircase and both the sound and appearance on an oscilloscope are similar to a sawtooth waveform. Adding the second and fourth harmonics to the fundamental tone provides what was missing previously — the even harmonics.

For the drawbar organ enthusiast, adding harmonics may not be the answer. He may prefer to try to eliminate everything but the fundamental. The square wave can be processed by a low pass filter, which effectively knocks off its sharp corners and gives an approximate sine wave. Mixing the

# Organ Talk

Ken Lenton-Smith

delays tend to counteract the strict phasing of divider systems.

Some organs feature an 'ensemble' tab; in this instance applying to the facility to multiply voices. This dedicated form of delay-line will, of course, totally destroy the phase-lock effect.

## Free Phase

This type of generator is ideal for the critical organist who is used to playing an acoustic instrument. Playing a chord will result in random phase-relationships between the various sound sources.

It should also be mentioned that, however well it is maintained, no pipe organ is ever precisely in tune with itself due to changes in temperature, wind pressure and other factors.

A simple extension organ (with one rank of pipes to cover the complete compass of the stop array) gives a good chorus effect but the average pipe instrument will have several ranks from which to choose tonal effects. Playing a three-note chord with three stops drawn will bring nine pipes into play, for example.

Tiny random tuning errors and phase differences make the pipe organ sound majestic and brilliantly exciting in the upper register — an effect which is not particularly easy to reproduce by electronic means. Several divider generators can be used, each feeding a section of the stop tabs' associated filters. A Leslie speaker on Chorage, in association with a fixed speaker, will give a form of pseudo-chorus, or, various bands of the frequency spectrum can be modulated by independent, slowly-moving sine oscillators. The best approach, which is closest to pipe-organ analogy, is a free phase generator system. This consists of a set of totally independent oscillators tuned to each note of the instrument's compass. Tuning this type of instrument is, of course, a major operation as up to 100 separate tunings may be required.

Tuning can follow the normal practice of piano and organ tuners in that octaves are deliberately *slightly* mistuned to add brilliance.

A typical free phase oscillator is shown in Figure 2. It can be seen that a small time-constant can be added to retard attack and provide a small delay: the supply voltage is controlled by the keyswitch and the delay should vary according to 'length' of pipe. Large pipes take longer to speak than smaller ones and an *arpeggio* on a pipe instrument with 16', 8' and 4' stops drawn will prove that the 16' pipe may not have time to speak.

The greatest advantage of free phase, however, is that the various oscillators keyed will sound in random phase, and octave related sounds in particular will be greatly improved.

The disadvantages? Circuitry is not completely repetitive and a coil winder becomes a necessity. The lower notes of the compass will require large inductors and the instrument will generally be less portable.

For the serious musician, however, free phase offers many advantages. Several manufacturers (Conn, for example) consider this system well worthwhile.

There are, of course, other systems of tone generation including computer methods. As far as divider and free phase organs are concerned, I recommend listening critically to both systems for the differences that can be detected! E&MM

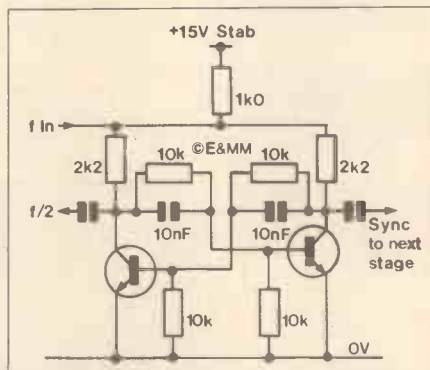


Figure 1. Discrete bistable divider stage.

filtered outputs either by fixed resistors or drawbars will provide the basis for *harmonic synthesis*, in direct contrast to using a complex waveform and various stop filters to obtain *subtractive synthesis*.

## Locked

There are many variations on this general theme used in commercial instruments. The advantages have already been mentioned so let's examine the other side of the coin.

Cascading the frequency dividers results in complete phase-locking between octave-related tones. The TOS itself is also locked in phase where its various outputs are concerned as these are also derived by frequency division, even if of a more complex sort. Consequently, it can be argued that octaves sound 'dead' and that the tuning is in some ways too precise.

Compared with a pipe organ with several ranks of pipes, the divider organ with a single generator set may be seen as an extension organ. The borrowing that must take place to cover the stop system, including possibly mutations, cannot add any richness to the result. This objection may be valid, but, after the signals have been keyed, filtered and amplified, reverberation is normally applied. Quite apart from adding reality generally, the various spring reflections or bucket-brigade

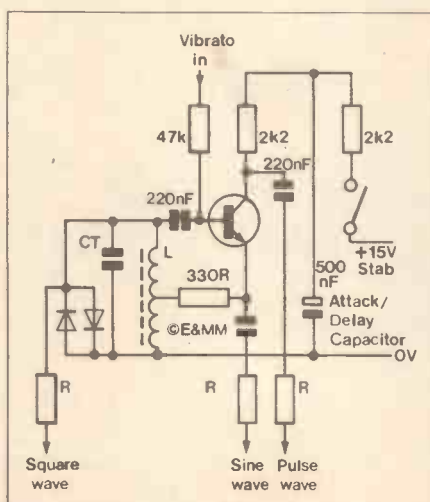


Figure 2. Free phase oscillator with ferrite inductor tapped  $\frac{1}{2}$  up from ground. Coil and all capacitors vary according to frequency.



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Mistaken Identity on stage for ABC Music's New Sounds 82 Semi-Finals

...The semi-finals of ABC Music's New Sounds 82 were held on May 23rd. The judges, consisting of Gerry Cott, Colin Pattenden, Chris West and Mervyn Jones, chose six bands to go into the finals on July 18th. The finalists are: Civilization, Click, Joint Effort, Mistaken Identity, Recruits and Rude Bamboo. First prize is a day in Rock City Studios, Shepperton, to produce a master tape. More details from ABC Music, 85 High Street, Esher, Surrey.

**Professor Dr F. Sennheiser (70)**, who founded the Sennheiser company and has up to now been its executive head in unlimited liability, handed over both offices to his son, Dr J. Sennheiser (37), in May. Dr F. Sennheiser will remain in an advisory capacity.

**Troubadour Productions**, formed last year by James O'Neil, have opened the largest recording studio in the North of England. Situated in Sunderland's Old Town Hall, the studio has installed the Sony PCM (Pulse Code Modulation) digital recording system capable of recording on one, two or four tracks, mono or stereo. James O'Neil is available both as accompanist and arranger to users of the studio. Details from Thomas E. Bergman and Partners, North House, 17 North Street, Newcastle-Upon-Tyne NE1

8DF. Tel: 0632 323535 ... The Design Council Awards for 1982 included the Meridian Amplifier System from Boothroyd Stuart Ltd. which won the award because of its "operational simplicity, high performance and unobtrusive, sophisticated appearance." Further information from Press and Publicity Office, The Design Council, 28 Haymarket, London SW1Y 4SU... Warner Brothers Records have released a 12 inch full length version of the new Laurie Anderson single 'Big Science' backed with 'Example #22' and the full length version of 'O Superman'. All three tracks are featured on her debut album titled 'Big Science'.

... the Tandy Corporation is proceeding to complete the acquisition of the domestic portion of the Consumer Products Division of Memorex which produces blank audio and video cassettes ... The British Amateur Electronics Club (B.A.E.C.) is holding their annual Amateur Electronics Exhibition in Penarth from July 17th to 25th. On show will be various electronic games and projects. This is their seventeenth exhibition and new members and volunteer helpers are invited to contact the chairman. Details from Mr C. Bogod, "Dickens", 26 Forrest Road, Penarth, South Glam. Tel: 0222 707813 ... Ultravox are soon to record a new album with George

Martin at Abbey Road Studios and at Monserrat.

The Brumbeat Band Search Final held in the North of England was won by a band from Stoke called Man Upstairs who won a PB Power Amp worth £500. There were originally 242 entrants who submitted cassettes and these were reduced to 20 for the regional heats. Sticky, from Birmingham, came second winning a Custom Sounds 150 watt guitar combo; third was Expertz, also from Birmingham, winning 10 hours recording time at Saxone Studio in Kidderminster; fourth was Mezzoforte and fifth were The Killjoys winning 10 hours recording time at Signways Studios, Birmingham and a Peavey microphone respectively.

At the NAMM Convention in Atlanta, the Syntauri Corporation demonstrated its AlphaSyntauri synthesiser range. Based around the use of the Apple II microcomputer, the Syntauri includes a 4 or 5-octave keyboard, a computer-based program for music instruction and the system is digital ... Calrec Audio Limited is believed to be the first U.K. company to automate the design of microphones and complex mixer consoles. The time involved is reckoned to be cut by 75%. The computer system is a Hewlett Packard 1000F and should greatly speed up the building of custom sound

control desks ... Bruce Clark has been appointed to the Board of Norbain Electronics Limited of Reading. Formerly General Manager, Mr Clark will assume responsibility for maximising market effectiveness

... Texas Instruments intend to spend over £1,000,000 during 1982 to support its consumer business. This will mainly be devoted to TV ads at key buying periods covering their range of Learning Aids and press publicity detailing their calculator range. Their T1-99/4A Home Computer will be given wide coverage, too.

... Theatre Project Services Ltd. will be handling the distribution of the music, disco and PA cabinets manufactured by the Electro Voice division of Gulton Europe Ltd. ... The Central London branch of the Musicians' Union is considering a move to bring a proposal before its committee to restrict the use of synthesisers which make "audible imitations or sounds of any musical or percussion instrument as defined in the MU directory". It may be a while before it reaches the executive committee but it is still likely to cause quite a stir throughout the music business ... CBS have released a single-sided single in the UK after test-marketing them in the USA. The record, I Want Candy by Bow Wow Wow has a blank B side and it is hoped the price will be fixed at 99p. ... **E&MM**

## EVENTS



April-September JVC's 5TH ANNUAL TOKYO INTERNATIONAL VIDEO FESTIVAL. This competition has been divided into two categories — one is a completely open category and the other is called 'Video Letter Exchange' for compositions using video as a means of 2-way communication. The prize is a 15-day trip to Japan to receive a large cash prize, trophy and citation. There are over 30 prizes to be won. Closing date is 10th September. For further information contact JVC (U.K.) Ltd., Eldonwall Trading Estate, Staples Corner, 6-8 Priestley Way, London NW2 7AF. Tel: 01-4502621.

June 18th-20th GLASTONBURY CND. FESTIVAL. 1980's-style successor of the famous 'Glastonbury Fayre', this gathering is a must for those who are disillusioned with the heavy atmosphere, poor organisation and surfeit of HM-Hero Rock at the other major festivals. The broad musical line-up includes Aswad, Judy Tzuke, Talisman, Thompson Twins, The Beat and the Climax Blues Band. Advance tickets £8 from CND (Festival), 227 Seven Sisters Road, London N4 — enclose an SAE. Or phone 01-263 5673 for information.

June 23rd-25th APRS 82 INTERNATIONAL EXHIBITION OF PROFESSIONAL RECORDING EQUIPMENT. Kensington Exhibition Centre, Derry St. Kensington, London. The world's leading manufacturers will display the latest professional recording equipment. Over 90 exhibitors. For details write to APRS, 23 Chesnut Ave, Chorleywood, Herts.

July 6th-8th THE LEEDS ELECTRONICS SHOW, now in its nineteenth year, is free to anyone booking in advance. Principal presentations revolve around information technology and instrumentation. The event's catalogue is free — for a large addressed envelope with a 28p stamp. Details about the seminar and the show itself from The Leeds Electronics Show, 34-36 High Street, Saffron Walden, Essex.

July 17th-25th THE 17th B.A.E.C. AMATEUR ELECTRONICS EXHIBITION. The Shelter, The Esplanade, Penarth, South Glamorgan. All aspects of amateur electronics and the B.A.E.C. activities will be demonstrated. For details ring 0222 707813.

July 18th NEW SOUNDS 82 COMPETITION. Woking Centre Halls. This competition, devised by ABC Music, to find the most promising sound of 1982 starts with the heats during May (closing date for entry 30th April). Entry forms are available from any of the ABC music shops or from Harmony House, 85 High St. Esher, Surrey KT10 9QA. Tel: Esher 66195.

July 31st JOE PASS GUITAR CLINIC. Presented by Summerfields of Gateshead in conjunction with the Jazz Centre Society and the London Borough of Camden. To be held in the Shaw Theatre, 100 Euston Road, London, at 2.00 p.m. Tickets from the box office are £2.00.

August 6th-8th VIENNA PEACE FESTIVAL. The organisers of the Glastonbury Festival are staging a similar, but much larger pan-European Rock music event in central Europe. This festival will be of particular interest to E&MM's Eastern European readers. Details on 01-263 5673 or from the CND address above.

September BRITISH COMPUTER SOCIETY COMPETITION FOR SCHOOLS. To mark the 25th anniversary of the incorporation of the BCS, a two-part competition for schools and colleges has been organised. The first part is to write a program for the composition of a piece of music; the second is to write a program to generate variations on a specific theme. The finals will be held in the British Association Conference Centre in Sheffield. Further details from Cecil Marks. Tel: Burgh Heath 52498.

We shall be pleased to publish news of forthcoming electronic and electro-music exhibitions, club meetings and special electronic music concerts.

## CORRIGENDA

**Aug '81**  
Hexadrum. Page 24, parts list: C52 is 100n, not 33n as stated elsewhere in list. C51 remains 33n as listed. See also corrigenda in Sept '81, page 78.

**Nov '81**  
Autoswell. Page 70, Fig. 1: R3 should be 47k, not 220k.

**Jan '82**  
Pseudo Phaser, Circuit Maker. C2 (5nF) should be taken from the right hand side of C1 (47n), not as shown from R1 and the amp output.

Spectrum Synthesiser. Page 90, Fig. 9, VCO diagram; and Feb '82, page 69, VCO parts list: All references to both C38 and C39 refer solely to C39, which is 100n polycarbonate (WH41U).

**Feb '82**  
Spectrum Synthesiser, Page 70: envelope parts list — code for 12pF ceramic capacitors (C56, C73) should read WX45Y.

**April '82**  
MF1 Sync Unit, page 48: RV1,3 — two off required. Calibrated knobs — two off only required. Maplin Verobox code should read LQ08J. Multi-Verbox, page 54, Fig. 1, Junction of R2 and R3 should be joined to the junction of C2 +ve terminal and TR1 base.



## Jean-Michel Jarre's **MAGNETIC FIELDS II**



*An Electro-Music Transcription by Mike Beecher*

This exciting composition was first recorded by Jean-Michel Jarre on his 'Magnetic Fields' album and has since been performed live on 'The Concerts in China' album (see last month's full feature and review). The transcription given here is a virtual note-for-note copy of the original studio recording on Magnetic Fields (Track 1, Side 2) and presents all the information necessary to analyse the piece and have a go at the music. Because electro-music contains much more than just mere musical notation, the important effects and stereo positioning are also given and the 'score' is divided into four staves of clarity. Do not be put off by this! It is still relatively straightforward to play and a passable performance can be done by learning to play the Bass Sequence (left hand) and the Polysynth (right hand) staves as ordinary keyboard music.

The Drum Machine staff provides the exact rhythmic programming for your percussion player (human or instrument) and splits the bar into 32 pulses. If your 'programmer' requires a rest between a pulse/beat to make it sound, then you'll need to have 64 events per bar. The first bar at A will be adequate for the whole piece (or something similar if you have a preset instrument) and cuts out a lot of programming time. The familiar 'Left to Right' panning of sounds used by Jean-Michel can be done using two EG/VCA's that are switched on and off by, for example, a couple of Synclocks. Alternatively, you could try experimenting with our Panolo effects unit.

The Bass Sequence line is meant to be played on an 8-note Sequencer as

shown, with a key (or pedal) control voltage setting the actual rest note for each sequence (two per bar). A little license has been given on the recording to the 'change point' of a sequence, and some sequencers will only change pitch at the start of the series (e.g. Yamaha CS30).

The top staff 'Extra parts' adds the final touches and is most easily inserted as the final layer of your multitrack recording. Panning and echo effects can then be done manually as tracks are transferred or mixed down.

The chords should enable guitar or further keyboard improvisation and at section D the E&MM Digital Delay was used to add the echoed mono synth line after a quaver delay (using a single echo with plenty of reverb for depth). It's also quite convenient to record your initial drum using the MF1 Sync Unit to put down a pulse track to control an external drum machine. By this method, the real drums can be recorded with all the breaks etc. at the final stage. It is quite possible to play this piece as a solo performance with 'Extra Parts' on mono synth, one polyphonic instrument, 8-note sequence/synth for the bass (controlled by a pedalboard), plus a drum machine.

Of course, you are unlikely to create the overall ambience and character of the music without a close study of the original LP by Jean-Michel Jarre and this is highly recommended as a step towards learning the skills of today's exponents of electro-music — a fundamental requirement for any serious composer.

# Magnetic fields II

DRUMS: HANDCLAPS R = RIGHT IN STEREO  
(HC) L = LEFT

CENTRE CYMBAL (CY) Shortest pulse  
STEREO SIDE DRUM (SD) pulse  
BASS DRUM (BD) =  $\text{♩}$  (3/2)

Note: Positions in the stereo field are indicated by L = LEFT, R = RIGHT, C = CENTRE, [ ] = ECHO, // = Portamento (P)

Tempo  $\text{♩} = 95$

EXTRA PARTS

POLYSYNTH LEAD

BASS SEQUENCER

SOLO

DRUM MACHINE

HC  
CY  
SD  
BD

Note: Left Drum Clap (L) has LPF open, R Clap has LPF partially closed.

+ 8 note BASS SEQUENCER (C)

[Set Sequence (on root C) to: CC - CC<sup>2</sup>CCC<sup>1</sup>]

Echo [R] Echo [R]

Repeat previous bar

1 SEQUENCE

NO REVERB ON DRUMS

unless indicated in appropriate line

Use 16', 32', Osc. with ADSR =  $\text{—}$

**A**

+ SOLO POLYSYNTH (8', 4')

Bright Sawtooth (Sustain on) (C)

Cm G7 A $\flat$  B $\flat$

R L L R R L [R] R L L R R L [R]

4' MONOSYNTH

R ECHO >

G7

**B**

E $\flat$  B $\flat$  Cm A $\flat$



# Magnetic fields II

(last time only) L + [R] P P P P P

Fm G7

D

P P [C]

(rest as before)

SD last →

Cm G7(b9)

D

G7(b9) Ab Fm G7

Alter SD last time

(SD last)

D

[D]

MONO SYNTH 8' then same [R] x x x etc. (1/4 delay)

(SD last)

Cm G7(b9)

D

SD last time change SD as shown

Reproduced by permission of Jean-Michel Jarre ©Dreyfus Music (Paris) 1982.

# Magnetic fields II

Chords: A $\flat$ , Fm, G7

LAST TIME TO CODA

DRUM SOLO [R] [R] [R] [R] [L] [L] [L] [L] [R] [R] [R] [R] [L] [L] [L] [L] [R] [R] [R] [R]

To **A**  
Add last time cues  
Cut to CODA

**CODA**

FADE IN STEREO 'TRAIN' NOISES (FAIRLIGHT CMI)

Chords: Cm, G7(b9)

MUSIC FADES OUT

CONTINUE TRAIN R TO L (STEREO)

Chords: A $\flat$ , Fm, G7

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# CASSETTE REVIEW

Electronics & Music Maker's CASSETTE REVIEWS aim to give an indication of what readers are up to musically, and also include a short appraisal of their work.

To this end we invite home electro-musicians to send in a cassette of their work for possible inclusion in future issues.

The recording method used is, of course, entirely up to you.

The range we seem to get is from sound-on-sound on a stereo tape machine, through bouncing in stereo between two machines, up to small 4-track multitrack recordings. But if your method comes 'above' or 'below' these in technique or application, don't hesitate to send your cassette in as well. It can be a one-off demo-type tape, an independent cassette-only release or anything in between.

You should send one cassette, mono or stereo, clearly marked with your name and address on the cassette itself, information on instruments used and recording method adopted, and a relevant black-and-white photograph. Send to: E&MM Review, 282 London Road, Westcliff-on-Sea, Essex SS0 7JG. Subjective 'scores' given at the end of each listing below are out of a maximum 10 for each category; tapes are generally given 4 for basic ferric types (e.g. TDK D, AD, etc), 5 for chrome types (e.g. TDK SA etc), and 6 for metal (e.g. TDK MA etc), with sometimes a point either way for variations.

If you'd like further information on any of the cassettes mentioned, such as contact addresses, please write to 'E&MM Review' at the above address.

