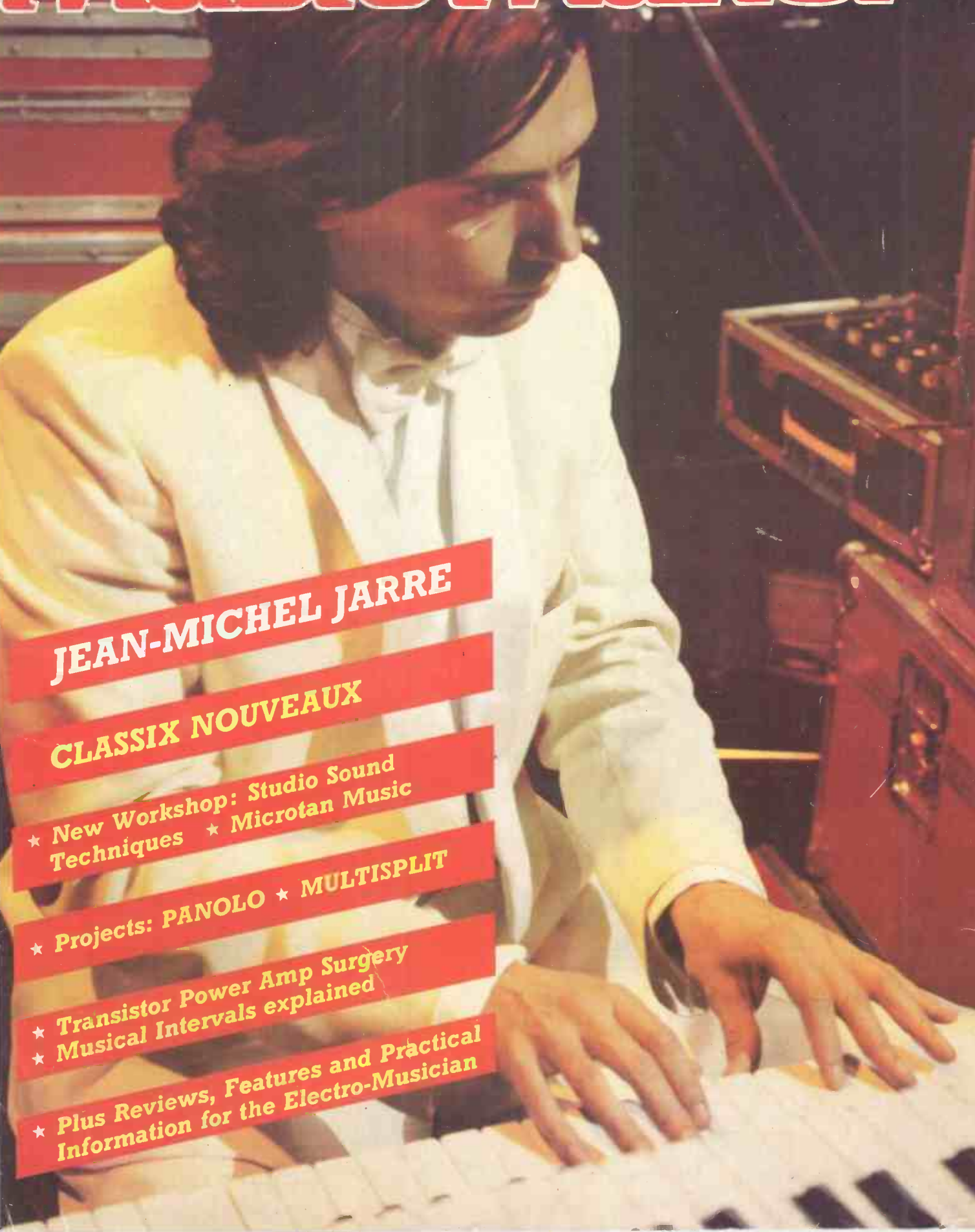


Electronics &

JUNE 1982 75p

# MUSIC Maker



**JEAN-MICHEL JARRE**

**CLASSIX NOUVEAUX**

★ New Workshop: Studio Sound Techniques ★ Microtan Music

★ Projects: PANOLO ★ MULTISPLIT

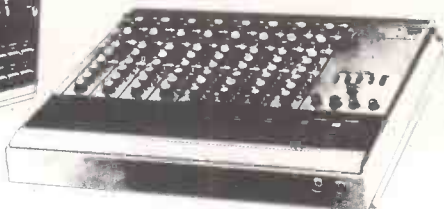
★ Transistor Power Amp Surgery  
★ Musical Intervals explained