Tony Bacon

## 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!

This month, our *Tape of the Month Winner* is

**DEREK OVERY** (Norwich, Norfolk) 'Noisy Neighbours' 19 tracks. Gibson SG Special; Aria ES650SB; Ibanez Andorra; Yamaha FG180; Top Twenty bass (made fretless); Casio VL-Tone; Casio M10; Indian flute; Prinzsound tuner for white noise; Clef Kit; Clef Clap; Soundmaster SR88 drum machine; various acoustic percussion; Super Mini Takfell metronome; Justina tuner; FX: WEM Copicat, E-H Fuzz, E-H comp/sustain, Vox flanger, Storm phaser, Petronics overdrive. Teac 144 Portastudio; Eagle C7800 cassette deck; Sony TC252; Shure Unidyne B mic; Prinzsound SA800 amp; Wharfedale (kit) and Harry Moss (car radio) speakers. Maxell UL.

Congratulations, Derek, you made the humble cassette reviewer, surrounded by empty library cases and even emptier beer bottles, laugh out loud within the first minute of your tape's title track. 'Hello', he speak-sings over the imaginary phone-line to City Hall, 'I want to make a complaint, there's a tribe of Mohican warriors moved in next door and they're kicking up an awful din, music-centres in every room. . .'. Yes, I laughed. Overy is a pro musician/teacher whose hobby for many years has been home recording, and he dreams of 'scoring music for films, documentaries etc.'. This becomes apparent elsewhere on the tape, where more languorous, reflective pieces develop. Overy proves proficient on a range of instruments, and fiddles with tone rows, white noise, George Benson, cathedral echo, South Sea island rhythm sections, Indian drums, clarinet quartets, and Vera Lynn, until you're quite firmly convinced that here is a man with catholic tastes. Derek is intending to build a small studio in his back garden this year (don't forget your vest) which 'will be like a dream come true'. Good luck — in the meantime, we hand over this month's TOTM to a deserving case.

Music: 7 Production: 7 Presentation: 6 Tape: 4



Derek Overy. Photo by Carol Stannard.

## Best of the Rest

**MARTIN LLOYD** (London SW7) 'Connotations' Six tracks. No information — tape includes voice, synth, sequencer, drum machine, vocoder, etc. 8-track? TDK SA. Another highly enjoyable and professional tape from Lloyd — he was awarded Tape of the Month in the very first Cassette Review, you may remember. Once again, little or no information accompanies the tape — c'mon Martin, let us know about your work in more detail! The opening track, 'Half-Life', is reminiscent of the earlier tape: staccato, sequencer-based and featuring recurring vocoder and poly-strings. The rest is a little less regimented, and benefits as a result, with divergence into (for example) deep, badly sung vocals on 'Moscow Girls', and much better sax on 'Continuum' and 'Science Fiction Man'. But the bulk of sources are electronic: an obvious VL-Tone on 'Perspective' and 'Second Sight' (although the latter's Casio-like sounds seem rather more performance-controlled than the basic instrument allows), and good polyphonic texturing throughout. Only 'Science Fiction Man' seems overlong: the rest is clever, concise, and entertaining. Not fair, then, to put Lloyd as TOTM again (although he deserves it), but the least we can do is give him this month's easily-gained E&MM Gold Star for effort — in exchange for more info, we stress.

Music: 8 Production: 7 Presentation: 2 Tape: 5



Martin Lloyd.



Mike Ross with Roy Muir (on left).

**MIKE ROSS** (Dalkeith, Mid Lothian) 'Jonathan Livingston Seagull'. Gibson 335; Fender Telecaster; Korg MS10; Yamaha FG365S acoustic; flageolets; Yamaha bass; FX: MXR Analogue Delay; Caron(?) distortion; Pro phaser; Boss DR55 drum machine. Fostex 250 Multitracker with TDK and Memorex tape, mastered on to Technics RMS250 cassette deck. TDK SA.

Ross calls this a suggestion for music to describe Richard Bach's story. The book struck me as a bit daft, but Mike's music doesn't necessarily require a Seagull fan to appreciate it. Melodic, multi-guitar pieces ensue, which took about a month to record on the Fostex 4-track cassette; Ross is currently working on another concept project involving four other musicians — the only guest on 'Seagull' is Roy Muir on occasional bass guitar.

Music: 5 Production: 5 Presentation: 5 Tape: 5



## Cassette Review

**MARK SINISTER** (Heslington, York) 'Vortex', and 'On Highland' demos. Casiotone 201; PE Minisonic II synth (home-made); PE Sequencer (home-made); Soundmaster SR88 drum machine; WEM Copicat; Elektor analogue reverb. JVC CD1770 cassette deck. BASF C-.

Sinister must be a Yorkshire surname — there's none in the London phone book, anyway. Some low-level hum at first on this tape, but it doesn't interfere with distant-mixed drums under long, sustained synth lines clustering around root notes in this atmospheric but somehow uninspiring pair of tracks. There are germs of ideas, but nothing sounds particularly sorted-out. Perhaps that's the intention?

**Music: 4 Production: 3 Presentation: 4 Tape: 4**

**PAUL R. KELDAY** (Bognor Regis, Sussex) 'PSI' WMT independent release. Six tracks. Korg MS50 synth; Evans EP100 Echopet. Grundig TK745 stereo reel-to-reel; Aiwa 990 radio-cassette; portable cassette machine. Philips Super Ferro.

Synth sounds mixed with musique concrete noises open this WMT Products tape, setting the scene for what is to follow. Kelday investigates the sound-layering of electronic sources against acoustic and environmental sounds to fascinating effect, having committed the pieces presented here to tape from May to October 1981. Not exactly fun listening, as titles like 'Latent Image' and 'Rings Of Jupiter' imply.

**Music: 5 Production: 4 Presentation: 5 Tape: 4**

**PM** (Chapelton, Leeds) 'New Improved' 17 tracks. Paul Fillingham, voice; Russ Fisher, synth; Chris Richards, guitar; Rose Macpherson, synth; Bob Smith, bass. Roland SH09; Casiotone M10; Hofner and Epiphone six-strings; Fender Precision copy; FX: Como chorus; WEM Copicat; Boss flanger; Coloursound fuzz-wah; Roland Bolt 30; Intermusic 100 combo; FAL 100W amp; Fender 30W bass amp; Boss DR55 drum machine. Hitachi TRK8190E stereo cassette recorder,

mastered on BASF Cr02; Shure, Titan and Hitachi mics. Philips Ultra Ferro.

Good, for a change, to hear a band playing in real-time (jargon for live) for *Cassette Review* — PM perform in front of a stereo pair connected to their Hitachi. The members got together in February to record this tape, and singer Paul Fillingham tells us, "On the strength of this recording, and the unity it has given us as a group, we shall be rehearsing regularly to enable us to perfect a stage-show." The group should also concentrate in these rehearsals on improving the dynamics of their material — there is little sparkle evident on 'New Improved', vocals being rather strained, and a seeming lack of interaction and listening to one another which is vital to a distinctive and character-full group sound. But doubtless things will improve — this is an encouraging start, and the enthusiasm is certainly there. Perhaps tinkering with some modest multitrack stuff could help the recorded sound, too.

**Music: 4 Production: 4 Presentation: 6 Tape: 4**

**THE PHIL PALMER COLLECTION** is a straight recording of 14 old and new standards in stereo (Dolby), played on a Kawai T-30 organ and best described as 'music for easy listening'. Organ enthusiasts will know that Phil teaches in Devon: on this tape he demonstrates his ability and the resources of the T-30 admirably, with smooth key changes and interesting left hand chord sequences. Solo registrations are suitably varied across the range of synthesised voices available.

The programme content is well chosen with production and presentation up to the expected standard. Possibly Phil prefers to produce his music single-handed, having used the rhythm unit throughout. On this cassette, his playing would be better complemented by a live drummer. One other point concerns the over-frequent use of wavering string choruses and choirs in the left hand part, emphasised by the 'toppy' nature of the T-30. Still, registration is something that can be chosen at will as scores for each number (with chord symbols) are available from Organcourse, 46 Fore Street, Seaton, Devon. The tape is available at £3.99 + 20p postage & packing from Phil Palmer, The Lodge, Burcot, Oxon.

**Music: 7 Production: 7 Presentation: 6 Tape: 4**

Ken Lenton-Smith

# ELECTRO-MUSICIANS DIRECTORY

This special directory is a great way of making contact with other electro-musicians and costs less than any other Classified advertising. The information is presented in condensed form to allow us to insert the maximum number of entries each month.

Eddie F. Dagenham, Essex, 01-595 2409, G, A, REP, -  
 Roy McBridge, Forfar, Angus, 030 781 405, G, B, R, -  
 Dave Stobie, Edinburgh, Midlothian, 031 3343944, K, M, V, -  
 Robert Mackenzie, Billericay, Essex, 02774 59949, K, B, V, -  
 Paul Miller, Portadown, Armagh, N.I., 0762 35525, K, M, V, -  
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 Steve Gould, Halesowne, West Midlands, 021 5594602, K, B, E, -  
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 Derek Purden, Stalybridge, Cheshire, 061 3037330, D, A, V, N.

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 Neil Johnson, Southend-on-Sea, Essex, 0702 67375, KGB, A, JPR, N.  
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 C. White, Edgware, Middx, 01-958 9121, KO, M, RE, N.  
 Phil Towner, London, 01-673 8781, D, A, V, N.  
 R. Shore, Bournemouth, Sussex, 0202 521253, KOGE, A, V, C.  
 Darren Tansley, Colchester, Essex, 0787 227473, KG, M, E, N.  
 R. Goodall, Sheffield, Yorks, 0742 348372, KO, A, CRE, N.  
 Peter Makin, Bolton, Lancs, 0942 892193, GM, M, PREV, C.  
 Mark Shreeve, Enfield, Middx, 01-363 2589, KG, A, EPCV, N.  
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 Nigel Turner, Durham, Co Durham, 0385 64500, G, BM, RE, C.  
 Ron Berry, 13 Lawson Terr., Durham City, KGEVC, A, PRE, DC.  
 Desmond Fernandes, Wallington, Surrey, 01-647 1726, KOMDVC, M, PREVO, N.  
 Andrew McCloy, Belmont-Sutton, Surrey, 01-642 8560, DVSC, M, PREV, N.  
 Paul Rogers, Carshalton Beeches, Surrey, 01-669 5415, EDSC, M, PREV, N.  
 Carey Nutman, Houghton le Spring, Tyne & Wear, 0783 844141, KOC, M, CPRE, N.  
 Chris Giles, Edgware, Middlesex, 01-951 0191, KGM, A, CJVE, C.  
 John Dyson, Sheffield, S. Yorks, 0742 348063, GKC, M, V, -  
 Ian Boddy, South Shields, Tyne & Wear, 0632 554086, K, A, E, -  
 Paul Williams, Stevenage, Herts, 0438 50471, K, B, E, -  
 Malcolm Harper, Oldham, Lancs, 061 620 4641, KWWBC, A, CPV, C.  
 Ken Jones, 3 Park Avenue, Birmingham B12 9RU, KMC, B, V, N.  
 Stephen Pontin, Thames Ditton, Surrey, 01-398 7933, M, M, CJRE, C.  
 Peter Piper, Rotherham, S. Yorks, 0709 73945, KOGEMVC, M, CRE, C.  
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 David Purnell, 30 Conygre Green, Timsbury, Bath, Avon, KG, BM, V, N.  
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TELEPHONE	G=GITAR	V=VOCALS	C=COMPOSER	A=ADVANCED	P=PROGRESSIVE	G=REGGAE		N=NEITHER

Fictitious example:

NAME: BILL JONES TOWN: SOUTHEND COUNTY: ESSEX TELEPHONE: 0524 61232 STD Code + no. INSTRUMENT: K LEVEL: M MUSIC: E ELECTRONICS C

Send your information in this format for your directory ad next month (closing date 30th June 1982). Cheques made payable to Maplin Publications. £1.00 for 3 insertions.

# TI-99/4 Music Maker

Continuous eulogies on this or that advancement in digital synthesis techniques can seem dangerously like force-feeding if one isn't careful, and one (meaning those like myself with a tendency to get a little carried away at times) would do well to recognise that there are many people who are perfectly content with a less ambitious approach to computer music, and to whom a helpful, interactive music entry program with plenty of colourful graphics is infinitely preferable to the niceties of waveform sequencing and so on.

Just about every microcomputer on the market comes armed with some sort of music-making ability, courtesy of a sound generator chip buried in the bowels of its motherboard. The Texas Instruments-99/4 has the significant advantage of a 16-bit processor (9900) and it's also pretty cheap (ca. £300). That former fact would lead one to expect a reasonable degree of sophistication, but, ultimately, the musical output is only as good as the hardware actually responsible for outputting the waveforms. Texas Instruments are, of course, responsible for *that* games sound chip, the infamous SN76477, and the micro-controlled version, the SN76489. Bearing that in mind, you'd expect a better-than-average stab at music synthesis in their own TI-99/4. Their advertising certainly suggests this with "outstanding music/noise generation from 110Hz to beyond 40,000Hz". However, like its 8-bit bedfellows, the TI-99/4 uses a programmable chip that produces 3 channels of square waves with rather limited amplitude control (16 steps of 2 dB). Attempts to get inside the unit to dig out the identity of the sound chip proved futile (TI obviously believe in enforcing the suggestion of "no user serviceable parts inside").

## Software

The software for the Music Maker comes in the form of a trendily-named "command module" which is nothing more than a ROM that slots into the front of the main console unit. The software is reasonably priced (around £35) and has both good and bad features (like just about everything these days). That's also true of the cosmetics of the system as a whole; whereas the main unit is very attractive in appearance (plenty of brushed aluminium), the power supply is an ugly, wedge-shaped thing looking a bit like a sewing machine pedal!

On switching on the unit with the Music Maker module in position, you're ready to select between either TI Basic or the Music Maker program itself. With the latter, the first thing that appears is the logo (Figure 1) and some 3-part baroque-style music. The main menu gives three options (Figure 2): traditional mode, sound graphs, or load music. The traditional mode comes with a couple of staves as in Figure 3. Before entering notes, though, it's necessary to prescribe essentials (for this computer, anyway) like key and time signatures, and tempo. At the top right-hand corner of the graphics display, the particular measure that you're working with is displayed. The number of measures



Figure 1.

available for a composition is a product of free RAM and note length. Thus, with 8K of RAM, 3 voices, and quarter notes (crotchets) as the minimum event time, 60 measures can be filled; with sixteenth notes (semi-quavers) this is logically reduced to just 15. The right side of the display is used for selecting note/rest durations, draw/play/erase functions, and so on. All note entry is mediated by a flying cursor that's sent scurrying (slowly) around the screen with various arrow keys derived from a special overlay on the keyboard. Unfortunately, every time you want a different duration for a note, it's necessary to hop back to the right-hand side of the display to 'collect' a new note duration. Not surprisingly, this tends to slow down the whole business of entering music somewhat.

The biggest limitation of this music entry program is the fact that you're limited to just 3 octaves from A2 to A5 (i.e., 220 Hz to 1760 Hz). Mind you, as the only audio output from the TI-99/4 is via the very small and rattling console speaker, this pitch restriction may be wise! It really does seem crazy advertising



Figure 3.

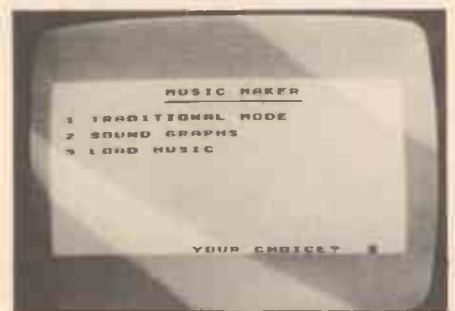


Figure 2.

sound generation capabilities up to 40 kHz and not provide a decent audio output! Once one measure has been filled with up to 3 voices, you can then hear the fruits of your labour and progress on to the next measure. Fortunately, a copy facility is provided so that it's possible to repeat measures/parts from one bar to the next, or whatever, and this certainly helps to relieve some of the drudgery of the basic note entry procedure.

Once you've got your notes in order, the entire piece can be played back according to the options in Figure 4. A useful feature is that as the music is played the computer displays the number of the measure it's currently playing — very helpful for pinpointing mistakes. Redo allows the user to select a repeat of the music as it's playing, but, unfortunately, it isn't possible to specify continuous repeats. Something that the Music Maker does do is to provide the option of printing hard copy of completed measures on a TI Thermal Printer. This is a very valuable feature, and, unlike the Mountain Computer MusicSystem for the Apple II, which prints out music line-by-line, the



Figure 4.



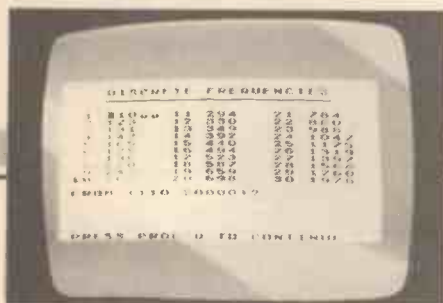


Figure 5.

Music Maker prints out measure-by-measure, and that makes a lot more sense. However, one has to put up with the unfortunate fact of life that a 5 x 7 dot matrix printer doesn't see quite eye-to-eye with the 8 x 8 graphics matrix used by the Music Maker program — and that means "that some of the characters in your composition may be only partially printed".

## Sound Graphs

Returning to the main menu, the other music entry option to consider is what I call 'sound graphs'. According to the manual, eight noise generators can be engaged, with generators 1 to 4 representing 'periodic' noise and generators 5 to 8 white noise. To complicate matters, generators 4 and 8 play noise based on the frequency of 3. I have to admit that I got hopelessly confused with all this inter-generator interaction, and the final

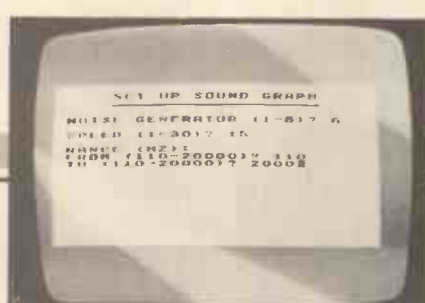


Figure 6.

audible result tended to suggest that the software was a little confused as well. Still, in principle, you start off by selecting the frequencies that you want to play with by choosing 'discrete' or 'continuous' options. Whereas 'discrete' gives you a choice of 30 frequencies (Figure 5) with default values from 110 Hz to 1,976 Hz, you do actually have the option of specifying any frequency from 110 Hz to 20,000 Hz (the latter providing entertainment for one's pet pooches, I suppose). The 'continuous' option, on the other hand, although hardly in keeping with the true meaning of the word, does give a choice of 120 different frequencies, but these don't appear to be reassignable. After deciding which sound generator you're going to work with (Figure 6), the sound graph itself is alighted upon (Figure 7). As with the traditional mode of music entry, 'notes' are entered by using the

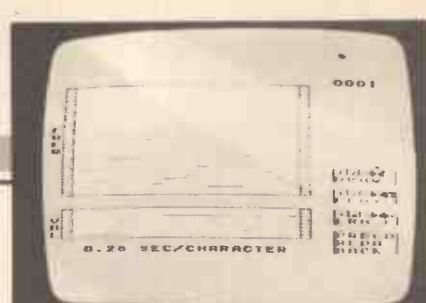


Figure 7.

various arrow keys. Each measure will accommodate up to three voices (in the 'freq' part of the display) and one 'line' of noise (in the 'vol' part of the display). Where all those 8 noise generators come in is beyond me and something that the manual isn't too clear about either. The good features of the Music Maker, i.e., the 'copy' and 'print' options, also work for the sound graphs mode.

That's basically it. You can, of course, save your composition on disk or cassette, or edit it until you're happy with your creative efforts, but the final proof of the pudding is only what the TI speaker feels like passing on into the ether, and the effect of that bit of hardware on the musical output of the TI Music Maker is about as subtle as drinking a glass of champagne with a mouthful of saccharine tablets!

David Ellis

E&MM

# MUSIC KITS

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## ALSO

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E&MM/7/82



# NEW PRODUCTS



## Korg Symphonic Piano 80S

Here's Korg's latest electronic keyboard with a big 75-note spread and stereo sound monitor/practice speakers at its ends. Six tone presets give piano 1 & 2, electric piano, vibraphone, clavichord and harpsichord. There's control of tremolo

(panolo), chorus, key touch variation and transpose, plus a separate string orchestra section with attack, decay and volume setting. Retail price is likely to be around £850 inc. VAT (due for release in September).

Further details from Rose-Morris & Co. Ltd., 32-34 Gordon House Road, London NW5. Tel: 01-267 5151.



## Carlsbro Cabinets

The Stingray Electro-Acoustic is a new 2-channel 150 watt RMS speaker from Carlsbro which includes an L15 RCF driver and two J44 horns. It incorporates parametric EQ, reverb, a



pre-amp and two slave sockets.

Also new is the 2 x 10, 1 horn PA cabinet rated at 50 watts.

Information from Carlsbro Sales Ltd., Cross Drive, Kirkby-in-Ashfield, Nottinghamshire NG17 7LD. Tel: 0623 753902.

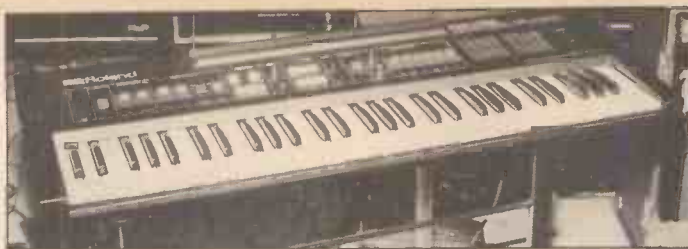


## Yamaha Combo Ensemble

The CE20 is a 4-octave mono/poly instrument with six 8-note polyphonic voices and 14 high-note priority monophonic voices. The poly section contains brass, horn, organ, electric piano, harpsichord and strings. The mono voices range from piccolo and flute to electric bass

sounds. The keyboard features dynamic touch control and, after initial depression, the keys remain touch sensitive. Its circuitry is based on the GS1's frequency modulation system (reviewed in February 1982).

Contact Kemble-Yamaha, Mount Avenue, Bletchley, Milton Keynes, Bucks MK1 1JE. Tel: 0908 71771.



## Dual Voice Combo Piano from Roland

1982 promises to be the year of the electric piano and Roland have incorporated some important features on this instrument. These include de-tuning of 2 oscillators per note, 3 tone selectors per voice (piano

to harpsichord), adjustable decay, 6-stage graphic EQ, transpose and new style arpeggio control with timed variations.

Contact Roland (UK) Ltd., Unit 6, Great West Trading Estate, 983 Great West Road, Brentford, Middlesex TW8 9DN. Tel: 01-568 4578.

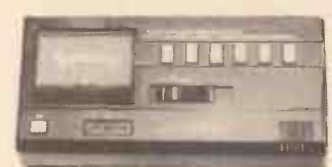


## Atlantex 12-2

The new Atlantex 12 into 2 mixer has 3 band EQ, 2 auxilliary sends, pan, and an external power supply (+ 15 volts). It is priced at £335 inc. VAT.

## In Tune

Atlantex's quartz crystal tuner gives you a choice of analogue meter or LED readout; six buttons correspond to the six strings of a guitar. An electronic instrument can be plugged into a jack socket for a direct reading and another jack out socket



allows monitoring. The Argus tuner costs £32.98.

Details from Atlantex Music Ltd., 1 Wallace Way, Hitchin, Hertfordshire SG4 0SE. Tel: 0462 31511.



## Teisco

A new range of synthesisers from Teisco include the T77 Electronic Piano at a price of £399. The S60P preset synth is a small 36-note monophonic synthesiser at £450 and

the EX300, a string/brass ensemble with bass and human voice, is priced at £649.

Contact John Hornby Skewes Ltd., Salem House, Garforth, Leeds LS25 1PX. Tel: 0532 865381.

## Roland Demo

Our roving editor was lucky enough to hear the new Roland instruments being demonstrated by the Roland team: Alan Townsend, Jay Stapeley and Dave Green.

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Part of the ever-growing electro-music enthusiasts who visited our stand at the BMF recently.





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# Harmony Generator Extension

Paul Williams

The Harmony Generator published in E&MM October 1981, although very useful, is only capable of generating square waves. Also, only one octave output is available at a time. The circuit shown in Figure 1 not only provides the Harmony Generator with triangular and sine waveforms on a selected octave output, but also provides facilities for mixing these and all seven octave outputs simultaneously.

The additional waveforms are produced by a voltage controlled function generator, IC11, which is used in a phase locked loop (PLL) in conjunction with IC10. The PLL IC10 is used only for its phase comparison and error voltage generation functions, its internal VCO not being used. Instead, IC10 controls the frequency of oscillation of IC11 by a control voltage applied to pin 8 via an inverting and level shifting stage, TR2. The CV is adjusted such that the loop frequency is the same as the input frequency presented to pin 14 of IC10. IC10 and IC11 thus constitute a square wave to sine wave (and triangular wave) converter.

Since waveforms other than square waves are involved in the mixing, the envelope shaping must be linear rather than by means of the very elegant chopper system used in the original Harmony Generator design. An operational transconductance amplifier, IC12, is used both as a virtual earth mixer and a current controlled amplifier to perform the envelope shaping function. The mix is set up on RV4-12 and summed to the virtual earth node at IC12 pin 3 by R31-39. The rectified input voltage from IC2 in the Harmony Generator is converted into a control current for IC12 by TR3 operating in the common base mode. The final output mix between

# CIRCUIT MAKER

direct and harmony signals is affected by RV13 which is in a rather odd configuration best suited to the current output of IC12.

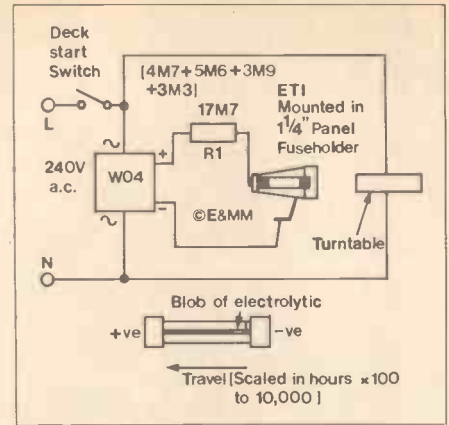
This circuit is not suitable for operation on the original +9V battery derived supply, so a  $\pm 12V$  mains operated supply is shown. The duty cycle of the square wave, which should be monitored at IC11 pin 9 is adjusted by RV3. The 50% duty cycle setting can be clearly detected by ear since its harmonic structure is quite markedly different from any other duty cycle setting. After the duty cycle has been trimmed, the sine wave output will be of reasonably low distortion. However, if very low distortion is required then R29 can be replaced by a 100k preset which is adjusted for minimum sine wave THD.

Although it would add considerable complexity, there is no reason why the circuitry of IC10 and IC11 should not be duplicated for all octave outputs, allowing sine and triangular waveforms to be produced on all seven octave outputs simultaneously.

## Equipment maintenance aid

Ben Duncan

The component at the heart of the circuit above is a recently introduced elapsed time indicator (ETI), a device that was previously electromechanical, and therefore too large and costly to be justifiable in everyday applications. The new format here is a 1 1/4" fuse-like barrel containing a blob of electro-



### Stylus replacement timer.

lyte, this moving along the barrel in response to the passage of current. The FSD (full scale deflection), hence maximum duration in hours (T) that can be measured is governed by the magnitude of current (I) viz:

$$T = \frac{0.00677}{I}$$

NB:  $I_{max} = 85\mu A$   $I_{min} = 0.6\mu A$

In the application circuit above, the device is intended to act as a guide to timing stylus replacement, thus it's connected across the turntable's mains supply. The bridge rectifier (BR) provides the requisite DC voltage, and R1 sets the current for a 500hr FSD. Once this period has elapsed, the fuse-like ETI is simply removed from its enclosure (a standard 1 1/4" fuseholder) and turned around, the inversion of polarity causing the electrolyte blob to set course on another 500hr trek.

Obvious applications are as an objective, if arbitrary guide to stylus and tape head maintenance, as a means of qualifying reliability or simply for the measurement of hours of use for warranty or determining hire charges.

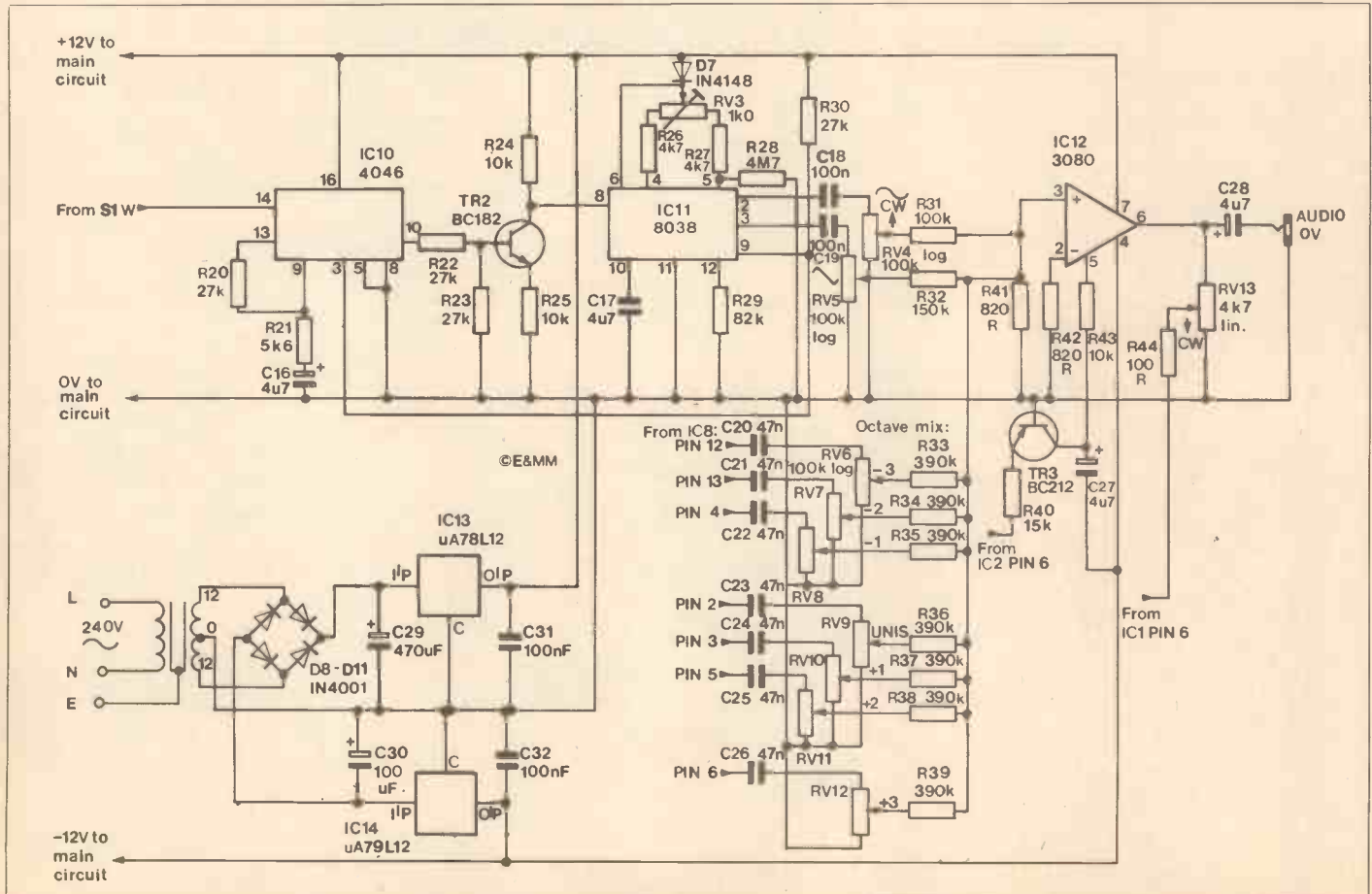


Figure 1. Circuit diagram of the Harmony Generator extension.



# CIRCUIT MAKER

## Touch Sensitivity

D. Ward-Hunt

Electronic keyboard instruments often have some form of dynamic or touch sensitivity added in order to allow the player more expressiveness. The circuit shown here enables touch sensitivity to be added to most keyboards without the need to modify the keyboard contacts or the keyboard itself. The circuit makes use of a pressure sensitive pad placed underneath the keyboard rest. Under normal playing conditions, the circuit is adjusted so that the output voltage is zero. However, if during 'normal' fingering additional pressure is applied to the keys, then a variable output voltage is generated by the circuit, the value of which is dependent upon the pressure applied.

This type of sensitivity is particularly useful with a synthesiser, when this 'pressure' dependent voltage can be applied, for instance, to the VCO frequency input so producing pitch bend effects. Alternatively, the voltage may be applied to any control voltage input to produce various effects, i.e. VCF cut-off frequency, VCA and so on, all controlled by the pressure applied to the keyboard.

### Circuit description and construction

The touch sensitive pad (made from conductive foam as supplied with CMOS ICs) undergoes a reduction in resistivity with increasing compression. One side of the pad is fed with a small voltage via R1, and the other side is connected to the inverting input of IC1. Since without compression the resistance of this pad is over 20M, the output of IC1 is close to zero. Once the pad begins to

compress, the resistance drops rapidly until the ratio of the 'input resistor' (the pad) and R2 is such that IC1 amplifies the few millivolts up to a maximum of about 5 volts (negative). This voltage is applied to the inverting input of IC2 where the output voltage is adjusted by RV1 to suit a particular application. This positive going voltage is applied to a low pass filter (IC3) acting as a slew limiter necessary to smooth out the voltage which would otherwise suffer small but rapid fluctuations due to unwanted variations in the pressure being applied by the player. The remainder of the circuit is very straightforward. RV2, R5, 6 & 7 enable the output voltage to be nulled when no pressure is applied and allow any offsets in the ICs to be cancelled out.

The touch sensitive pad is constructed from a piece or pieces of conductive foam (as supplied with CMOS ICs) and with the circuit values shown should be approximately 20mm square by 10mm

thick and as 'springy' as possible. The two springs at either end of the keyboard ensure that the output returns to zero volts when no pressure is applied, but relatively inelastic foam will result in loss of control during playing. These springs should hold the keyboard approximately 10mm higher than its normal resting position, allowing the pressure pad to sit underneath the centre of the keyboard uncompressed. Two metal plates (or aluminium foil) are used to act as the contact plates to the conductive foam pad and these are wired into the circuit as shown in the circuit diagram.

Of course RV1 could be replaced by a potentiometer if various levels are required for different uses, and if your synthesiser has no accessible inverter then it might be wise to add a further inverting op-amp so as to be able to apply negative going voltages as well as positive going voltages, for downward pitch bend, for instance.

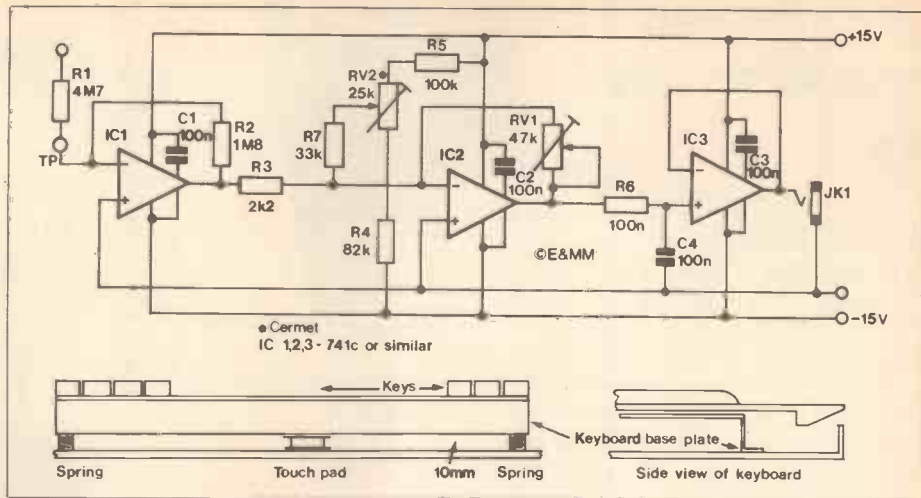


Figure 2. Construction details and circuit diagram.

## SYNTHESISER INFORMATION SOURCES

As dedicated synthesists and electro-music enthusiasts know, the acquisition of information relating to synthesisers, synthesiser recordings and synthesiser publications has never been easy. Even during the past few years when electronic music was beginning to achieve a wider popularity, it was still difficult to gather information about different types of synthesisers and to obtain any of the less-popular synthesiser recordings and to find books and magazines about the subject.

Even now, when electro-music can be heard everywhere, the seeker of information can still be stumped when trying to find the best synthesiser for a particular need or when trying to track down an elusive recording or publication.

Seeing still such a gap in public knowledge, two organisations have developed aiming to supply such information and help, too, the development and promotion of electronic music.

### E.S.S.P.

The Electronic Synthesiser Sound Projects (E.S.S.P.) library began in 1970 with Kaleidoscopic Vibrations by Jean Jaques Perrey and Gershon Kingsley, and has since collected all commercially released synthesiser recordings in the U.K., including many international titles and private productions.

In 1979 a Network and Distribution centre was set up to provide an information service and mail-order

facility for the supply of synthesiser records, books and accessories. If you send them your name and address you will automatically be linked to the Network and will receive all information as it is prepared. The E.S.S.P. Information service and Library will answer any queries free of charge (SAE required) providing no costs are incurred due to photocopying or special research.

Three information lists are produced, regularly up-dated, covering best-selling, new release and recommended titles as follows: List 1 - Electronic, Computer, Synthesiser sound recordings - which includes records and tapes of such recordings including those using synthesisers as main instruments; List 2 - Electronic, Computer, Synthesiser sound publications - consists of books and magazines on the subject; List 3 - Extra Sensory sound recordings - these are more nearly 100% synthesiser and electronic music recordings including experimental / meditation / transformative music. The Distribution centre is able to supply most records, tapes and accessories and will try to obtain items not on their lists.

Their E.S.S.P. Synthesis label is for the promotion and distribution of electro-music and they will listen to your recordings and review them. They have the facilities to release and distribute such recordings. This should hopefully open new doors to many new synthesists as well as providing a source of new material.

Their Studio has extensive facilities for lectures and demonstrations and their range of services and facilities has grown considerably in a short time. "In the future," says David Tuffnell of E.S.S.P., "we would like to see Synthesiser programmes on every radio station, Synthesiser shops in every town and village, and Sound Houses all over the world for demonstration and educational promotion. That's the vision anyway!"

### Zero Zone

Zero Zone, based in Somerset, began in May last year, initially to provide an information service and to give unbiased advice to people wanting to know about synthesisers. From this evolved the idea of doing live workshops so people could get hands on experience of synthesisers. These workshops have been very successful and are free to any organisation requesting them; the only cost being expenses for transport etc.

Zero Zone's information service includes advice on the best synthesiser for a particular purpose and can advise on suitable sounds for almost any need. Information is available on recent computerised keyboards and their programming service will program them for you.

Theatre sound effects are produced to order using instruments and an extensive library of sound effects. The advice service includes a full range of synthesiser books and reference materials. In conjunction with E.S.S.P., they provide a complete

products service for books, manuals and programming planning sheets for synthesisers, computers and electronic music.

A recent development is their Independent Synthesiser Recording Distribution Network (ISRDN) which is to help those who produce privately or independently recorded synthesiser material to obtain wider distribution of their work. It is a unique co-operative effort which could be of enormous benefit to all concerned. Help is available, too, regarding artwork and printing and efforts are underway to acquire cassette duplicating facilities.

Zero Zone is still developing its organisation and will grow to be increasingly useful to the synthesist. It actively promotes the development of electronic music in all its forms and is particularly interested in setting up an experimental music group.

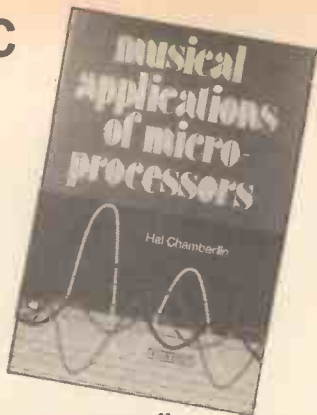
The need for such services as provided by E.S.S.P. and Zero Zone has been around for a long time and is a possible source of information for anyone with queries or problems in obtaining records, etc., in the electronic music field.

For further details and information send a SAE either to: David Tuffnell, Electronic Synthesiser Sound Projects, The Sound House, PO Box 37B, East Molesey, Surrey, KT8 9JB; or to: Michael Law, Zero Zone, The Chapel House, Perch Hill, Westbury-Sub-Mendip, near Wells, Somerset.

Ian Waugh

E&MM

# ELECTRO-MUSIC CROSSWORD COMPETITION No. 3

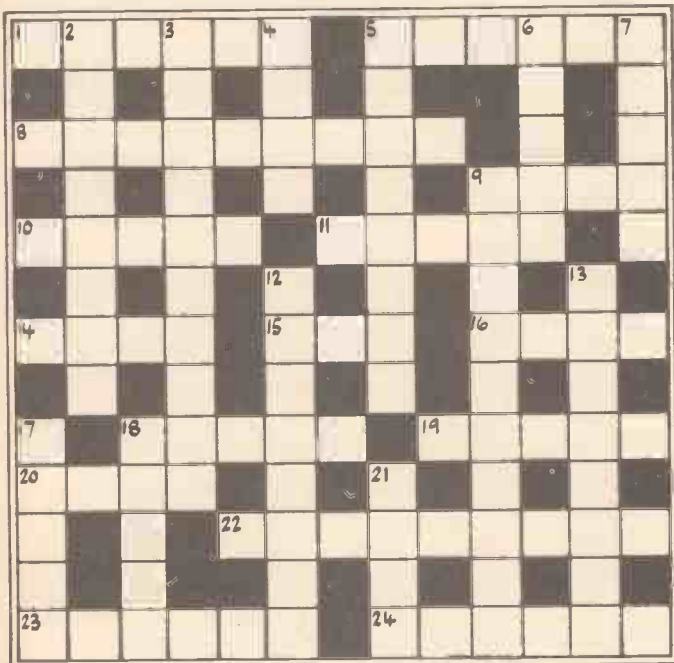


Here's a chance to win a copy of one of the most important books for the electro-musician —

“Musical Applications of Microprocessors” by Hal Chamberlin. This valuable prize, worth £20, will be awarded for the first correct crossword drawn out of the hat on 23rd July.