★ Plus Reviews, Features and Practical Information for the Electro-Musician

# Fostex

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 multitracker improved the capabilities of 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-B: 8-track reel-to-reel
- A-4: 4-track reel-to-reel
- A-2: Half-track reel-to-reel
- 250: 4-track cassette multitracker
- 350: 8 into 4 into 2 mixer
- 3060: Meter bridge for above
- 3040: Add-on 'Dolby C' unit
- 3050: Digital delay (270ms)
- 3030: 2 x 10-band graphic equaliser



INCORP. SYNTHESIZER DREAMS

## THE LONDON ROCK SHOP

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

London's latest music store is packed with all the latest gear: keyboards, synthesisers, organs, acoustic/electric guitars, bass guitars, back-line equipment (amps, cabs and combos), PA gear, mixing desks and recording equipment. We specialise in the very latest, up-to-date product from the smallest to the largest manufacturers:

- |                  |                            |
|------------------|----------------------------|
| <b>KEYBOARDS</b> | <b>AMPS, CABS + COMBOS</b> |
| Roland           | Fender                     |
| Moog             | Carlsbro                   |
| Korg             | Roland                     |
| Casio            | OHM                        |
| Hohner           | Aria Loco                  |
| Yamaha           | Pignose                    |
| Wurlitzer        | Vox                        |
| Fender Rhodes    | Gallien-Krueger            |
| + secondhand     | Session                    |
|                  | Music Man                  |

We part-exchange instruments, give cash discounts, accept Barclaycard, Access and can arrange personal finance (A.P.R. 36.2%) through Forward Trust (a division of Midland Bank). 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 you are interested in 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.



## Roland

We have London's largest stocks and best display. If Roland make it then we sell it! The World's No. 1 manufacturer now has such an enormous range of product that many competitors are straining to catch up. Since we stock the complete range of Roland you can come and check everything out — the one-stop shop!

### KEYBOARDS

- Jupiter 8
- Jupiter 4
- Promars
- Juno 6 (June)
- SH-2
- SH-09
- CSQ 100/600
- Saturn-09
- RS-09

### AMPS

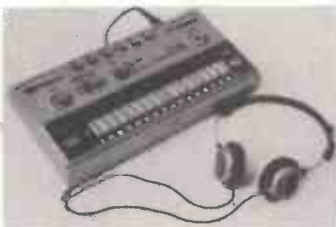
- Bolt 30/60
  - Cube 20/40
  - Cube 60/100
  - Spirit 30/50
  - Jazz Chorus 50/120/160
- RHYTHM UNITS**
- Rhythm Composer TR-808
  - CR 8000/5000
  - Drumatix TR-606
  - (Bass Line TB-303)

### PA ETC

- 16-2 Mixer
- RE-201 Space Echo
- RE-301/501/555
- Roland Rack
- Dimension D
- Boss Echo/Reverb
- Mixer/Amps PA 150/250
- Power Amps 120/240

We also specialise in the amazing Roland Guitar and Bass Synthesisers. All models, all colours are kept in stock at all times! GR 300 Guitar Synthesiser + G-202/303/505/808 GR 33B Bass Synthesiser + B-33/88 Please ring for further details or send 25p in postage stamps for fully detailed catalogue.