Send your completed crossword, including your name and address to:

**E&MM CROSSWORD,**  
282 London Road, Westcliff-on-Sea, Essex SS0 7JG.



### Across

1. 'Mary had a little lamb.' — and Thomas heard himself (6)
5. A pick-up or detector, for instance to measure temperature (6)
8. The art of electronic music (9)
9. Remade soup for a composition (4)
10. Goes well with bread, but sounds fed up (5)
11. Clearly a case for diodes (5)
14. 'Electronic Dream Plant's' flying keyboard (4)
15. and 24. One half of the couple who gave us "Nutbush City Limits" (3,6)
16. Strong — and hot! (4)
18. Electromotive—(5)
19. A mixture of two or more metals (5)
20. No longer in circuit, but doing business (4)
22. Radio removal (9)
23. The Disco Flasher (6)
24. See 15

### Down

2. Bad soldering — try Dijon again (8)
3. The point at which your transistors get wet (10)
4. Christian name of popular BBC disc jockey (4)
5. Screened (8)
6. Organ voice controls (5)
7. Surname of long established rock guitarist (5)
9. Function generator (10)
12. Sounding prudent — but all in little bits (8)
13. A single, unvarying frequency (8)
17. Of ice creams and loudspeakers (4)
18. Saturday night illness (5)
21. The rhythm that's a hit (4)

### May's Answers

**Across:** 1. Battery; 7. Tenor; 8. Fortran; 9. Adders; 11. Simon; 13. Gigs; 14. Ebonite; 15. Bass; 16. Relay; 17. Osmium; 21. Gyator; 22. Train; 23. Inverse.  
**Down:** 2. Atomic mass; 3. Tetrodes; 4. Read; 5. Send; 6. Tone; 9. Asdic; 10. Regulators; 12. Modern; 13. Generate; 18. Mark; 19. Unit; 20. Cyan.

Although we had several replies to our May Crossword, none were correct.

We acknowledge with thanks the cooperation of John Wiley & Sons Ltd, who distribute "Musical Applications of Microprocessors" in the U.K.

This book, reviewed in E&MM July 1981 issue, is available from: Maplin Electronic Supplies Ltd order ref. WG40T price £22.65 inc. p&p.

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### CT-202. A PRO FOR GIGS, WITH 49 POLY VOICES.



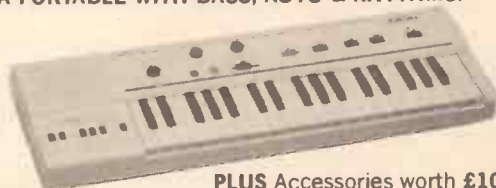
**£275**

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Rave reviews for this superb 4-octave keyboard. Melody Maker said: "Crystal clear tones... sparkling harpsichords... impressive clav". The fantastic 49 voices make this an ideal stage instrument. 34½ x 11½ x 3½ inches. Weight: 16.8lbs.

**CT-101.** Similar to the 202 but with 25 voices, which, like the CT-403, include Piano, Organ, Harpsichord, Accordion, Xylophone, Chimes, Clarinet, Flute, Violin, Mandolin, Guitar and synths. 30½ x 11½ x 4½ inches. **£25 worth Accessories £195**

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### MT-31

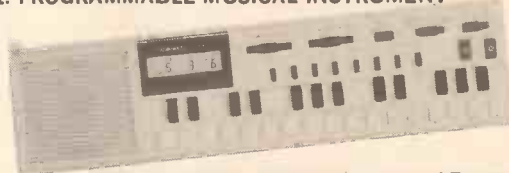


**£69**

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Very similar to the MT-40 but without the bass keyboard, auto accompaniment feature and the rhythm box. Weight: 4.4lbs.

### VL-1. PROGRAMMABLE MUSICAL INSTRUMENT



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**VL-10.** Slim Executive version of VL-1. 7/16 x 7¾ x 2½ inches

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The 5-octave, 8-note polyphonic keyboard can be split into two separate keyboards, with different preset voices.

In addition to a 16-step preset arpeggio, there is a programmable arpeggio function with up to 127 steps, 9 note pitches, and rests, which can also be used as a real time sequencer.

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# America

Jerry De Muth

The guitar was once the 'hot' instrument in rock; the instrument that budding stars gravitated to, buying the latest model that would enable them to get a sound that would propel them to fame. But today, thanks to the development of synthesizers and digital technology, it's keyboard instruments that have become the hottest thing in the music industry.

Musicians are continually updating their keyboards, hauling two, three, four, five, even six different keyboards on to a stage for a performance. Full-size electric pianos are placed next to acoustic pianos, small synthesizers are put on top of electric pianos and console organs. Several different electronic keyboards and synthesizers are stacked in specially-built racks, such as the Hi Lo Dollies, to which the Santa Rosa, California, company just added its latest model.

All Hi Lo Dollies function as either a four-wheeled dolly or a two-wheeled hand truck as well as a safe and sturdy stand for performing, making it easy to move and set up electronic keyboards and synthesizers. Racks that are adjustable for tilt and height on the latest Hi Lo Dolly makes it possible to stack keyboards that previously could not be stacked because of their contours.

Among the keyboards that a musician might put on such a rack are new models from such firms as Rhodes, Crumar, E-mu and Moog.

Rhodes has introduced Chroma, a synthesizer which combines multi-voice programming features with the feel of real mechanical action that is both velocity and pressure sensitive. The 16-channel, polyphonic synthesizer also features a split keyboard capability, 50 programmable presets plus 100 taped-voice programs and digitally-based programming and tone controls linked to 16 oscillators, 16 filters and 16 amplifiers.

"The Chroma embodies several fundamental breakthroughs in synthesizer technology," explained John Shykin, director of marketing for Rhodes, when the new instrument was unveiled for music dealers in late winter. "First is the touch dynamic sensitive keyboard, with keys that don't feel like push-buttons. The player's touch creates and controls pitch, attack and decay while he's playing.

"Second, all of the operating, programming and tone controls are generated in the software, giving the player complete access to all the oscillators, filters and amplifiers.

"And finally, Chroma has the most sophisticated computer interface available. Software is available to allow it to connect with an Apple II computer and other software will soon be available."

The Chroma also features built-in diagnostics which include automatic tuning, automatic oscillator, filter and amplifier checks and a board and battery check, all of which are accessible from the front panel. The keyboard can be split at any point, and the split can be stored in the synthesizer's memory to be recalled on command. Other programming capabilities include a program link which allows two programs to be overlaid. Linked programs can be transposed separately or together. Chroma's programming also gives the player access to a sequencer-like arpeggiation mode.

There also are complete editing facilities and a cassette interface which allows audio and program information to be combined on tape. The back panel features include a single footswitch, a dual footswitch and two volume type (linear) pedal inputs. The outputs are all balanced, assignable and 300 ohms.

The Chroma comes with a custom-designed, heavily padded ATA Anvil case, a standard cassette with 100 voice programs and two owner's manuals.

The interfacing of synthesizers and computers, which Chroma permits, has become the latest trend. Simple printed circuit boards that plug into relatively inexpensive personal computers are now



Chroma by Rhodes.

sold by at least five companies. These boards turn these computers, whose normal uses range from keeping track of personal expenses to playing video games, into keyboard instruments. This interfacing has many advantages, most obviously extensive memory capabilities and speed of operation, according to Rock Wehrmann, of Moog. In a synthesizer, he explains, a program is stored in memory where it can be recalled instantly. A microprocessor, or small, integrated computer, makes all this possible in such instruments as those made by Moog. Interfacing the keyboard with a computer expands the instrument's capabilities.

## Moog

Last year, Moog introduced the first commercially available digital synthesizer, The Source, among other synthesizer models. This year they have already introduced two new synthesizers and a digital sequential controller, dubbed, naturally, the DSC.

The 800-note DSC features storage of vibrato and pitch bend, programmable transposition, rhythmic auto-correction, cassette input/output, sync to tape recorders and battery backup.

Moog's latest synthesizers are the Taurus II, a low-cost one and a half octave pedal synthesizer with detachable electronics, full modulation, performance controls and total interface capability, and the five-octave keyboard Memorymoog. This is a six-voice polyphonic synthesizer with 40 programs, 20 program chains, three oscillators per voice, expanded modulation, programmable pedal functions and an LED readout that asks for and responds to commands.

All of these new Moog products, like the new synthesizers from other manufacturers, are relatively small, especially when compared with the first commercially available synthesizers which were created by Robert Moog, which were much, much smaller than the first synthesizers which literally filled entire rooms.

"I started on a huge Moog 55 which, compared with today's keyboards, is a real monster," recalls Derrick Simpson, who has been playing keyboards for 14 years and now heads the keyboard and sound reinforcement department at



Moog Taurus II Pedal Synthesizer.

Chicago Music Co., that city's leading professional musician-oriented store. "Synthesizers are getting smaller. The trend today is toward compact units.

"Digital technology is making things smaller in size but bigger in terms of capabilities. There's even a couple of programmable small keyboards available now. Generally, the units are also sturdier than they had been. The packaging is a lot better now.



Emulator.





Moog  
Memorymoog  
Synthesiser.



Crumar Composer.

"Because of the new technology," Simpson added, "I've been able to cut my rig down from eight units to four units."

E-mu Systems, Inc., has adopted such recent trends as computer interface to its Emulator digital polyphonic keyboard instrument. All Emulators will now include as standard a powerful realtime multi-track sequencer which makes it possible to create complex musical compositions and sound effects tracks in a manner analogous to overdubbing on a multitrack tape recorder. Using the Emulator's built-in disk drive, completed sequences can be stored on floppy diskettes along with Emulator sounds. The sequencer can be easily retrofitted to earlier models at a cost of \$250.

Emulators also now include two foot switches and a foot pedal. The foot pedal duplicates the function of the MOD wheel, making it possible to control vibrato depth while playing with both hands. One of the foot switches acts as a sustain pedal, while the other controls a new keyboard doubling mode. In this mode, notes played on the lower half of the keyboard are automatically doubled by the sound on the upper half of the keyboard.

The synthesiser's capabilities also have been expanded with the introduction of two new optional software systems. The recording of up to eight individual samples at half-octave intervals across the keyboard is possible with the User's Multi-Sample. This results in more accurate reproduction of highly resonant sounds and, in addition, makes it possible to have eight independent sounds available on the keyboard simultaneously. The Personal Computer Interface allows any computer equipped with an RS-232 serial port to control Emulator sounds.

In the area of hardware, E-mu's new analog voltage interface will allow any source of control voltages and gates to control Emulator channels.

Possibilities include remote polyphonic keyboards and polyphonic sequencers such as the Roland MC-4, the Oberheim DSX, or E-mu's own 4060 16-channel keyboard/sequencer.

A double-manual electronic keyboard, with two four-octave keyboards, has been introduced by Music Technology. The company's Crumar T-3 features two manuals of polyphonic strings, electronic pianos and organs with rotary sound system effect.

## Strings

The string section can have independent crescendo for each key depressed, as well as be treated by a phaser which can sweep automatically or be looped at any phase angle. The organ has the most popular drawbar settings activated by preset switches and has its own reverb system, along with percussion and key click features. All sections are assignable to upper, lower or both keyboards.

An optional advanced 'nerve center' offers such rhythm accompaniment as a realistic digital cymbal sound, and a variety of chord rhythms, alternating or walking bass and stylistic lines played by bass, guitar and piano. An assortment of pedals permits foot control of various sections, including percussion.

The basic T-3, which weighs 31 kilograms, includes a protective cover, pedals for volume, sustain and solo percussion control, music rack and stand. The suggested retail price is \$2,350, or \$2,950 with the nerve center.

Linn Electronics uses digital technology for its latest rhythm machine, the LinnDrum, which has more features, but a lower price, than its well known LM-1 Drum Computer.

Stored in the LinnDrum's computer memory are digital recordings of open and closed hi-hat, crash and ride cymbals, bass, three toms, snare,

sidestick snare, two congas, tambourine, cabasa, cowbell and handclaps. LinnDrum also stores as many as 49 different patterns and dynamics, odd time signatures and what Linn Electronics refers to as 'human rhythm feel' all of which are programmable. Drum sounds can be changed by using alternate 'chips' supplied by the factory and custom-prepared sounds are also available.

All patterns remain in memory even with the power off. Programmed data can also be kept on cassette by way of the tape storage function and then reloaded at a later time. LinnDrum will sync to a variety of synthesizers and sequencers and can overdub to tape. Although separate outputs for all sounds are provided, a stereo mixer with volume and pan sliders is integrated into the front panel. The front panel also contains controls for adjusting voltage inputs and tuning the snare, toms and congas.

Shipping of the LinnDrum, which carries a suggested retail price of \$2,995, began in June.

## Roland Amps

To help improve the sound of its keyboard instruments, Roland has added two compact Cube amps to its popular line of Cube guitar amplifiers. The new amplifiers, both specially designed for keyboard use, are the 40 watt Cube-40 Keyboard, or CK-40, and the 60 watt Cube-60 Keyboard, or CK-60. Each amp has two input channels with individual volume controls for handling two keyboard inputs. Each channel also features an input attenuator with an extremely wide dynamic range to accept input signals of any magnitude without causing input clipping.

Both the CK-40 and the CK-60 feature controls for treble, middle, bass and reverb and the CK-60 allows the reverb to be selectively assigned to either or both channels. The CK-40 has a self-contained two-way 10-inch speaker while the CK-60's two-speaker system includes a 12-inch speaker and a horn tweeter for more faithful reproduction of keyboard instruments. Rear connection jacks include pre-amp out, main-amp in, two mono record-out jacks, headphones and external speaker jack. List prices are \$350 and \$460, respectively.

Meanwhile, not forgetting guitarists and bassists, Roland has introduced its Spirit amplifier group, a new series of five lower-priced guitar and bass amplifiers.

The Spirit 10 is a compact, portable rehearsal guitar amp with 10 watts RMS of power and an eight-inch full-range speaker. There are jacks for headphone, lineout and overdrive and normal switching and controls for volume, master volume, bass, middle and treble.

Roland's other new guitar amps — the Spirit 30 and Spirit 50 — have larger speakers, increased wattage and more features.

The two bass amps, the Spirit Bass 30 and Spirit Bass 50, have volume, bass, middle and treble controls, hi/lo signal inputs, and a parametric equalisation section for wide-ranging tonal contour.

**E&MM**

*Manufacturers and companies mentioned:*  
E-mu Systems: Syco Systems, 20 Conduit Place, London W2.

Hi Lo Dolly, P.O. Box 2173, Santa Rosa, CA.  
Linn Electronics Inc., 18720 Oxnard St., Tarzana, CA 91356.

Moog Music Inc., Lintis View Estate, Port Seaton, East Lothian, Scotland.

Crumar: Trevor Daniels & Co. Ltd., 49 Potters Lane, Till Farm, Milton Keynes, Bucks.

Rhodes: C.B.S. Arbiter Ltd., Fender House, Centenary Estate, Jeffrey's Road, Brimsdown, Enfield, Middlesex.

Roland U.K. Ltd., Great West Trading Estate, 983 Great West Road, Brentford TW8 9DN.

Music Technology Inc., 105 Fifth Avenue, Garden City Park, NY 11040.



Roland Spirit 10 guitar amp,

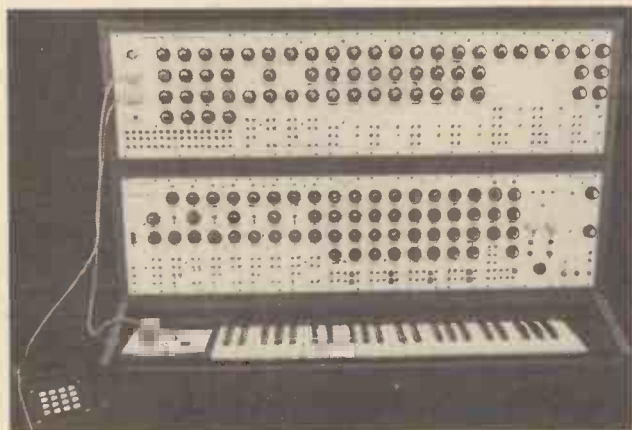
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Roland Spirit 30 guitar amp.

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# UNDERSTANDING ELECTRONICS

A regular column that explains the electronics of music

Robert Penfold

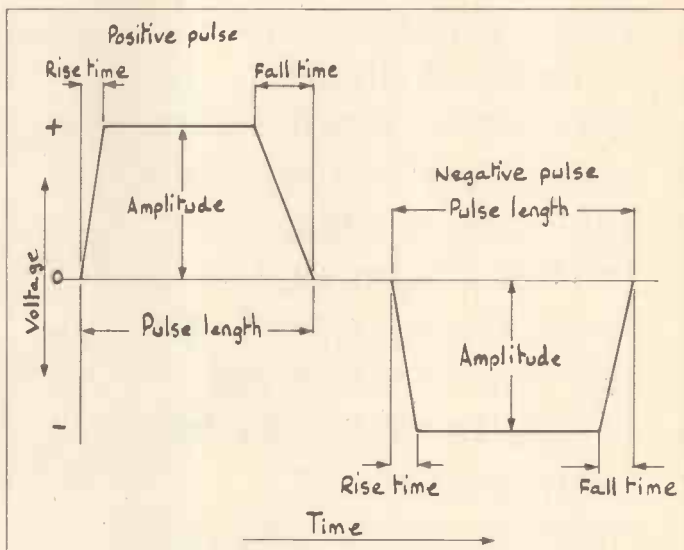
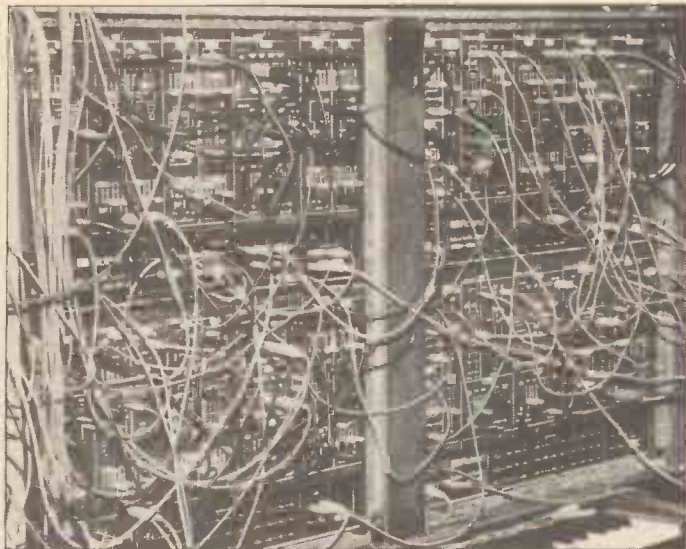


Figure 1. A voltage pulse has amplitude, polarity, rise and fall times, and length.

## Trigger Interfacing

There are many areas of technology where a lack of standardisation complicates what should really be quite simple tasks, and unfortunately electro-music is one of these areas. Taking a trigger signal from one item of electro-music equipment and using it to control another piece of equipment should simply entail connecting the two together using a lead fitted with the appropriate plugs.

In practice this may give perfect results, but there is a real possibility that the required triggering will be unreliable or fail altogether, or it may be produced reliably but delayed slightly.

## Pulse Parameters

A voltage pulse has a number of parameters, and Figure 1 helps to clarify these. First there is the amplitude and polarity of the pulse: the amplitude is normally between 5 and 15 volts in practice. Most synthesisers, sequencers and associated systems work using positive pulses, but there are plenty that use negative ones. The two are not really compatible, and in a direct coupled circuit it is unlikely that a trigger pulse of the wrong polarity will have an effect.

There is also just a slight risk of damage to the piece of equipment which is driven with pulses of the wrong polarity (but not to the equipment providing the trigger pulses). But if capacitive coupling is used it is very possible that triggering will be obtained. However, if we take a positive pulse being fed to equipment which requires a negative trigger pulse, on the trailing edge of the waveform there is a negative going signal which may well provide a suitable trigger signal. Similarly, the trailing edge of a negative pulse might provide a suitable positive going trigger signal for an item of gear that needs positive trigger pulses.