**ROLAND: TR-606 DRUMATIX:** The latest sensation from the chip kings! This fascinating, programmable drum unit is completely chip-controlled so that you tell it what to do and it remembers until you re-program it. Battery or mains operated with sync family to other Roland drum units or to new TB-303 bass line (available May/June). R.R.P. £199.00 inc. carrying case, Roland headphones £17 extra. Words alone cannot do justice to the incredible versatility of this sober drummer!



### GUITARS

- Fender
- Gibson
- Aria
- Hamer
- Jaydee
- Washburn
- Roland
- Kramer
- Chandler
- Yamaha
- Ibanez
- Pangbourne
- + secondhand

### BASSES

- Aria
- Fender
- Washburn
- Kramer
- Yamaha
- Jaydee
- Roland
- Pangbourne
- Ibanez
- + secondhand

### EFFECTS UNITS ETC

- Boss
- MXR
- Dod
- Yamaha
- Fostex
- Carlsbro
- Whirlwind
- Fender
- Ernie Ball
- Dean Markley
- GHS
- Martin
- Rotosound
- Superwound
- Jim Dunlop
- + much, much more



**IBANEZ MC 924**  
Musician Bass:  
3-band active eq.  
Also fretless as  
used by 'Sting'.

**CHANDLER  
CUSTOM**  
Telecaster.  
Bound body,  
Seymour Duncan  
pickups, active  
preamp.

**ROLAND G-505**  
Guitar  
Synthesiser:  
Red, blue or S/B.

**We're open seven days a week for . . . sound advice at a better price!**



**OPEN EVERY SUNDAY**  
11 a.m. to 5.30 p.m.

# Korg Mono/Poly - Unexplored possibilities



- 4 Individual Oscillators • 2 Envelope Generators • 2 Modulation Generators • Unique Sync and X-Mod Effects
- Unison, Unison/Share and Poly Modes • Chord Memory • Arpeggiator • Bend and Modulation Wheels
- Noise Generator • Portamento • De-tune Control • Auto Damp • Extensive Inputs and Outputs.

# Korg Polysix - Infinite capabilities



- 6 Voices plus Sub Oscillator Control • 32 Programmes • Tape Interface • Programmable Modulation and Effects (Chorus, Phase and Ensemble)
- Unison Mode for Monophonic Playing • Arpeggiator and Chord Memory • Bend and Modulation Wheels.

# The choice is KORG!

Each of the four oscillators on the Korg Mono/Poly has individual controls for the layering of complex harmonic structures. Advanced microcomputer control of the oscillators enables a choice between fat monophonic sounds or two modes of polyphonic playing. Designed for ease of use as well as powerful sound the Korg Mono/Poly offers a comprehensive and stunning effects section and creativity unmatched by any other instrument.

The new Korg Polysix is a programmable 6 voice polyphonic instrument, featuring a 32 programme memory which can be interfaced with any cassette deck to store and reload further memory programmes in seconds. A complete performer's instrument, it has programmable modulation and effects, unison mode for monophonic use, and an arpeggiator and new chord memory.

**KORG** inspires your creativity.

Dear Rose-Morris, please send me details of the Korg Mono/Poly and Polysix and of my nearest Korg Key Centre.



Name \_\_\_\_\_  
Address \_\_\_\_\_

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

E&MM/6/82



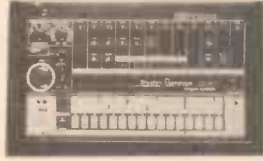
# FUTURE MUSIC

# ROLAND

10 Baddow Road,  
Chelmsford, Essex.  
Tel: 352490

**Complete Range In Stock!  
Unprintable Prices!  
Phone for a Quote  
Now!**

The complete range of Roland Keyboards and Synths. Jazz Chorus, Bolt, Cube and Spirit Amps.



Rhythm Composer TR 808



CompuRhythm CR 5000



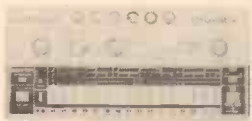
CompuRhythm CR 8000



Spirit Bass 30



Cube 40k and 60k



Drumatrix TR 606



Piano Plus HP 70 Piano Plus EP 11



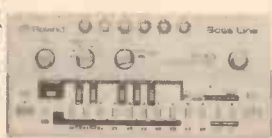
Bass 50



MicroComposer MC4 A and MC4 B Polysequencer



New!! Juno 6 Polysynth



Computer Bass Line TB 303

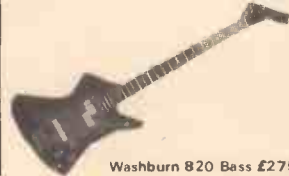
G 202 Guitar/Synth Controller



Washburn Raven £114



Washburn 820 Bass £275



Washburn A20 Stage Guitar £225



AMPLIFICATION



Full Range of this Terrific Value for money Amplification now in stock!!



## Fostex PERSONAL MULTITRACK



A8

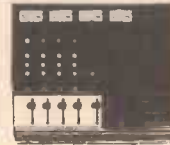
£1175

A4

£735

A2

£435



250

£615



350

£395



3040

2050

3050



PROPHET 5 R.R.P. £3333 F.M. £2995



PROPHET 10

R.R.P. £6265

F.M. £5345



Pro-One R.R.P. £556

F.M. £450



Poly Sequencer R.R.P. £935

F.M. £795

## SEQUENTIAL CIRCUITS INC

Future Music now has these fabulous American synthesizers in stock!



Turbo Drums Now Available

### PEARL MAIN AGENT

Innovation	£650
Export	£375
Sound Venture	£699
Rock Kit	£540
Contemporary I	£780
Contemporary II	£750

### MAXWIN

Funky 405	£280
Maxwin 0722	£485
Supermaxwin	£345
Maxwin 5-piece kits from	£330
Maxwin 805	£364
Maxwin 805 with extra floor tom!	only £375

### GRETSCH

24" 5 Drum	£595
------------	------

### HOSHINO

22" 5 Drum Sunburst, with Stands	£395
----------------------------------	------

### SNARE DRUMS

Hayman Clear/Blue	£35
6 1/2" Ludwig 402	£105
Maxwin 2214 Wood	£27
5" Rogers Dynasonic	£85
6 1/2" Rogers Dynasonic	£115
Ludwig 400	£85

**LARGEST DRUMSTORE IN SOUTH EAST ANGLIA!**  
50 kits in stock, and a fantastic selection of Sticks, Heads, Cymbals, Latin Percussion and Cases

### SECOND HAND BARGAINS!

Premier Resonator 4 Drum	£295
Sonor 6 Drum	£495
Rogers 5 Drum	£350
Staccato 8", 10", 12" Toms	£125



now available

### Fast Mail Order.

Good P/X.

No Deposit H.P.

Hire/Buy Scheme.

Barclay Card.

American Express

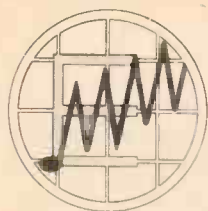
Access.

PLEASE SEND ME THE NEW 1982 FUTURE MUSIC CATALOGUE.

NAME .....

ADDRESS .....

ENCLOSE S.A.E.



# Electronics & Music Maker

VOLUME 2 Number 4  
June 1982

## Editorial & Production

**Editor** Mike Beecher  
**Art Editor** Peter Blackmore  
**Assistant Editors**  
**Music Editor** Ian Waugh  
**Technical Editor** Ben Duncan  
**Editorial Secretary** Holly Baker  
**Editorial Assistant** Toni Markwick  
**Technical Artist** John Dudley  
**Administration** Wendy Guy  
**Photography** Ian James  
**Music Preparation** Chris Francis

## Consultants

**Keyboard** Rick Wakeman  
**Electro-Music** David Ellis  
**Guitar** Peter Maydew  
**Percussion** Warren Cann  
**Organ** Ken Lenton-Smith  
**Stage Equipment** Ben Duncan  
**Projects** Robert Penfold  
**Microprocessors** Peter Kershaw  
**Hi-Fi** Jeff Macaulay  
**Studio Technician** Glenn Rogers

**Editorial Offices** 282, London Road,  
Westcliff-on-Sea, Essex SS0 7JG.  
Tel: (0702) 338878/338015

**Advertisement Manager**  
Graham Butterworth  
Tel: 01-527 3376.

**Advertisement Sales** Terry Day  
**Advertisement Offices** Electronics &  
Music Maker, Hillcroft House,  
16, The Avenue, Highams Park,  
London E4 9LD. Tel: 01-527 3376.