Even if this method does give reliable triggering, it is likely that satisfactory results will not be obtained since triggering will be

delayed by an amount equal to the trigger pulse length, and this may be sufficient to give unacceptable results 'off' the main rhythmic beats of the music. Fortunately, it is not difficult to produce a negative trigger pulse from a positive one, or vice versa: all that is required is a simple circuit which is appropriately called an 'inverter'.

The amplitude of a trigger pulse is not normally critical, and although a pulse amplitude of 15 volts may be specified it is quite likely that a very much lower voltage, perhaps as little as 5 volts, will be sufficient to give reliable triggering. An excessive trigger pulse potential is usually no problem either, and although there is a slight risk of damaging equipment by using a slightly excessive trigger pulse amplitude, in practice most equipment has protection circuitry in one form or another that enables a substantial overload to be sustained repeatedly without any problems occurring. If the pulse voltage does need to be boosted or attenuated this is again something that can be achieved using simple and inexpensive circuitry.

Some equipment is intended to have a direct coupled trigger signal from a logic circuit, and then the trigger signal should switch between some maximum acceptable voltage and a certain minimum acceptable potential. The figures depend upon the family of logic devices concerned, and in some cases on the supply voltage in use. As an example, the popular TTL logic devices (which have a nominal 5 volt supply potential) have a maximum acceptable voltage of 0.8 volts for logic 0 and a minimum acceptable voltage of 2 volts for logic 1. These are then the voltage parameters for most micro control ports.

While it may sometimes be necessary to build a simple interface circuit when driving logic circuitry from a source which is not specifically designed to operate with the particular logic family concerned, this is often unnecessary, and logic devices can often be driven successfully from a capacitively coupled source.

## Pulse Length

The length of the trigger pulse is not usually critical, and it is usually only a minimum length that is specified. There is normally no need to specify a maximum acceptable pulse length simply because most equipment has built-in circuitry which effectively shortens the input pulse if necessary, and this effect may well be inherent in the circuit. The minimum pulse length is important merely because a very short pulse may not activate the equipment properly since the trigger circuitry obviously takes a small but finite time to operate. If necessary a simple pulse stretcher can be used to lengthen a trigger pulse and produce reliable results. This feature has been included in this month's Universal Trigger Interface.

Of course, the above is only true in the case of a genuine trigger pulse, and the situation is quite different for a gating pulse. The gating pulse to an ADSR envelope shaper for example, controls the duration of the signal up to the final release (R) part of signal. When controlling a circuit of this type electronically, it is obviously necessary to set the gate pulse duration at just the right figure to give the desired effect. In other respects though, the notes given here apply equally to gate and trigger pulses.

## Rise And Fall Times

The rise time of a signal is merely the time it takes to go from its minimum level to its maximum one, and the fall time is the time taken during the transition back to the minimum amplitude. Some circuits require a trigger pulse having very short rise and fall times, and multiple triggering or some other form of malfunction can result if these requirements are not met. A circuit known as a Schmitt Trigger can be used to speed up the rise and fall times of a signal, but trigger pulses normally already have very fast leading and trailing edges and in practice it is unlikely that this would be necessary.

(Continued on page 61)

# Universal Trigger Interface

Design by Mike Beecher

Development by Robert Penfold

- ★ Trigger link-up for all currently available commercial synthesisers, sequencers and micros
- ★ Interfaces, buffers and patches trigger signals for multi-instrument use
- ★ LED pulse monitoring
- ★ Two pulse stretchers for achieving precise rhythmic triggering



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In virtually every area of electronics there are compatibility problems when using a set-up that consists of items of equipment from a variety of manufacturers. There may even be problems of incompatibility between items of equipment from the same manufacturer if some of the gear is of more recent origin than the rest, and electro-music is not an abstainee from problems of this nature.

The E&MM Universal Trigger Interface is a simple, but very useful, gadget that helps to overcome a host of incompatibility problems. The unit comprises four sections: two monostable multivibrators and two stages which invert, buffer and provide interfacing for processors. Figure 1 is a simplified block diagram of the unit and this shows just one of the inverter/buffer/micro-interface stages, and just one of the monostables.

## System description

The inverter is used when an input signal which has a leading edge going from 0V to some positive level must be converted to a signal having a leading edge that switches from a positive voltage down to 0V. Alternatively, it can convert a leading edge that switches from a positive level down to 0V into one that makes the opposite transition. What this stage cannot do is process input signals that are negative going with respect to the 0V rail, but it's unlikely that a trigger signal of this type will be encountered in practice.

The buffer stage enables a sensible output current to be obtained when the source signal is at a fairly high impedance. The voltage remains unaltered apart from a small DC offset appearing at the output of this stage.

In the digital interface mode the signal fed to the input is simply clipped to a nominal level of 4.7 volts; this enables micros (and other logic systems, both TTL and CMOS) to be safely controlled by high

voltage input pulses, e.g.: 9 to 15 volt levels emanating from synths.

A switch is used to connect the input and output sockets to the appropriate circuit,

and a LED indicator is connected at the output. This is pulsed on when the output is in the high state.

The monostables are negative-edge trig-

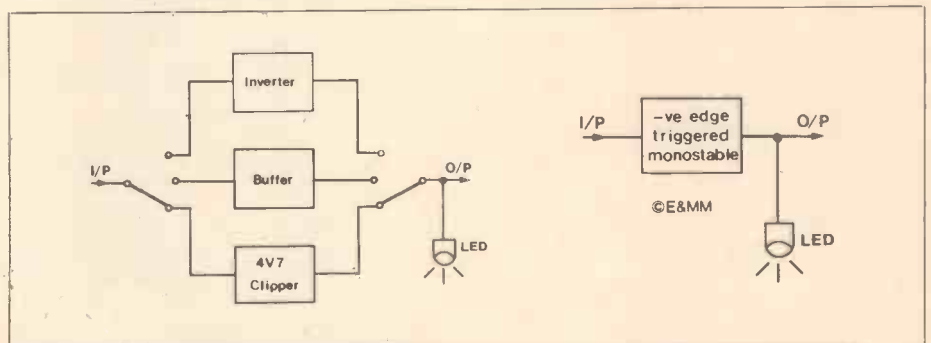
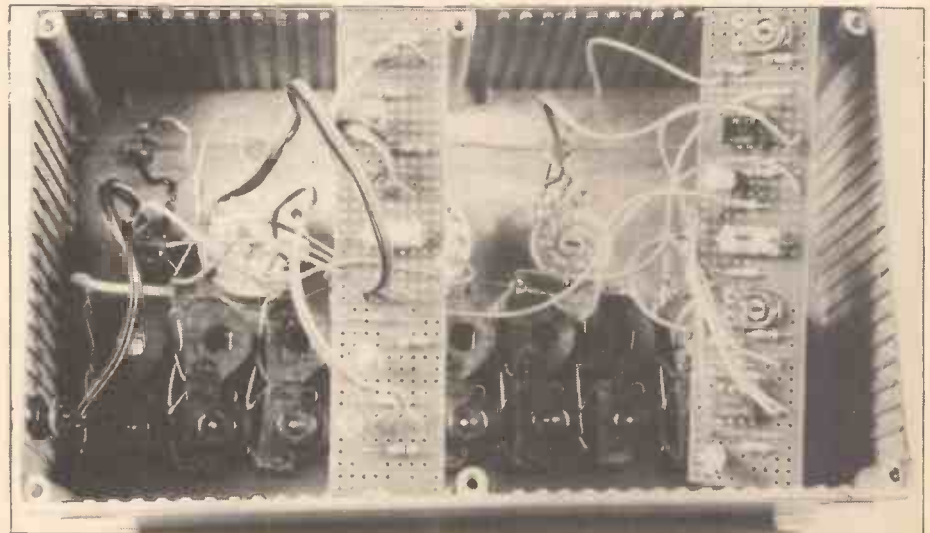


Figure 1. Simplified block diagram of the trigger box.



Interior view of the Trigger Interface.



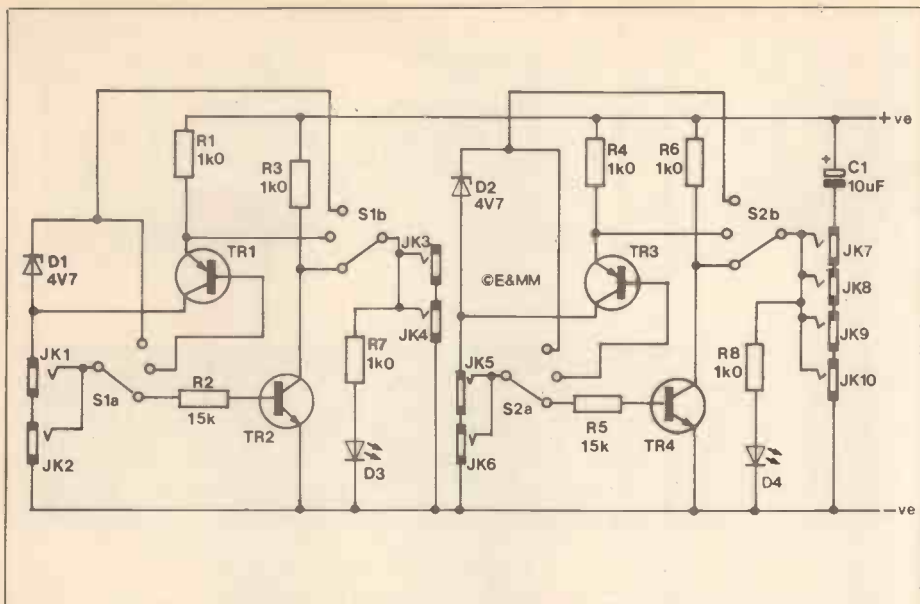


Figure 2. The inverter, buffer and logic interface circuits.

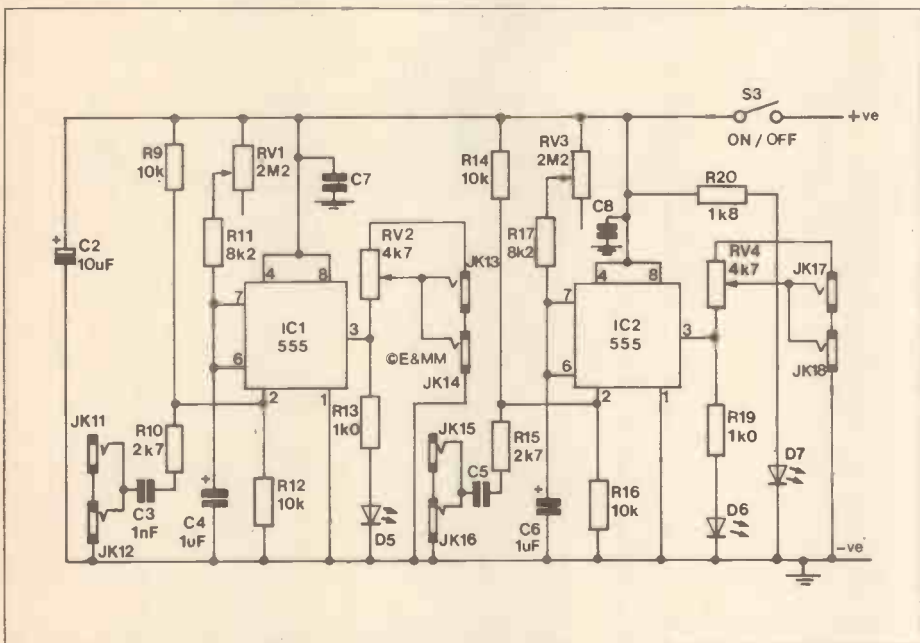


Figure 3. The monostables' circuit diagram.

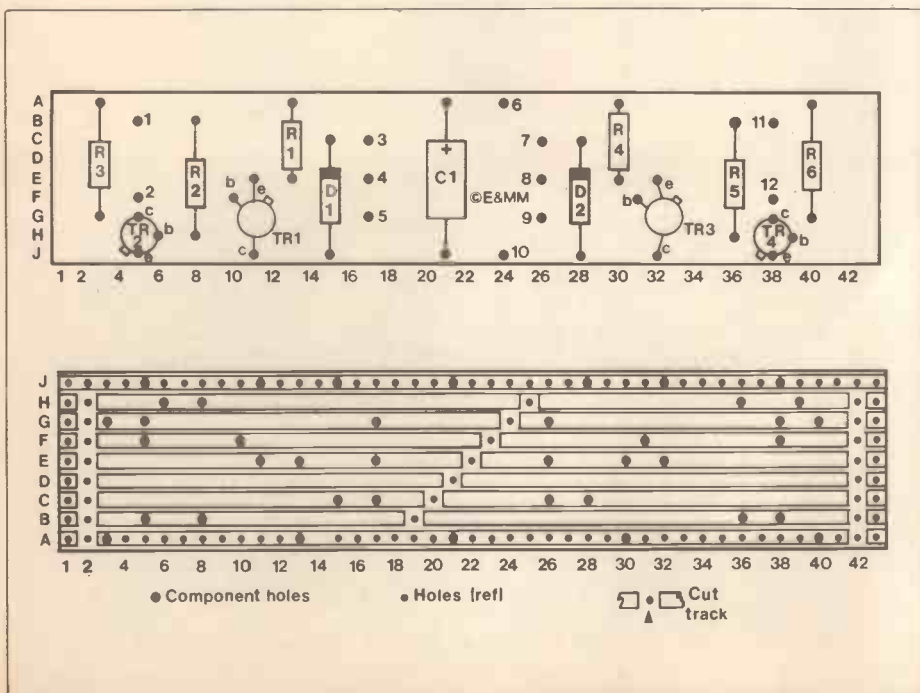


Figure 4. Veroboard layout for the buffer/inverter/interface circuits.

gered types, although they may sometimes trigger reliably when fed with brief positive input pulses. The output is normally low and a positive output pulse of adjustable duration (from about 10ms to 2.5 seconds) is produced when the circuit is triggered. Of course, by using an inverter at the input either monostable can be made to trigger on the positive going edge of the input signal, and using an inverter at the output enables negative output pulses to be obtained.

These facilities can be useful where it is necessary to trigger a piece of equipment from a pulse that would otherwise be too brief to give reliable triggering: the monostables can be triggered by a pulse of less than a microsecond in duration. Monostables can also be used as a simple form of frequency divider; with an input frequency of (say) four pulses per second and the pulse duration set at just under one second, the monostable will have an output frequency of just one pulse per second. After the monostable is triggered, the next three pulses have no effect, as the output pulse hasn't ended, and the circuit will not be triggered again until the fifth pulse, this appearing just after the first output pulse ends. An important point to bear in mind when contemplating the use of this type of frequency division is that the output signal is not a brief positive pulse; it obviously has a long duration, and this might preclude its use in some instances. Each monostable has a LED at the output which lights up to indicate the output pulses.

## The Circuit

Figure 2 shows the circuit diagram of the two inverter/buffer/micro-interface circuits and Figure 3 shows the circuit diagram of the monostable multivibrators.

If we first consider one of the inverter stages, this uses TR2 plus its collector load resistor R3 as a simple common emitter inverter. Base resistor R2 is included to effectively make TR2 voltage rather than current operated, and to protect TR2 against excessive base current. The buffer stage employs TR1 as a straightforward emitter follower stage, having R1 as its emitter load resistor. D1 is used to clip the input signal at approximately 4.7 volts when the unit is switched to the micro-interface mode.

S1a couples the input sockets to the appropriate stage, and S1b provides the equivalent function at the output of the unit. A pair of input sockets are fitted to the unit so that an unprocessed input signal can be easily taken from the extra input socket if desired. Similarly, a pair of output sockets are fitted so that the unit can readily drive more than one item of equipment.

The second inverter/buffer/micro-interface stage is essentially the same as the first, the only difference being that it has an additional pair of output sockets. LED indicators and series current limiting resistors are wired in parallel with the output of both stages. If the indicators aren't bright enough, don't be tempted to reduce R7/8 below 1k, as the additional current drain will be detrimental to the fidelity of the output pulses. Instead, look for a more efficient LED (red ones are available with high light output) or use a green one (the eye's sensitivity is greatest here). Alternatively, a 'bezel' LED has a fair degree of immunity from high level ambient light, and a wide viewing angle.

If we now consider one of the monostable stages, this is based on the familiar 555

# Universal Trigger Interface



Interior view with veroboards in position.

timer IC used in the standard monostable configuration. Taking the monostable based on IC1, the output pulse length is determined by RV1, R11, and C4. The pulse length can be adjusted over the approximate range stated earlier by means of RV1, with minimum resistance through RV1 corresponding to minimum pulse length. Pin 2 is the trigger input of IC1 and this is biased to about half the supply voltage by R9 and R12. In order to trigger IC1 this input must be taken below one third of the supply voltage, and it must be taken only momentarily below this threshold level, otherwise the trigger signal will significantly affect the length of the output pulse. The input signal is coupled to the trigger input by C3 and R10. The low value of C3 when compared with the input impedance into which it feeds ensures that only a brief pulse will be supplied to the trigger input of IC1 however long the input pulse may be.

LED indicator D5 and its current limiting resistor R13 are connected at the output of IC1, as is preset potentiometer RV2 which enables the output signal to be attenuated somewhat if desired. As the 555 can source ample current, reducing R13/19 slightly to make the LEDs flash more brightly should present no problems. Again, pairs of input and output sockets are fitted to the unit. The second monostable circuit is identical to the first one. S3 is the on/off switch and power for the unit is provided by an external (ready-made) mains power supply unit. The current consumption of the circuit varies somewhat according to the states of the invert and buffer stages, but is in the region of 20 to 30mA.

## Construction

The unit is housed in a diecast aluminium box having external dimensions of 190 x 110 x 60mm, and the sockets are fitted in two rows along the lower part of the front panel. There is not a great deal of space for the sockets, and it is necessary to fold their tags over slightly in order to fit them into the available space. Fit the sockets one pair at a time, wiring them in parallel before fitting the next pair. The five controls are mounted in a row along the centre of the front panel, and the five LED indicators are fitted in a row

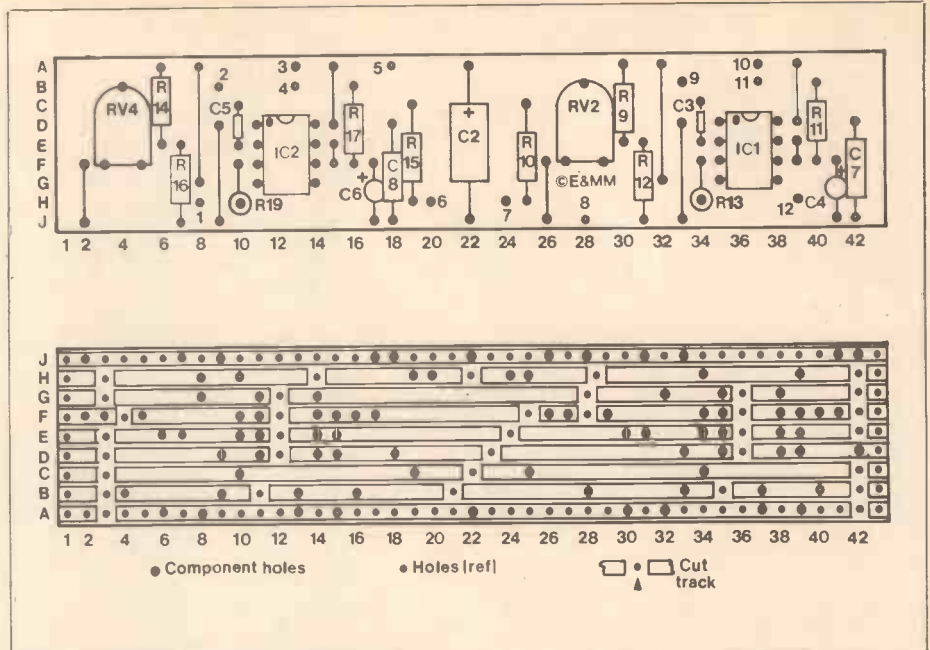


Figure 5. Veroboard layout for the monostables.