**Publishers** Maplin Publications,  
282, London Road, Westcliff-on-Sea,  
Essex SS0 7JG.

**Distributors** Spotlight International,  
Spotlight House, near 1 Benwell Road,  
London N7 7AX. Tel: 01-607 6411.

**Printers** Eden Fisher (Southend) Ltd.  
**Typesetters** Quillset (Southend)

**Subscriptions** Rates for 12 issues:  
UK £10.75; Europe & Overseas  
(Surface) £11.65; Airmail (including  
Europe) £25.95.

**Binders** £3.95 inc. p&p Overseas  
add 11p extra covered by bankers  
draft in pounds sterling

## Copyright

All material is subject to world  
wide Copyright protection, and  
reproduction or imitation in whole  
or part is expressly forbidden.  
All reasonable care is taken to ensure  
accuracy in preparation of the  
magazine but Maplin Publications  
cannot be held legally responsible  
for its contents. The Publishers  
cannot assume responsibility for the  
return of unsolicited manuscripts,  
photographs, artwork or projects.  
Permission to reproduce printed  
circuit board layouts commercially  
or marketing of kits must be sought  
from the publisher.

©Copyright 1982 Maplin Publications.

E&MM JUNE 1982

## Electro-Music goes East!



Jean-Michel Jarre with his wife  
Charlotte Rampling at the London  
preview of 'The China Concerts'.

One result of E&MM's recent  
questionnaire showed that  
over 60% of its readers  
wanted an interview published  
with Jean-Michel Jarre (it was  
the most popular request taken  
from 1000 entries). It's been  
quite a squeeze getting the  
information into one issue, but  
with that high rating we felt we  
had to oblige! Nevertheless,  
there's more to come for practi-  
cal musicians in the way of a  
complete electro-music transcrip-  
tion of a piece from the new  
album.

Following many enquiries  
from home/small studio users,  
we start a new series: 'Studio  
Sound Techniques' that gives  
plenty of practical information  
on maintaining and using re-  
cording equipment.

This month's projects are real  
low cost musician's accessories.  
The Panolo was inspired by the  
Yamaha Electric Grand 'Tremolo'  
effect, with some additional  
influence from the Kraftwerk and  
Jarre concerts.

The Multisplit has numerous  
uses and although it's an easy  
project to construct, its com-  
mercial counterpart is hard to  
find.

The Electric Drummer has  
caused a tremendous amount of  
interest over the past months.  
Information regarding the new  
stereo sound generator board,  
controls, EPROM and general  
operation will be published in the  
next issue.

Next month, we'll be meeting  
French singer Ronny, accompan-  
ied by the all-electronic drums of  
Warren Cann and Hans Zimmer's  
original 'Switched-On Bach'  
Moog.

*Mike Beecher*

## CONTENTS

### Special Features

**Jean-Michel Jarre** ..... 6  
*An exclusive interview with this most popular French  
electronic music composer that traces his  
background history from his early influences to his  
latest epic performances in China.*

**Classix Nouveaux** ..... 28  
*Mik Sweeney talks about his guitars and Sal Solo  
describes how he is acquiring production skills.*

### Instrument Reviews

**Effects:**  
*Carlsbro Minifex* ..... 16  
**Synthesiser:**  
*E-mu Systems Emulator* ..... 22

### Workshops

**Making Notes:**  
*Interval, cadences and the 'Circle of fifths'* ..... 34  
**Computing:**  
*Making music with the Microtan 65* ..... 36  
**NEW Studio Sound Techniques:**  
*An exciting new series for the home electro-  
musician running a home studio* ..... 40  
**Electro-Music Engineer:**  
*DIY repair of transistor power amplifiers* ..... 44