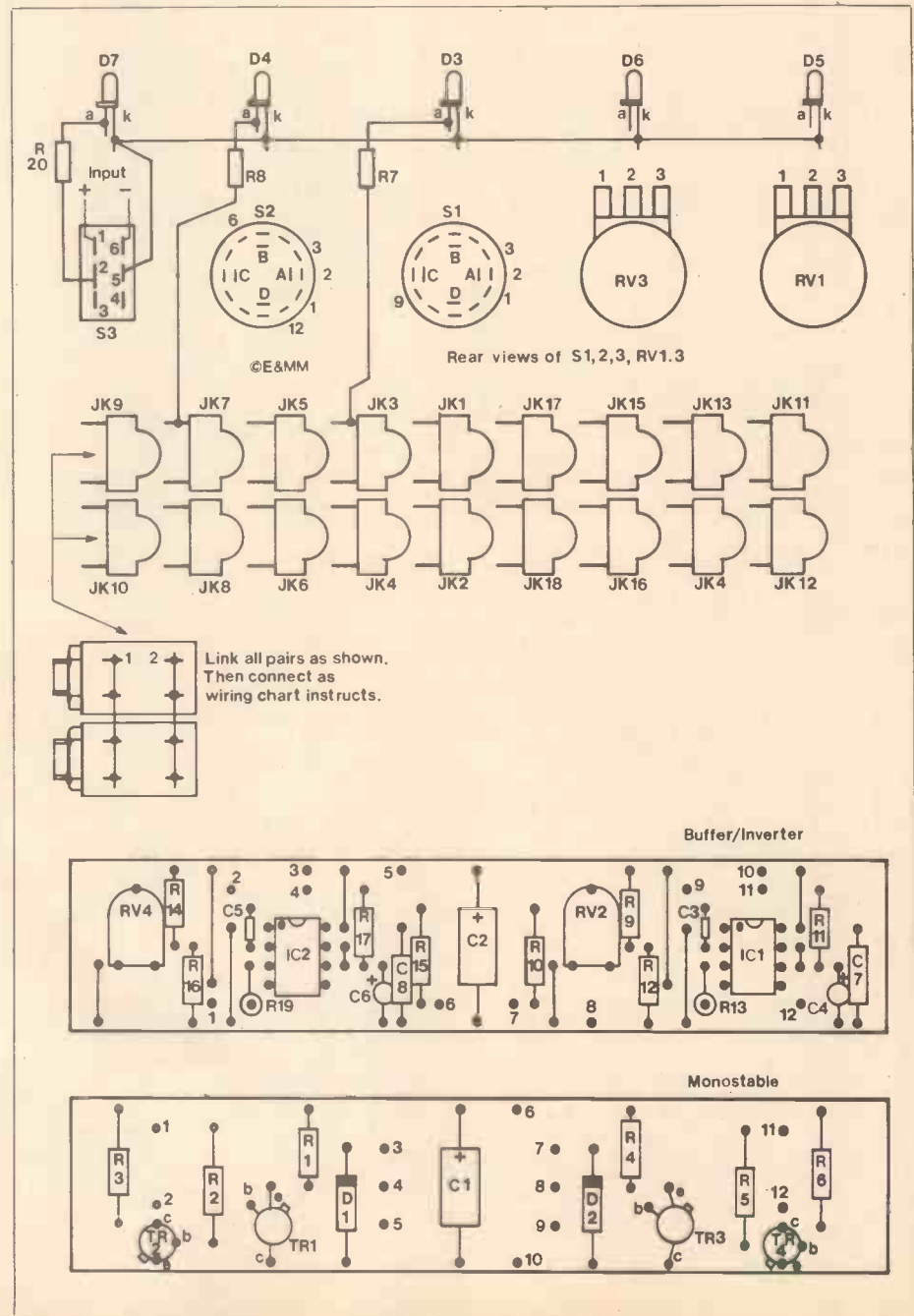


Figure 6. Interface wiring diagram (use with wiring details).



along the top part of the panel. On the prototype the LEDs were mounted in fresnel lenses, but ordinary panel holders can be used if preferred, although this will give the unit a less neat appearance. Alternatively, a recessed 'bezel' LED may be preferred for its ruggedness.

The two inverter/buffer/micro-interface circuits are accommodated on a 0.1in. matrix stripboard having 43 holes by 9 copper strips; details of this board are provided in Figure 4. The two monostable circuits are fitted on to a 0.1in. matrix stripboard of the same size, and this board is detailed in Figure 5. Construction of both boards is quite straightforward and there should be no difficulty in producing either of them. There are numerous breaks in the copper strips of both boards; note that the main row is placed obliquely to avoid weakening the board excessively. Care should be taken to ensure that none of the breaks are omitted or incorrectly positioned.

The completed boards slot into vertical guide rails in the case, and it might be necessary to file down the ends of the boards slightly before they can be fitted in place. They must be fitted into guide rails lying to one side of the switches, so that there's no danger of the components or copper tracks coming into contact with the tags of the switches. An entrance hole for the power cable must be drilled in one side of the case, and this hole should be fitted with a small grommet. Alternatively, for stage use, a nylon cable gland or latching power connector may be preferred.

Note that R7, R8 and R20 are not mounted on the boards, but are hung between the appropriate LEDs and sockets

## WIRING DETAILS

From	To	Remarks	From	To	Remarks
S3/1	—	+ve input	Monostable/1	D6/a	
S3/6	—	-ve input	Monostable/2	JK17/2	
S3/2	D7a	Via R20	Monostable/3	RV3/2	
S3/3	—	Not used	Monostable/4	RV3/1	
S3/5	D7K	Link to D3,D4,D5,D6 cathodes	Monostable/5	S3/2	
S3/5	JK9/1	Link to Pin 1 on all JK skts	Monostable/6	JK15/2	
Buffer/1	S1/1		Monostable/7	JK11/2	
Buffer/2	S1/2		Monostable/8	JK13/1	
Buffer/3	S1/9	Link to S1/3	Monostable/9	JK13/2	
Buffer/4	S1/8		Monostable/10	RV1/2	
Buffer/5	S1/7		Monostable/11	RV1/1	
Buffer/6	S3/2		Monostable/12	D5/a	
Buffer/7	S2/12	Link to S2/6	S1/A	JK1/2	
Buffer/8	S2/11		S1/C	JK3/2	Link to D3a Via R7
Buffer/9	S2/10		S2/B	JK5/2	
Buffer/10	JK3/1		S2/D	JK7/2	Link to JK9/2 & D4/a Via R8
Buffer/11	S2/4				
Buffer/12	S2/5				

(or LED and switch in the case of R20). Wiring details of these three components, together with details of all the other point-to-point style wiring of the unit are given in Figure 6 and the accompanying wiring chart.

The unit can be powered from any supply that gives a suitable voltage, is capable of providing the necessary current, and has a reasonably well smoothed output. The proto-

type utilises a four voltage (6, 7.5, 9 and 12V) supply, which enables the unit to be used in virtually any set-up. In this circumstance, use the *minimum* voltage that provides reliable triggering. A supply voltage of not less than 5 volts is needed, and the absolute maximum permissible supply voltage is 15 volts, which is the most the 555 ICs can withstand. **E&MM**

## UNIVERSAL TRIGGER INTERFACE PARTS LIST

Resistors — all 1/4W 5% carbon		Maplin code		Semiconductors			
R1,3,4,6	1k	4 off	(M1K)	IC1,2	NE555	2 off	(QH66W)
R2,5	15k	2 off	(M15K)	TR1,3	80179	2 off	(QB54J)
R7,8,13,19,20	1k8	5 off	(M1K8)	TR2,4	80108	2 off	(QB33L)
R9,12,14,16	10k	4 off	(M10K)	D1,2	82Y88C4V7	2 off	(QH06G)
R10,15	2k7	2 off	(M2K7)	D3-7	0.2in. red LED	5 off	(WL27E)
R11,17	8k2	2 off	(M8K2)				
RV1,3	2M2 log pot	2 off	(FW29G)	Miscellaneous			
RV2,4	4k7 0.1W horiz. preset	2 off	(WR57M)	S1,2	3-way 4-pole rotary	2 off	(FF76H)
				S3	DPDT min toggle		(FH04E)
				SK1-18	Standard Min. jacks	18 off	(HF90X)
					Fresnel lenses for D3-7	5 off	(YH56L)
					Veroboard		(FL07H)
					Discast box		(LH74R)
					Wire	1 metre	(XR06G)
					Contact knobs	4 off	(RW87U)
					Grommet		(FW59P)
					Power source (see text)		(YB22Y)



## SYNTHESISER TRIGGER INFO

ARP: Gate IN, Minimum 8V. TRIG IN, 8V (10ms min). Gate OUT, 10V, TRIG OUT, 10V (20ms).

ELECTRONIC DREAM PLANT: The Wasp and Gnat synths trigger most easily by use of the EDP Spider Sequencer, which provides choice of two outputs: S-TRIG and GROUND (GND) to 9V.

EMS: 4V positive triggers are required.

E&MM SPECTRUM uses 9-15V positive going triggers from Gate IN/OUT.

KORG: A 5V to GND pulse is required to initiate EGs and GND to 5V to initiate release. MAPLIN 5600/4600 Synthesizers both use -7V to +7V positive triggers.

MOOG: An S-Trigger pulse is used. This is a shorting connection (pulse to GND).

OBERHEIM synths require at least +9V Triggers (max. 15V).

POWERTRAN: The Transcendent 2000 requires a negative gate voltage, but options are usually provided (e.g. in the 1024 Composer) for GATE IN/OUT pulses to be adjusted to either positive or negative (9-15V).

PPG: Uses 15V positive triggers.

PROPHET synths use 15V max. positive triggers.

ROLAND: The Roland Drumatix TR-606 has a 14V, 20ms TRIG OUT, but most Roland equipment will trigger between 5-15V, from a 20ms min. positive going pulse.

YAMAHA: TRIG OUT is usually negative going +10V to GND. TRIG IN is similar.

# ELECTRO-MUSIC ENGINEER

by Ben Duncan

## PROTECTION: Part 1. The Taming of the Juice

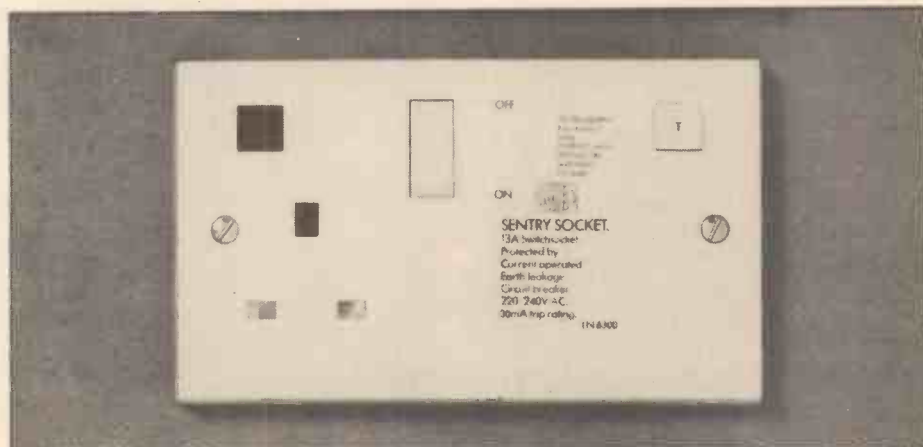
Most 240 volt mains fatalities occur as a result of housefires. However, for musicians and sound engineers, electrocution is a far greater menace. Death occurs when high currents flow through the heart muscles and respiratory system; Table 1 delineates the effects of various magnitudes of current. Note that currents in excess of 20mA, whilst not inherently lethal, may result in muscular contraction, so that you're unable to let go of the live object. This situation is especially dangerous, as an initially small current can build up to a lethal dose as a result of skin burns.

The body's main line of defence against excessive current flow is skin resistance. Dry, calloused skin, with a typical resistance of 250k implies a current circa 1mA at 240 volts and countless engineers owe their lives to the thick, horny calluses that develop on the palms and fingertips after years of soldering and rough manual tasks. However, it should be borne in mind that resistance bears a crucial relationship to the area of skin contact. Moreover, the passage of even quite low levels of current can result in burns, and as carbon is a good conductor, the current can rapidly snowball. The addition of sweat greatly reduces skin resistance, which makes musicians particularly vulnerable, especially when they're involved in the hyper-activity of a live performance.

Before considering mechanical means of protection against electric shock, it should be noted that the passage of mains-derived current will only normally be lethal if the heart/respiratory centre lies in the way. With this in mind, many engineers automatically place their left hand in their pocket whilst working in proximity to live circuitry. Then, if they do touch a 'hot' wire, a lethal current is unlikely to flow near the heart; rather (assuming there's no direct bodily contact with mains earth or neutral) the current will usually find its way to ground through the feet, via the right-hand side of the chest and legs. Of course, in no way does this precautionary measure guarantee that a shock will be harmless nor is this tactic of practical use to performing musicians. But then the nature of the hazard they face is different to that encountered in workshops.

### Earth Leakage

Assuming that the mains terminations in stage and studio equipment are competently enclosed, then the prime hazard boils down to simultaneous and inadvertent electrical connections between the live side of the mains and exposed metal which happens to have a poor earth connection, say a microphone. As exposed metal in any mains powered equipment is normally assumed to be earthed, it follows that a musician holding this microphone is bound to receive a serious shock immediately he touches other areas of exposed metal such as the aluminium knobs on his amplifier. Ideally, with the neutral side of the mains being earthed,

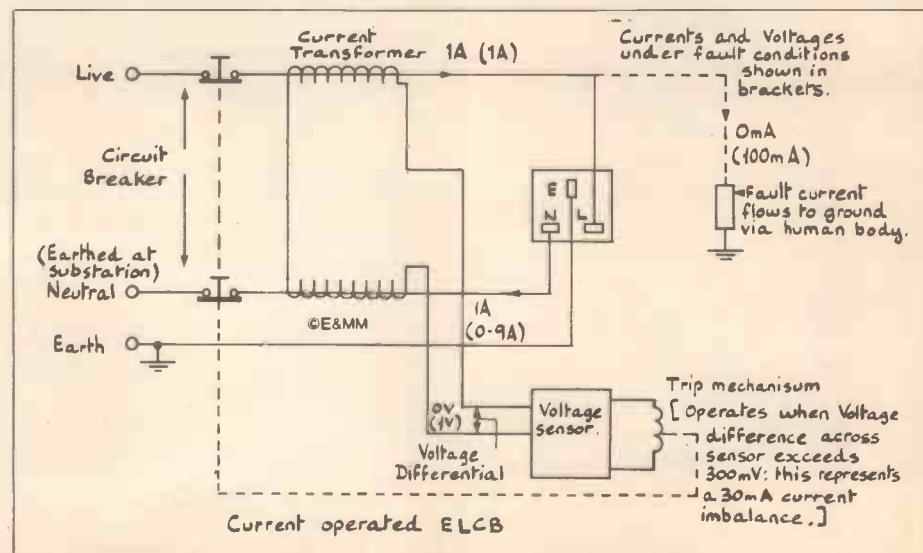


MK 'Sentry Socket' with integral ELCB replaces a standard wall socket.

Current level	Effect
1mA	Threshold of perception.
5mA	Maximum harmless current level.
10-20mA	Unpleasant shock, but no sustained muscular contraction.
50mA	Pain, exhaustion, possible fainting, physical injury.
100-300mA	Ventricular fibrillation starts, but respiratory centre remains intact.
5A	Sustained myocardial contraction and respiratory paralysis. Burns if current is only concentrated in one area.

Table 1. Physiological effects of AC (50/60Hz) fault currents.

contact between live and earthed conductors should draw a large current and blow fuses. However, even if the earth connection is apparently sound all the way from the equipment to the mains socket, a high impedance or open circuit may appear either in the permanent mains wiring or in the vital connection between earth and neutral. In this case, heavy-duty supply fuses are unlikely to blow, and there's no guarantee that the vaguely defined fault current will blow even the more sensitive mains fuses incorporated in the equipment, at least in time to save a life. To an extent, the highly dangerous 'Bad Earth' is guarded against by PME (Protective Multiple Earthing) systems wherein the neutral and earth conductors are bonded at several points between the local substation transformer and the mains outlets, and by earth leakage circuit breakers (ELCBs). There are two types in common use. 'Voltage operated' ELCBs detect small fault currents (which



The current-balance ELCB compares the current levels in each side of the mains supply. When these differ, an error voltage appears across the output of the current transformer, causing the trip mechanism to disconnect the mains supply.



wouldn't normally blow fuses) flowing down the earth cable. 'Current balance' ELCBs compare the magnitude of the supply current in the live and neutral conductors; obviously, if the current differs, then some must be flowing to earth (or at least, somewhere it shouldn't!) and the circuit breaker promptly opens (see Figure 1).

## Active Protection

Although one or other of these types of circuit breaker appear in the electrical installations of many venues, it's exceedingly naughty to assume as a matter of course that they exist and that they're functional! Also, the voltage operated ELCB is readily defeated if the fault current fails to flow down the earth wire to which the ELCB is connected; if a musician is standing on a damp concrete floor, or touches a brass water pipe, then the fault current will bypass the ELCB. By comparison, the current balance style of ELCB is relatively foolproof, but one can't be sure that the current level at which a permanently installed one 'trips' is low enough to be a lifesaver. The answer to these niggles is to buy your own, with a 50mA or (even better) 30mA trip current, and wire it into the master plugboard. You can then be absolutely certain that an earth fault appearing anywhere amongst your gear will cause the mains to be promptly disconnected whether you're playing at home, at a gig or in a field. Obviously, if you use several plugboards any one of which could be connected to a wall socket, a current balance ELCB should be fitted in each, otherwise a false sense of security can arise. Alternatively, ready-wired ELCBs are available built into the socket end of a short extension cable. For home studio use, double wall sockets can be replaced by single ELCB protected sockets, e.g. the MK 'Sentry Socket'.

From a practical viewpoint, careful enclosure design is demanded for use on the road. A suitable box must guard the ELCB's delicate plastic body and prevent the 'trip', 'test' and 'reset' buttons being knocked accidentally; but at the same time, all the buttons must be readily accessible. One way to achieve this is to mount the ELCB in a diecast box with the buttons almost flush with the lid (see photograph in March 1982 'Electro-Music Engineer'). Holes marginally smaller than a fingertip are then drilled to expose the buttons, allowing these to be pressed with the help of a handy stave-like object such as a drumstick or car key! Of



MK current balance ELCB.

course, in large rigs the breaker can be conveniently and safely placed inside a propriety 'cupboard' within the mains distribution trunk.

Having installed a current balance ELCB, it's sensible to be aware of its capabilities. Firstly, it offers *no* protection if you make contact between *live* and *neutral* conductors. Fortunately, this mode of shock is rare unless you probe inside equipment using both hands (which is unlikely on stage), or are silly enough to place both hands across a half-withdrawn 13 amp plug! Secondly, because excessive sensitivity can result in nuisance tripping, when say, equipment is slightly damp, or there's a lot of RFI or other random 'noise' on the supply, usable ELCBs for stage and studio use are generally restricted to a 20 or 30mA minimum trip current. So protection with 100% certainty cannot be assured and should never be assumed. In particular, shocks can be suffered without tripping the unit if the leakage current hovers between 1 and say 29mA.

In mitigation it's fair to say that the presence of a correctly wired and regularly tested ELCB makes serious shock or electrocution highly unlikely, but more to the point, provided you give regular attention to the integrity of the earth connections on your mains cables, a potentially lethal fault will be detected the moment it occurs, and usually long before it has a chance to cause harm. So the golden rule with ELCBs is to heed them when they trip even if everything seems in order. Use a meter with one lead connected to a known ground (e.g. the earth pin on a permanently wired 13 amp outlet) to check for live potentials on exposed metalwork, or try to isolate the faulty equipment by progressive unplugging.

Figure 2 depicts a cheap and simple circuit which offers no active protection but provides confirmation that all three mains conductors are intact. Note in particular that the earth side of the upper pair of neons is connected *not* directly to the earth conductor, but rather to the equipment chassis, to which the earth conductor is assumed to be connected. If this arrangement isn't adopted then the neons will fail to show a fault if the earth to chassis connection fails. However, 'LNE neons' obviously can't monitor the earthing of *all* the panels and sub-frames in a large chassis, so this circuit should be regarded essentially as a means of spotting decrepit connections inside 13 amp plugs. Testers working along similar lines, but built into a dummy 13 amp plug, are also available commercially, e.g. The Martindale mains tester, available from Turnkey.

Though Britain's mains voltage is uniquely high and especially waspish, at the same time, U.K. standards of mains distribution are widely regarded as the world's most scrupulous.

## Fusible Materials — a Precautionary Pot-Pourri

Regrettably, our most elegant masterpiece, the fused 13 amp plug is widely abused. In theory, square pin plugs should contain a fuse commensurate with the cable rating, but public nonchalance and the irresponsibility of 'shifting units at all costs' as a selling technique combine to ensure that most 13 amp plugs contain 13 amp fuses. Thus weedy 2 amp cables commonly fitted to musical gear become potential fire risks. To make matters worse, conscientious musicians often report great difficulty in obtaining suitable fuses: 1, 2, 3, 5, 7 and 10 amp fuses are certainly manufactured, but they rarely appear in the average high street shop, though to be fair, electronic component retailers do stock most of the values specified in the BS1363 standard.

The plethora of fuse types found in the panel fuseholders of musical gear is strangely much less of a problem; if your local music shop or an electronic equipment retailer can't help you, try a shop which handles radio and TV repairs.

A more pressing quandary is widespread misapprehension of the abilities of various fuse styles. Strictly *all* mains fuses should be *High Rupture Capacity* (HRC) types — the ones with ceramic bodies. These fuses are designed to clear the massive peak fault currents caused by short circuits (which can lie between 500 and 10,000 amps on a single phase mains supply) without exploding or setting fire to anything. If a glass-bodied mains fuse is used in musical equipment, it's unlikely that any great alarm will be raised. However, if something does short circuit, the current surge will probably cause the fuse body to shatter, an event which leaves a myriad of glass fragments plus a layer of vaporised copper inside the fuseholder.

Contrary to popular belief, a 2 amp 20mm glass fuse, say, does not 'blow' at two amps. The minimum current excess which will reliably blow the fuse is approximately 1.85 times the fuse's normal rating, thus a 2 amp fuse can last an hour or more when passing a steady 3.7 amps. At the same time, standard glass-bodied fuses exhibit wide tolerances — another sample of the same fuse may blow in two seconds when passing the same current, and fuse blowing times can also be surprisingly dependant upon ambient temperature. This prelude offers some answers as to why fuses sometimes blow spuriously, and at other times don't blow when their rating suggests they ought to. At the same time it underscores the dangerous sophistry of 'commonsense' action such as doubling the fuse value when nuisance blowing is experienced. Yet another reason for a sudden dearth of fuse problems is a lowering of the mains supply impedance. The wiring in a domestic house, particularly if it dates from the 30s or 40s, can have a relatively high impedance, which limits the inrush current to amplifiers when

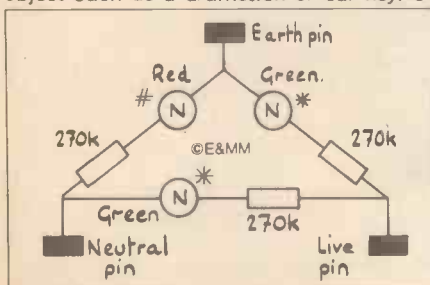


Figure 2. A simple mains wiring fault indicator.  
\*Asterisked neons are normally lit.  
#Red neon lights to indicate an earth fault.

they're initially switched on. If your house is then rewired or you use your amplifier in a public venue with chunky mains cables, the impedance of the mains supply can be low enough to double the inrush current you previously experienced — and a fuse value that previously gave no problems may then blow capriciously.

Fuses can also fail quite randomly as a result of metal fatigue brought on by long term thermal-cycling stresses (e.g. the alternate heating and cooling inside a valve guitar amplifier), or by vibration. Naturally, low capacity, quick-blow types are most prone, and if the fuse is in a hard-to-reach-in-a-panic-situation, it may be worthwhile replacing it as a matter of course with an anti-surge fuse of equivalent rating; the 'spring' inside these fuses tends to absorb shocks and retard metal fatigue.

The most satisfactory answer to all these problems is to adopt an empirical approach, testing a series of marginally greater fuse values until a compromise between reliability and the retention of effective protection is attained. To complete this discussion, readers who aren't *au fait* with the less esoteric aspects of fusing the mains such as the difference between 'quick blow' and 'anti-surge' fuses will find Robert Penfold's article useful ('Fuses', E&MM December '81).

### Foreign Policy

Last of all, a brief look at some of the hazards brought on by using foreign equipment designed for 110-120 volt mains. Sometimes, such gear is adopted, by a change of mains transformer, for export to

the U.K. and Europe, in which case it will operate from 220-240 volt mains, but won't necessarily meet U.K. safety standards. At the same time, there are many items of sound equipment residing in the U.K. which don't even boast a 220-240 volt transformer tapping. Ironically, this unmodified 110 volt equipment, operated via an external isolating transformer tends to be less hazardous, principally because the mains hardware (switches, filter capacitors, fuses and connectors) sees the relatively low voltages it was designed to suit. Unfortunately, 110 volt equipment is often powered via cheaper auto-transformers, which don't offer the same degree of protection and isolation as a transformer with a wholly separate 110 volt secondary. In this case, and whenever 110 volt equipment is modified to accept 240 volt mains, it's sensible to carefully check all the mains hardware, ruthlessly exchanging switches, fuseholders etc. for U.K./European approved versions if there's any doubt. When carrying out modifications, look out for the mains switch. In 110 volt equipment their rating will usually be 350 volt or 500 volt DC, which may seem adequate on 240 volt mains, but isn't safe in practice. Replace these with 1000 volt DC or 240 AC capacitors. Either type should be designed especially for direct connection across the mains.

Next, a new 3 core cable and mains input connector (where required) should be fitted, and one or more firm earth connection made to the chassis; remember to leave the earth wire a little slacker than the other conductors, so that if the cable is strained, the earth connection will be the last to part company!

Then check earth continuity between the equipment chassis and all exposed metal-work, and make subsidiary earth connections where this seems wise. Also check the mains circuitry very carefully, looking for evidence of the bizarre and potentially very nasty American-style bonded earth system. This is normally manifest as a 'ground' switch, which connected the (unearthed) chassis to either the neutral or live side of the 110 volt mains. Remove and joyously destroy the capacitor and all vestiges of the 'ground switch' wiring. This circuitry serves no practical purpose whatsoever except to maim and kill musicians. Finally, check that the mains switch (if a single pole type) and the fuseholder are wired in series with the live conductor.

As implied, 110 volt gear operated at its native potential isn't entirely obnoxious. One of its greatest attributes is the intrinsic safety that can be gleaned by powering it from a 110 volt transformer with an earthed centre-tap. With this arrangement, both sides of the supply become live (relative to earth), but at the same time, they're only at 55 volts (110 volt/2), a potential which is a little more dangerous than a couple of pairs of 12 volt car batteries as used in some outdoor public address systems. So gear set up for 110 volts running from a 55-0-55 volt supply can be expedient when music has to be played in damp conditions (e.g. waterlogged festivals), where nuisance tripping renders 30mA ELCBs useless. Hefty centre-tapped 110 volt transformers are readily available from plant hire contractors.

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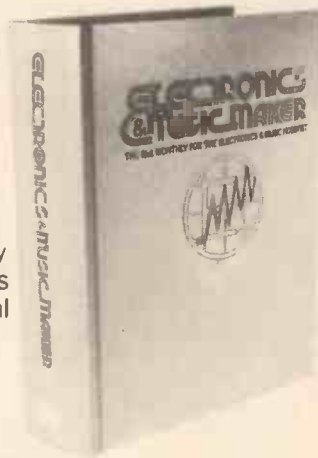
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## The Silent Hours

by Rikki Sylvan  
Kaleidoscope KRL 85198

**H**eralded by the record publicity as typifying '... the advanced synthesised new English approach coupled with considerable songwriting talent and musical ability', this album contains influences from many areas.

Rikki Sylvan has been involved in electronic and avant-garde music for many years and studied Indian music for two years before becoming a tape operator at CBS studios. An attempt to inject electronic music into the punk scene failed (pity!) although an album was recorded at the time. The Silent Hours is his latest project.

The album is in the electronic/New Wave mould (is there such a category?) but the roots seem to spring from rock, due in main to the excellent drumming by Charlie Charles which is superbly mixed. Coupled with good bass, bass synth and rhythm and lead guitar, the line-up tends towards a rock sound. The synthesisers fill in bursts of polyphonic chords and lighter sequenced riffs so although they play an important part in the music, the album is not primarily one of electro-music.

The vocals are reminiscent at times of John Foxx and although the lyrics are usually more comprehensible, some of them border on the trite: "See me on the Silver screen, Change channels I can't be seen; I'm

# RECORD REVIEWS

a 2D product for the TV age, I've got no soul but I'm all the rage." (From I am a Video.) The more subtle lyrics on, for example, Black Needles, Softcore and The Thin White Line seem better suited to this type of music.

The songs themselves are all interesting; some have more immediate appeal than others. What's That Sound? was released as a single in July but doesn't seem to have taken off. Perhaps some of the other tracks, such as Billy or Cigarette would be more suited to the singles market.

The introduction to Underground features Sylvan on sitar (those two years weren't wasted at all) but this fades into his more usual format when the vocals start and the sitar is relegated to odd fills in the background. This merges into Into the Void, the only instrumental on the album, which has an oriental feel as he plays about the pentatonic scale and it closes the album with heavy notes.

Side one only lasts 16½ minutes which seems rather short (side two is 20 minutes) by today's standards and another couple of songs would not have made the album over long.

The Silent Hours appears to be an attempt by Rikki Sylvan at commerciality and if it manages to slot somewhere between Gary Numan and Ultravox it could well make its mark. Publicity, media exposure, possibly tours could help Sylvan become a name, especially if a single takes off. He seems to be a prolific writer and if he continues writing he will undoubtedly turn out at least one hit.

The album is excellently produced by Eugene Moule who also played organ and did the backing vocals. It will be interesting to see how Sylvan develops and where he goes from here.

Ian Waugh

## As You Like It

Mark Shakespeare  
Electro-Voice Sales Ltd EVP R107

**T**he twelve tracks on this disc cover a wide range of styles and types of music played on the Wersi Helios W2T organ by concert organist Mark Shakespeare.

The record has been produced by Electro-Voice in their studio and thus could constitute a demonstration record. If so, the artist fulfills his requirements admirably in using the gamut of the Helios organ's facilities.

More important than the instrument itself is the sheer ability of the performer, who presents the listener with faultless technique and appropriate and sensitive registrations. Even if the reader is only mildly interested in the Helios, this disc is recommended to anyone wishing to progress at the keyboard. Just listen to the timbres he chooses and attempt to unravel his settings and arrangements mentally.

Mark was an infant prodigy — and is now a teenage prodigy! Before he could walk he was playing recognisable nursery rhymes on the piano with both hands. Having started formal piano training aged seven, he turned to the organ when he was eleven. He was playing regularly at the Tower, Blackpool by the age of fourteen. Since joining Electro-Voice, he has spent most of his time on tour.

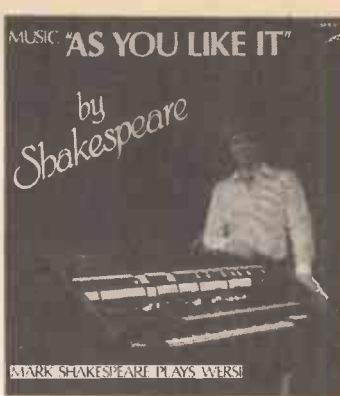
As the electronic organ has become progressively orchestral, so the organist/arranger has added a different type of music to his repertoire. This disc contains widely differing treatments — from 'organ tone' numbers to those that might well have

been played by a concert orchestra.

'Toca Toca' and 'Bermuda Triangle' are lively sambas, in organ tone for the most part, with flute, banjo and Waa thrown in for good measure. 'I was a fool to let you go' uses the Wersi Piano Star, the rest of the disc being solely the sound of the Helios. I found this track very satisfying, with its electric piano, trombone and superb bass line. For some of the slower numbers, Mark has used a breathy 'John Galway' flute, piano, harp and string chorus backing. 'Hoe Down', a Country Style track, contains two lively numbers with a pickin' banjo, fiddle, barroom piano and trombone that wobbles from one stereo channel to the other among the line-up.

In places I am sure double-recording has been used as not even Mark can manage what is heard, using only two hands and feet. 'Two organs' converse with each other across the stereo system — in a style reminiscent of Klaus Wunderlich: perhaps the German jazz organ style is showing through?

This interesting record (or a cassette tape) is available for £4.33 (inclusive) from Electro-Voice, Freeport, Rickmansworth, Herts RD3 6PF. Ken Lenton-Smith



## Five Miles Out

Mike Oldfield  
Virgin V2222

**A**nother album from the multi-talented, multi-instrumentalist, Mike Oldfield, who seems always to be chasing the elusive success of Tubular Bells.

Mike has certainly developed his own compositional style, with favourite chord progressions and (his trademark) almost medieval/baroque instrumental sounds and rhythms. While Tubular Bells was certainly before its time we have now had several years to grow accustomed to the Mike Oldfield style and as he has rarely written anything approaching the inventiveness of Tubular Bells, his other albums seem to lack that spark which made Tubular Bells innovative

and exciting. Five Miles Out is, perhaps, one of his better albums. Oldfield fans will love it and, as it seems to get back to the basic Oldfield lyricism, it could well attract new listeners.

Side 1 is a track called 'Taurus II' 24 mins 49 secs long, which runs the Oldfieldsian gamut of rhythm, tempo and melodic changes.

Side 2 has four tracks. The first one, 'Family Man' is slightly reminiscent of Modern Girl, Maggie Reilly on vocals adding to the Sheena Easton effect.

'Orabido' begins with a 'music box' tune of reflective nature before breaking into thin vocoded vocals over a drum kit playing eighths. This is then given the Oldfield 'compositional treatment' and emerges into 'normal' vocals by Maggie with a guitar as backing.

'Mount Teide' is another instrumental with less heavily accented rhythms than usual. Mike in reflective mood for 4 mins 10 secs although tasteful drums come in towards the end to close the tune.

All the vocals on 'Five Miles Out', the last track, are severely treated and the song contains a multitude of instrument sounds which chop from one to the other; immediately disconcerting but actually well handled. This is Mike Oldfield in single form.

A balanced album, totally Oldfield, and very interesting to listen to.

## Repeat Repeat

Peter Baumann  
Virgin V2214

**P**eter Baumann was formerly a member of Tangerine Dream, although since joining them in 1971, he has left several times, in order to concentrate on his two previous solo efforts. Both these albums had wide critical acclaim but did not establish him as a solo artist. This new album should, however, correct that, as it is a marked departure from his previous works 'Romance 76' and the excellent 'Transharmonic Nights'. 'Repeat Repeat' was recorded in several studios, the most notable being Compass Point at Nassau in the Bahamas, where the likes of Tom Tom Club, and Robert Palmer have recently recorded successful albums.

The album is, in fact, produced by Robert Palmer, and is extremely well produced and highly danceable. This is particularly true of both the current single, 'Repeat Repeat', and the reggae-ish 'Kinky Dinky'.

Peter Baumann's vocals range from a similarity to Lou Reed on the track 'Home Sweet Home', to a definite Kraftwerk feel on 'Decadance'. Possibly the one weakness of the otherwise fine album are the banality of the lyrics. For example the title track consists of repeated phrases of very little substance i.e. "We have heard this song before Didn't we — Didn't we". Hardly memorable but, nevertheless, the production and strength of the 'hooks' make up for this inadequacy to some



degree. The musicianship is particularly noteworthy and some credit for this must go to the good choice of participants in particular John Tropea (guitar) and Mike Dawe (drums). Stand out tracks include 'M.A.N. Series Two', featuring one Carsten Bohn on drums, to quote the lyric, "A new generation a great mutation, All expectations have been exceeded". Quite!

'Daytime Logic' is written by Carsten Bohn and is also somewhat better than the other tracks. Maybe Peter Baumann should work with Carsten Bohn more often. Perhaps the next album will continue to explore the avenues opened up by this album! If you liked the recent Kraftwerk album I suggest that you give this a spin. Short catchy melodies are its strong point, and it is well produced. Repeat Repeat, strong catchy melodies...  
Derek Pierce



# ELECTRIC DRUMMER

Part 5



Peter Kershaw B.Sc

The final part of E&MM's advanced microprocessor design

- ★ Real time and step by step programming
- ★ 'Spread' and 'Condense' editing facilities
- ★ 10 instrument sounds and external trigger outputs
- ★ Rhythm chaining for the programming of complete pieces
- ★ Tape storage facilities
- ★ Expandable
- ★ Battery back-up for memory option



E&MM's series of Electric Drummer articles have introduced and incorporated the latest state-of-the-art technology into electronic drum design — and by following the guidelines and ideas in the series, experienced constructors will be able to make use of and adapt this knowledge to produce one of the most up-to-date and versatile drum machines available.

In this, the final part of the series, we give a concise example of programming rhythms,

details of the front panel layout and a circuit for battery back-up.

Constructors may find it helpful to refer to past articles (issues November '81, and January, February and April '82) and an understanding of the use of microprocessors is also essential. E&MM's 'Using Microprocessors' series is recommended, in particular the articles leading up to the Electric Drummer's MPC board in the November '81 edition.

Many people have asked how the Electric Drummer can be used to help the electro-musician. To illustrate this, there follows a description of a typical programming session.

## Powering Up

When the Electric Drummer is powered up its four-digit display shows the number of free beats available. This will be half the number of bytes of RAM less some work space for the processor. For the full 4K allowed for on the MPC board it is more than 1,900 beats.

## Selecting the Rhythm

Press the RHYTHM SELECT key. The display shows 0.0 00. The decimal point in the rhythm field indicates that a rhythm number is required. Using the keys 1-9 and 10 (which=0) enter a number between 1 and 24. If you enter a number outside the permitted range, EE is displayed to indicate an error. Otherwise if, say, rhythm 12 was selected, the display would show 12 01 and the status of the first beat of rhythm 12 would show on the LEDs. As this is a new rhythm however, all the LEDs will be off.

## Editing

First let us program in a rhythm in editing mode. Let us say that we want to program in the following rhythm:

Beat No.	1	2	3	4	5	6	7	8
Low TomTom	X		X		X	X	X	X
Snare			X				X	
Accent	X							

Initially the display shows beat no. 1 and all the LEDs are off. Pressing any of the trigger keys (1-15 and Accent) will turn the LED on indicating that when the rhythm is played, that instrument will sound on beat 1.

Pressing the same key again will turn the instrument off. So, for beat 1 we press Low TomTom and Accent. Then we move on to beat 3 by pressing '+' twice.

Note that at any point we can go back and re-edit beat 1 by pressing the '-' key. We can also jump to any beat by pressing BEAT SELECT followed by the 2-digit beat number.

When we have programmed beat 8 we press END to tell the Electric Drummer that this is the last beat in the rhythm. If '+' is pressed again beat 1 will be displayed.

## Trying it Out

To listen to the rhythm simply press RUN/STOP. You may adjust the tempo with the control on the front panel. Each time beat 1 comes around the DOWNBEAT lamp will flash. The beat counter and LEDs continuously show the beats as they are played. The rhythm plays repeatedly until RUN/STOP is pressed again. As it is playing, you may 'ad lib' using the trigger keys to try out additions to the rhythm.

## A Change of Resolution

Suppose we now decide that we wish to add a snare drum beat between beats 6 and 7. Pressing SPREAD/CONDENSE then '+2' will double the number of beats see Table 1

Note that so that we can edit the rhythm the beat numbers have been changed. However, the pointers in the Electric Drummer continue to point to the same beat.

Beat No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Low TomTom	X				X				X		X		X		X	
Snare						X							X			
Accent	X															

Table 1.

Thus, if we were examining beat 6, after the SPREAD function we will be looking at beat 11. We can now step to beat 12 and add the snare. Should we later wish to return to the original SPREAD rhythm, we can condense by pressing SPREAD/CONDENSE then '-2'. Similarly, we could have added 2 beats instead of one by pressing SPREAD '+3'.

## Realttime Programming

Many drummers prefer to program 'live' without bothering to write the rhythm down. This can be done using the Auto Program keys. We will program the same rhythm as we did in the first example before Spreading.

The rhythm is in 4/4 time and is resolved to the nearest eighth-note. To set the resolution, hold down the RESOLUTION key whilst pressing '+' until the display shows 08. (You can also resolve to a 16th, 32nd, 64th or triplets of these.) To set the bar length, go to beat 8 and press END. Now we are ready to program. Press AUTO PROGRAM. The rhythm now cycles continuously as it does when playing, but the block sound generator taps out a constant metronome. If you wanted, say, the hi-hat as metronome, you could press BLOCK then HI-HAT. After adjusting the metronome to a comfortable speed you can tap out the rhythm using the trigger keys. As you press them you will hear them added to the rhythm. It is not necessary to play accurately as the Electric



Drummer will automatically resolve to the nearest eighth-note.

If you make a mistake on programming an instrument, you can simply remove the instrument from the rhythm by pressing CLEAR and the trigger key. At any time you can stop programming by pressing 1/STOP then edit beat by beat as before.

When you have programmed enough instruments, to remove the metronome, do so by pressing CLEAR then BLOCK.

### Sequences

If we want to play the backing for a whole song we can set up a sequence of rhythms required for that song. Suppose we have programmed in rhythms 7, 8 and 9 and that they occur in the following sequence: 7, 7, 7, 8, 7, 7, 9. First press SEQUENCE SELECT then 1 for sequence 1. The Electric Drummer is now waiting for you to enter rhythm numbers followed by the number of times they are repeated. This rhythm is programmed by entering:

07 03 ENTER 08 01 ENTER  
07 03 ENTER 09 01 ENTER END

A further option is invoked by entering a repeat number 00. This causes the rhythm to play until the CHANGE key is pressed. The sequence then continues at the end of the rhythm. This is useful for 'jamming' sessions where the number of repeats is unknown.

We can edit sequences using INSERT/DELETE. Following the key by '+' adds an entry to the sequence and following it by '-' deletes an entry.