### Regular Features

**A History of Electronic Music** ..... 18  
**Home Electro-Musician: David Pallant** ..... 25  
**Cassette Reviews** ..... 26  
**Fact File**  
*George Duke, Ross Middleton, Salvador Mulligan* 43

### Projects

**Panolo** ..... 50  
*An exciting new effects unit of interest to all  
electro-musicians.*  
**Multisplit** ..... 54  
*A unique and versatile project that distributes,  
splits and matches signals.*

### News and Reviews

**Readers Letters** ..... 4  
**Record Review: Jean-Michel Jarre** ..... 13  
**E&MM Binders** ..... 27  
**America** ..... 30  
**E&MM T-Shirts** ..... 32  
**E&MM Subscriptions** ..... 39  
**Back Issues** ..... 47  
**Music Maker Equipment Scene** ..... 48  
**Special Offer — 2 Carlsbro Effects Units** ..... 49  
**News and Events** ..... 57  
**New Products** ..... 58  
**British Music Fair Preview** ..... 60  
**Classified** ..... 62  
**Advertisers' Index** ..... 64

# Readers Letters

Send to: Reader's Letters, Electronics & Music Maker  
282 London Road, Westcliff-on-Sea, Essex SS0 7JG.

## Electronics v. Music

Dear Sir,  
I agree to some extent with Adrian Smith, whose letter was published in your February issue, on the matter of electronic versus musical content in E&MM.

Obviously it's impossible to please all of the people all of the time, but I do feel that the balance has been swung too far in one direction, too rapidly. I am a musician (although I prefer to be called an artist) and a trained electronics engineer, and E&MM was providing an ideal coverage previously available only by purchasing both a well-known international music publication (expensive!) and a copy of ETI. Now it seems you are competing with only one of these alternatives in an unnecessary way. I would like to see more advertisements from electronic component suppliers and less from the major Japanese concerns. Also I feel perhaps you are overdoing the reviews of commercially available instruments and equipment. Let's design and build our own gear. We have the technology! Maybe an ideas forum would be a welcome addition featuring a different electro-musical genius each month.

Mike Wood  
Stourbridge, West Midlands

The electronics v. music debate will rage for many years while we at E&MM try to bring you the best of both worlds.

We are a magazine interested in and catering for all musicians who enjoy creating the 'new' electronic music and our projects try to reflect this. Many electro-musicians have neither the ability nor inclination to build-it-themselves, and as commercial enterprises have the facilities (and the money) to make greater technological advancements than most individuals, it seems only natural that we should keep our readers informed of these latest developments.

On the other side, our projects attempt to reflect and incorporate the new technology as much as possible (our *Electric Drummer* for example) while keeping the disciplines required at a not-too-demanding level. We certainly do have the technology — and the ability — and we are always very interested to hear from anyone developing electro-music-related projects. Our survey indicated interest in both aspects of E&MM (which are not mutually exclusive) and indicates that we have the balance about right.

## Home studio tips

Dear Sir,  
I'd like to say thanks for thinking of us electro-musicians with your great magazine. I have built most of the musical projects since the first issue, and although I was a beginner in electronics and at least 50% of the earlier projects i.e. Syntom, Synwave didn't want to work for me to begin with (probably the soldering, because they all work now), I feel that I have learnt quite a lot from your magazine. Being a musician myself, I am in the middle of constructing a home studio

so how about a few tips or projects solely for the home studio musician? I'm sure there are a lot of electro-musicians who would agree that it would be a good concept. Keep up the good work.

T. B. Barrett,  
Reading, Berks

A new series, 'Studio Sound Techniques' starts this month!

## Spectrum Synth

Dear Sir,  
Can you please answer these queries concerning the Spectrum Synthesiser:—

- 1) Can I achieve headphone monitoring without using an external amp?
- 2) What is the output level and is it suitable for the 'AUX' input on a normal stereo amplifier?
- 3) You say in the text of the manual that to keep interaction low it is best not to make all the wires into one gigantic cableform. I have used ribbon cable throughout, except where screened leads are required. Can you see any interaction problems with the above method?