### The Triggers

Most of the triggers simply go to the trigger inputs of the sound generator board and therefore trigger the instruments programmed. ACCENT adds an accent to all the instruments. HI-HAT OPEN/CLOSED operates differently from the other triggers. It functions like the footpedal on a Hi-hat, so the Hi-hat may sound open (like a crash cymbal), closed (a short tap) or it may be closed at any time after striking.

Triggers 11 to 15 can be used to trigger other drum sounds such as the Synton or to control synthesisers. Particularly interesting effects can be obtained by passing the Electric Drummer audio output through filters, flangers, etc. which are themselves controlled from the trigger outputs. In addition, the downbeat output can be used to synchronise other equipment.

### Tape Storage

The contents of the Electric Drummer's memory may be saved on cassette using the TAPE STORE and LOAD keys.

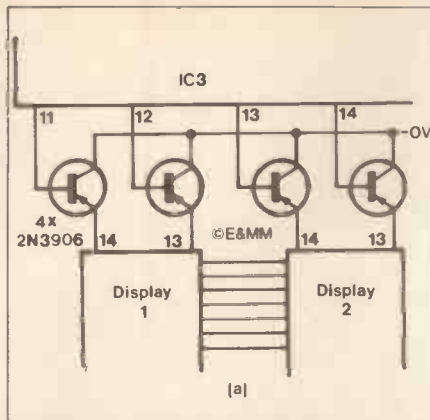


Figure 1a. Changes to CCT Control Board.

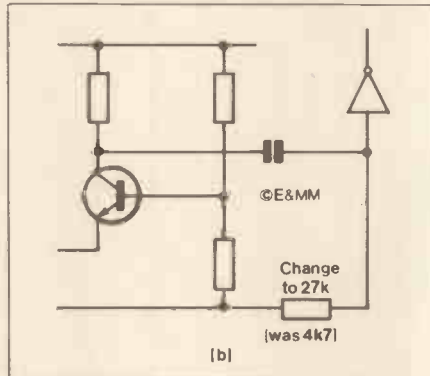


Figure 1b. Changes to CCT Control Board.

### Memory

When powered up, the Electric Drummer determines the amount of memory available. You should install the full 4K of RAM on the MPC board for maximum storage capacity. If more RAM is made available the software will use this too. The current issue of the MPC board does not support battery backup but more experienced constructors may wish to add the modification shown in Figure 3.

Since the publication of the Electric Drummer circuit in January some changes have been found to be desirable, as shown in Figure 1.

When the 74C917 is used to drive displays directly, the contrast is very poor. This can be corrected by the addition of four PNP transistors as shown in Figure 1a. The cassette interface requires a very high input level to operate correctly. This may be improved by changing the 4k7 resistor to 27k (Figure 1b).

The prototype was constructed in a large Verocase as can be seen from the photographs. This has ample space for all the PCBs and power supplies. The 7805KG voltage regulator may be mounted on a heatsink inside the case; the heatsink's resistance should be 4.5° C/Watt or less. Figure 2 shows the front panel layout with drilling centres.

The amount of RAM installed is optional. During the initialization, the program determines the highest available RAM address. The EPROMs for the electric drummer are

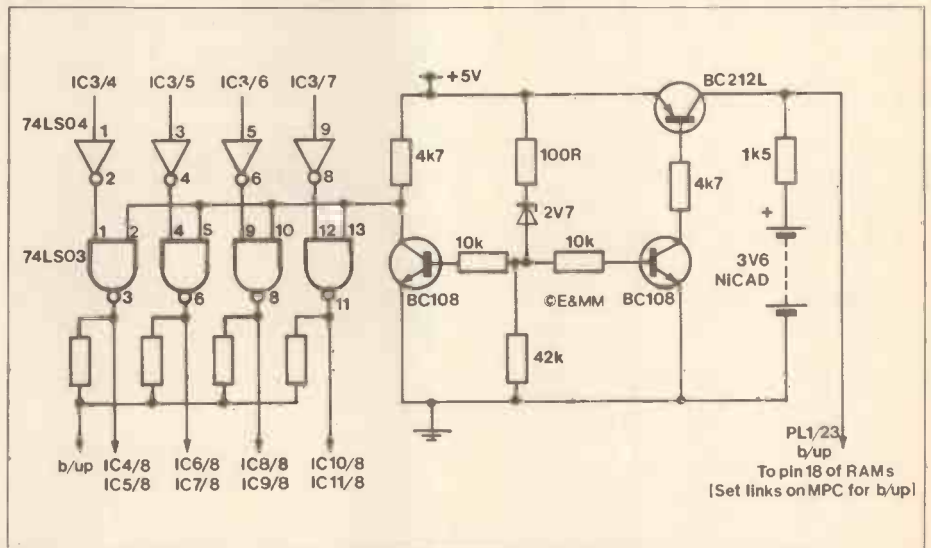


Figure 3. Battery backup modifications. RAMs should be CMOS 4114 compatible (5114 or uPD444 etc.).

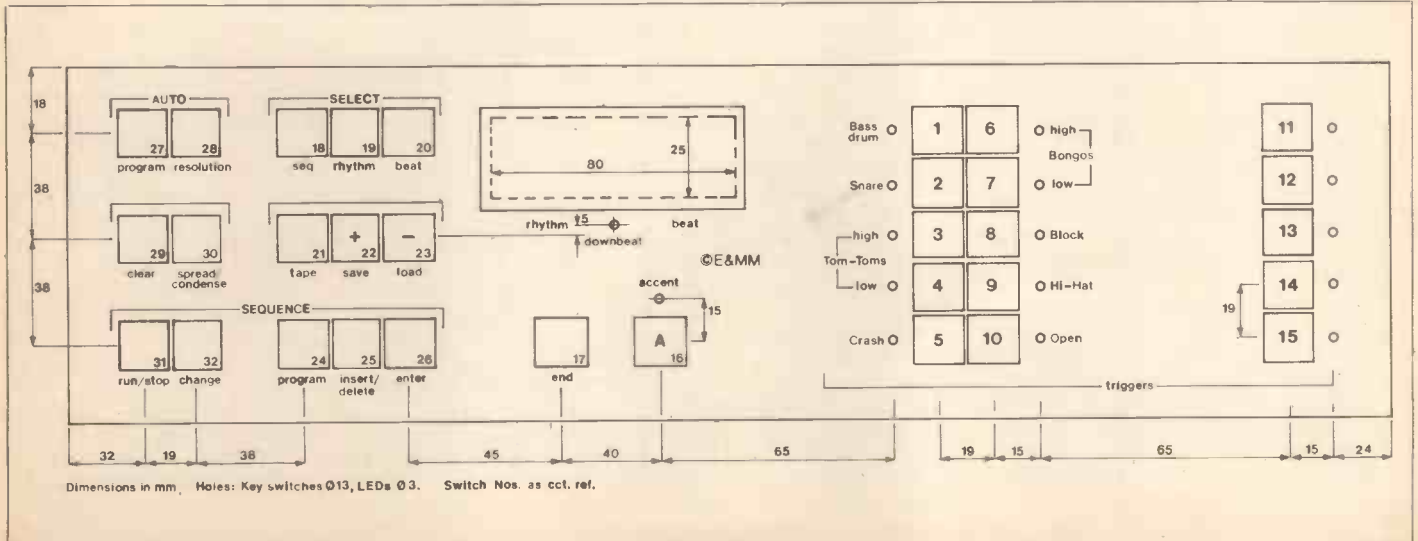


Figure 2. Front Panel layout.

## Electric Drummer

available from Cactus Consultants, 10, Upcroft Avenue, Edgware, Middlesex at a cost of £10.50 each including documentation. If demand is sufficient a complete kit of parts may be made available, including a single circuit board on which all lamps, switches and sockets can be mounted.

The transistor outlines on the Maplin sound generator board (GA60Q) refer to devices with T092 leadouts; the BC179 transistors specified in part 3 of the series have a none-too-convenient T018 leadout configuration, and are therefore best substituted for BC212Ls for ease of assembly.

The output/mix amp shown in the sound generator circuit diagram is doubled up for stereo operation on the Maplin PCB. Therefore, the parts list should be amended, two of each of the following being required: R70, 71, 672, C31, C32 and RV10. The latter could be a dual gang pot. The pads marked 'R110' are not used. Also note that the mix resistors (R61 to R69) can be assigned via two mix buses to one or other of the IC 11s (viz. IC 11L and IC 11R); alternatively, a pair of identical mix resistors may be used to pan the output of one or more of the percussion generators to both outputs.

The unmarked pads on the Maplin sound generator PCB around IC12 are provided to allow alternative programming of the chip: refer to page 236 in the Maplin catalogue or consult the manufacturer's data. As this option will involve a degree of experimentation, we recommend that you mount R74-79 on Veropins to avoid fouling the PCB, at least until final values have been established.

On the Maplin MPC board, IC14 is 74LS124. Also, note that in the MPC text (Nov '81), the reference to IC17 should read IC14.

## Sound Generator

Many long hours have been spent by the electronics team at E&MM improving this basic percussion board. From the outset, it was not intended to be the ultimate in drum sounds - an impossible task without considering complex cymbal circuits and sampled sounds (as in the Linn instruments). Nevertheless, it does provide the features necessary for creating a good range of drum kit sounds. These include Woodblock, Bass Drum, Low tom-tom, Hi tom-tom, Low Bongo, High Bongo, Side Drum, Cymbal and Hi-Hat. The latter can be set by a TTL pulse on/off for open/closed effect. All the sounds have a common 'Accent' control.

Since we have had many requests from readers to make provision for this board to operate from any micro with output port(s), the input trigger stages have been suitably modified to accommodate positive or negative (+15V max.) pulses. The Electric Drummer control circuits send negative pulses to the board, but for 'external' micro users it is more practical to deal with positive pulses i.e. a '1' on a port line. This means that instruments can be specified by 11 port lines (thus two 8-bit output ports are required for full operation). The unit has worked perfectly well with the ZX81 interface published in E&MM for the EDP instruments, and also with standard ports on other micros, including the Sharp MZ-80K.

A program for an external micro simply outputs the correct codes to the port lines for each event. So a possible wiring plan of these lines could be: Port 1, output code 1=accent, 2=hi-hat open, 4=hi-hat, 8=Bass Drum, 16=Side Drum, 32=Cymbal, 64=Hi tom-tom, 128=Low tom-tom. Port 2, output code 1=High Bongo, 2=Low Bongo, 4=Woodblock. This allocation puts the main drum kit on one port only for users with single port micros.

## SOUND GENERATOR BOARD PARTS LIST

Complete list with revisions for stereo output.

Note: The following have been deleted:

R7-10,17-20,  
27-30,110

Resistors - 1/2W 5% carbon unless

otherwise specified

Resistor	Value	Quantity	Maplin Code
R1	120k		(M120K)
R2	39k		(M39K)
R3,4,13,14, 16,23,24, 40,109	470k	9 off	(M470K)
R5,15,25	6k8	3 off	(M6K8)
R6	1M0		(M1M0)
R11,64-69	100k	7 off	(M100K)
R12	27k		(M27K)
R21,75	68k	2 off	(M68K)
R22,32,37,42, 47,52,57	22k	7 off	(M22K)
R26,74,79	10k	3 off	(M10K)
R31,36,41,46, 51,56,80, 85,90,95, 97,99,101, 103,105, 107	33k	16 off	(M33K)
R33,38,43,48, 53,58,82, 87,92	330k	9 off	(M330K)
R34,39,54	1k	3 off	(M1K0)
R35	680k		(M680K)
R44,49	120R	2 off	(M120R)
R45,50	10M	2 off	(M10M)
R55	2M2		(M2M2)
R59,71,72	100R	3 off	(M100R)
R60	510k 1/2W		(S510K)
R61-63,70,76	47k	5 off	(M47K)
R73	470R		(M470R)
R77,78	2k7	2 off	(M2K7)
R81,86,91,96, 98,100,102, 104,106, 108	15k	10 off	(M15K)
R83,88,93	4k7	3 off	(M4K7)
R84,89,94	180R	3 off	(M180R)
RV1-9	100k	9 off	(WR61R)

Capacitor	Value	Quantity	Code
C1,5,9	68n carbonate	3 off	(WW39N)
C2	1uF 35V tantalum		(WW60Q)
C4,35,38,41	680p ceramic	4 off	(WW66W)
C6,15,18,33	100n carbonate	4 off	(WW41U)
C8	1n ceramic		(WX68Y)
C10,34,37,40	470n carbonate	3 off	(WW49D)
C12	47n polyester		(BX74R)
C13,16,21,24, 25,28,29, 31,32	10n carbonate	9 off	(WW29G)
C14,17	22n carbonate	2 off	(WW33L)
C19,22,23,26	27n carbonate	4 off	(WW34M)
C20	56n carbonate		(WW38R)
C27	220n carbonate		(WW45Y)
C30	47n carbonate		(WW37S)
C36,39,42	10uF 35V PC electrolytic	3 off	(FF04E)

Note: The following have been deleted:  
C3,7,11

Semiconductors	Value	Quantity	Code
IC1,2,3	4071	3 off	(QW43W)
IC4	4016		(QX08J)
IC5-11	741c	7 off	(QL22Y)
IC12	SN76477		(YH32Y)
IC13-15	MC3340	3 off	(QH49D)
TR1,3,5,9, 12,15	BC214L	6 off	(QB62S)
TR7	2N3704		(QR28F)
TR8,10,11,13, 14,16,23	BC184L	13 off	(QB57M)
D1,3,5,7-12, 14,15	1N4148	11 off	(QL80B)
D13	BZY88C5V6		(QH08J)

Note: The following have been deleted:

TR2,4,6; D4,6

Miscellaneous

8 pin DIL skts

14 pin DIL skts

28 pin DIL skt

PCB

11 off (BL17T)

3 off (BL18U)

(BL21X)

(GA60Q)



An early prototype offering contact pads as well as programming.

A typical rhythm sequence might start off: Accent/Bass Drum, rest, Hi-hat closed, rest, accent/Side Drum/Hi-hat closed, rest, Hi-hat open etc. = 9, 0, 4, 0, 21, 0, 6 etc. The tempo can be set by the program using a 'FOR NEXT' LOOP containing a further 'FOR NEXT' that sets the delay period between events. Alternatively, a single line of a port can be used to input a clock tempo pulse as an interrupt from an external LFO (e.g. Synclock, Universal Trigger set to 'Micro'). The latter method is preferable as it allows the clock pulse to be used elsewhere for synchronising sequences and modulation effects in your studio.

The sounds are fed to two output pre-amp stages for stereo operation. Situated at the far right of the Generator Board is a group of resistors. These resistor values are chosen by the user to set the position of each instrument in the stereo field. They are R63, 61, 62, 67, 66, 65, 64, 68 and 69 in the parts list. It is very easy for you to decide the layout of your drum kit for yourself. Simply use preferred resistor values that add to 100k approximately for R64-69, and to 47k for R61-63 inclusive. A typical layout might be (from left to right): Hi-Hat, Side Drum, High-Bongo, Woodblock, Bass Drum (centre), Low bongo, Hi tom-tom, Low tom-tom and Cym-

bal. The two resistor values for each of these positions would be:

L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>
not used/100k	22k/82k	33k/68k
L <sub>4</sub>	C	R <sub>4</sub>
33k/56k	47k/47k	56k/33k
R <sub>3</sub>	R <sub>2</sub>	R <sub>1</sub>
33k/22k	33k/15k	47k/not used

An added bonus is the use of the SN76477N device, which has veropins located at relevant control pins on the IC for the constructor to experiment with. In the circuit described, only the white noise source is in use and the possibility of creating whistles, pitched sounds, helicopter, sea, trains, planes and other effects is available by making the appropriate pin links. (The Maplin catalogue gives full information on this device.)

Final sound balance is done via the presets on the board, although musicians may like to use pots on the control panel instead. It is useful too to add micro buttons at a later stage for manual triggering of each instrument (as well as automatic control) for that improvising touch! We've also tried the Kraftwerk idea of percussion plates that replace the micro buttons and complete the trigger circuit with two metal probes (see photo).

The Electric Drummer project presents the opportunity for musicians to use today's technology at low cost for maximum control in the studio or on stage. Many improvements to the design are possible, with further EPROM programs and improved percussion circuits. Meanwhile, the sounds of the Electric Drummer, like most drum synthesisers, may be considered unique to the instrument and it only remains for the musician to create his own unique rhythmic track to complement it.

E&MM

JULY 1982 E&MM



## An Interface Unit

While we are discussing interface units, it may be interesting to look at a commercially available model; this one is by Korg and called the MS-02. It may prove a viable alternative to readers requiring an interface module but not wishing to build our own project this month (Universal Trigger Interface).

For musicians wishing to play other synthesisers from one 'main' synthesiser, the MS-02 will overcome most of the problems encountered. Normally, a suitable control voltage is needed to drive the other synthesisers' VCOs and a trigger pulse is also required to switch on the EGs driving the VCFs and VCAs. This is usually quite straightforward when using two or more synths of the same make because they would use the same type of control for their range of instruments.

Among presently available synthesisers, there are two main types of control voltage systems for use with VCOs and other voltage controlled devices and also two types of trigger systems for the EGs. One of these is used by Korg (on earlier models) and Yamaha and is termed the Hertz/Volt System, where the VCO oscillator frequency is proportional to the control voltage. The other is employed by most other synthesiser manufacturers and is the Octave/Volt System, in which the oscillator frequency changes one octave for every one volt change in the control voltage. Trigger control generally works from a 'pulse to



**Korg MS-02 Synthesiser Interface.**

ground' or between specified voltage levels, the latter being harder to match in practice.

Provided your synthesisers are equipped with the conventional input and output jacks for control voltage and trigger or gate signals, you can use this interface for accurate signal processing. Facilities allow conversion from Hz/V to Oct/V and vice versa. An adding amp boosts voltages for frequency matching when used with VCOs and will take voltages from a foot-pedal, joystick or DC battery plus

potentiometer arrangement for pitch-bend and modulation effects. Two trigger matching sections are given with flashing LED indicators and an array of jack sockets internally linked into three groups allow several machines to be controlled from one voltage source.

**E&MM**

Further details of this unit can be obtained from the UK distributors: Rose-Morris & Co. Ltd., 32 Gordon House Road, London NW5. Tel: 01-267 5151.

## Top Twenty Music Video Chart

1. (—) Paul McCartney & Wings Rockshow.....EMI
2. (8) Bob Marley & The Wailers.....EMI
3. (4) Siouxsie & The Banshees.....Spectrum
4. (2) Rock Flashback — Deep Purple.....BBC/3M
5. (—) Pink Floyd — Live At Pompeii.....Spectrum
6. (6) Olivia Newton John — Physical.....EMI
7. (—) Iron Maiden.....EMI
8. (16) Adam & The Ants.....Home Video Productions
9. (18) Abba Music Show Vol. II.....Intervision
10. (1) The Best Of Blondie.....Chrysalis
11. (—) Elvis — King Of Rock'n'Roll.....World of Video 2000
12. (13) Videostars.....EMI
13. (17) Kate Bush Live At Hammersmith Odeon.....EMI
14. (15) Slipstream — Jethro Tull.....Chrysalis
15. (12) Elvis — Comeback Special.....Mountain Video
16. (7) Abba Music Show Vol. I.....Intervision
17. (10) The Kids Are Alright — The Who.....Spectrum
18. (19) E.L.O. Live In Concert.....VCL
19. (—) Rude Boy.....Videospace
20. (3) Toni Basil — Word Of Mouth.....Radialchoice

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## Top Twenty Electro-Music Records

- 1: The Concerts In China.....Jean Michel Jarre
- 2: White Eagle.....Tangerine Dream
- 3: Grand Canyon.....Isao Tomita
- 4: Meaning Of Love/Oberkon.....Depeche Mode
- 5: Technodelic.....Yellow Magic Orchestra
- 6: Dare.....The League Unlimited Orchestra
- 7: Computer World.....Kraftwerk
- 8: Audion.....Synergy/Larry Fast
- 9: Only You/Situation.....Yazoo
- 10: Trancefer.....Klaus Schulze
- 11: Magnetic Fields.....Jean Michel Jarre
- 12: Prisms.....Michael Garrison
- 13: Computer Experiments Vol. 1.....Synergy
- 14: Oxygene.....Jean Michel Jarre
- 15: Digital Dream.....Neuronium
- 16: Speak And Spell.....Depeche Mode
- 17: Silk Roads 1/2.....Kitaro
- 18: New Jerusalem.....Tim Blake
- 19: Switched-On Brandenburgs.....Wendy Carlos
- 20: Mind-Body-Spirit.....Francis Monkman

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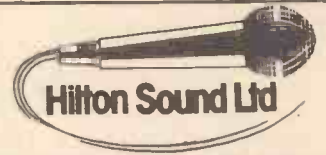
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