K. Houghton  
Billingham, Cleveland

Headphone monitoring can be done with 'phones of more than 1k impedance, but the output capacitors may need increasing in value.

The output level can be several volts, but providing the gain control on your amplifier is initially turned well down, no problems need arise; then simply adjust for a comfortable sound level. If your auxiliary input is excessively sensitive, add a 22k to 47k resistor between RV45 and the output of pin IC29 to reduce the maximum output between 5 and 10 times.

The prototype Spectrum was wired with ribbon cable in many places without trouble, but really the only way to be sure is to try it and see. If you encounter problems (such as clicks) try to isolate the offending cable(s) and replace with screened leads. Signal cables must be screened as a matter of course. The use of foil screened cables (available from Turnkey or Future Film Developments) will make the termination of multiple screens easier.

Peter Maydew

## Noise gates

Dear Sir,  
I am a student of electronic engineering and I own a 200W PA system. Recently I have been toying with the idea of using noise gates on separate channels of the PA to reduce microphone spill-over on stage, especially for the drum kit mics.

I know that noise gates are used on drum kits in studios, but I have never heard of this technique being used for PA, is there some reason for this? Could you also tell me which resistors to change to modify the unit for use with low impedance microphones?

M. Armistead  
Morecambe

Using a noise gate on drum kit mics is common PA practice, though naturally, it's most likely to be encountered in large rigs. There's no inherent reason why the E&MM noise

gate shouldn't be used for this purpose. However, judicious setting of the input level is necessary if good results are to be achieved, and for this reason, amongst others, it's inadvisable to connect the gate directly to a microphone. Rather, the unit should be 'inserted' at line level into the relevant desk channel(s). If you want to try a directly connected low impedance microphone, simply add a standard microphone transformer to the input (e.g. Sowter 4185), and add a 10k pot in series with the switch terminal end of R8 to provide variable gain.

(Sowter transformers are available from E. A. Sowter Ltd, P.O. Box 36, Ipswich.)

## Flute Pickups

Dear E&MM,  
Please could you advise me on what type of transducer or pick-up I can use for my flute. I enjoy your magazine but please could you print more low cost projects.

Andrew Fox  
Enfield, Middlesex

Your letter request is followed up this month, but of course, all our projects are designed to give some cost saving over commercial equivalents (if any!). Barcus-Berry produce a pickup designed especially for flautists. An alternative, and possibly cheaper dodge is to wire a tieclip mic to your flute. The Sony M50 is particularly renowned for its ability to produce good results from 'difficult' instruments, but also consider AKG's C567. Conventionally, a tie-clip mic is placed near to the mouthpiece, but it's advisable to experiment. (Barcus-Berry pickups are distributed by Strings 'n' Things, Unit 2, Chapel Road, Portslade, Brighton, Sussex BN4 1PF.)

## Long faders

Dear Sir,  
I am currently in the process of constructing a dimmer desk for the control of lighting equipment on stage. Most of the work on the desk is complete apart from the slide pots. After making a large amount of enquiries I can find no firm who can supply slide pots of longer travel than the 60mm, as by Maplin. Obviously they are made, since firms such as Pulsar use them in their desks but they could only supply me with their own values. The difference is enough to make the job look a lot more professional and offer greater control. Could you please tell me of anyone who could supply these sliders?

E&MM is a very good mag and I have constructed a few of the projects with great success. Keep up the good work.

J. W. Silk  
Scarborough, North Yorks

Audiomad (Unit 14, 31, Poole Road, Wimbourne, Dorset BM21 1QB), Penny & Giles (Newbridge Road Industrial Estate, Pontlanfraith, Blackwood, Gwent NP2 2YD) and Plessey Resistors (Cheney Manor, Swindon SN2 2P7) all produce a range of high quality, long-travel faders suitable for sound and lighting consoles.

## Speaker info

Dear Sirs,  
I must first thank you tremendously for publishing such a brilliant magazine! It is the first one I've come across which combines both of my interests (electronics and music). Could I ask a few questions?

Recently, I bought a second-hand 'Marshall Super-Bass 100 Amplifier' and I haven't a clue which speaker drive unit I should get. I already have an empty 15" cabinet. Could you also quote models to help me? My other query is, how much more powerful should the speaker be than its amplifier to cope with distortion, peaks, etc?

Philip Dixon  
Durham

Possible 15" Drivers for your Marshall Bass Amp, roughly in order of ascending price are: McKenzie C15 (150 watts); Fane Studio 15B (200 watts); Richard Allen Atlas 15 (250 watts); Celestion G15-150 CE (150 Watts); Electro-Voice EVM 15B (200 watts). Bear in mind that a finely tuned cabinet can make even the cheapest speaker excel, and that 'tuning' is different from every driver. So to make best use of your existing cabinet, insist on listening to potential drivers in your cabinet before purchase, if possible. If you can afford the EVM15B, or find one secondhand, then Electro-Voice (Gulton Works, Old Shoreham Road, Hove, Sussex BN3 7EY) can supply you with DIY plans for their TL606 bass cabinet which is finely tuned for their 15" driver (but not for other 15" speakers!)

The topic of speaker power ratings is a complex one and manufacturers' specifications are often based on speculative qualifications and artistic licence. As a rule of thumb, a driver rated at 1½ or 2 times the amplifier power should be regarded as a minimum for electric bass. More important, develop a relationship with your speaker, train your ears to listen for its groans when overloaded by heavily thumbed bass notes at high level.

## Consistent Percussion

Dear Sir,  
I have just finished constructing the E&MM Syntom and I am very pleased with the range of sounds that it can produce.

However I find that to repeat the same sound in several consecutive beats is almost impossible owing to the touch sensitive nature of the trigger.

Could you recommend a small modification that I could make to the trigger circuit in order that the tone would be exactly the same, irrespective of striking velocity?

John Berry  
Ormskirck, W. Lancs.

Making the Syntom non-touch sensitive would require a separate envelope generator to be built to take the place of the input stage. Perhaps the best way of getting consistent triggering is to use an external source of pulses, for example the Synclock in our December issue.

JUNE 1982 E&MM

# You'll find it cheaper at Chase

**SX2000**  
R.R.P. £299 £129



3 1/2 octave keyboard \* 3 Waveforms \* 7 Presets octave selector \* VCF \* VCA \* Vibrato \* Portamento. Great value at £149!

**SX1000**  
R.R.P. £229 £149



3 octave keyboard \* Octave selector \* Waveform selector \* Pulse width modulation \* Portamento \* Vibrato \* Low frequency oscillator \* Pink and white noise generator \* VCF and VCA envelope generator \* Great value at £149!

**OCTAVE KITTEN**  
R.R.P. £578 £249



24 db filter for bigger, fatter sound. 4-function envelope generator \* Noise generator \* Auto repeat of keyboard repeat \* Sample and hold circuit \* 5 selectable waveforms \* 3-octave keyboard with transpose switch for 8-octave capability \* Interchangeable with most variable synthesizers.

**OCTAVE CAT**  
R.R.P. £949 £399



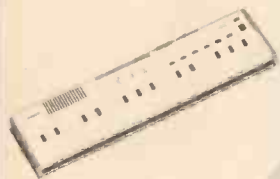
Duophonic synthesiser \* Will play 4 notes at a time \* Upper and lower voice memories \* 2 oscillators with combinable waveforms \* 24db filter for bigger, fatter sound \* Sample and hold circuit \* Noise generator \* Interchangeable with most variable synthesizers.

**THE PRO ONE**  
£420



The Pro-One has all the standard features you would expect from a mono synth. However, the Pro-One goes well beyond standard by including a sequencer, arpeggiator, automatic glide, digital interface, and numerous other features unheard of on a low-cost unit.

**CASIOTONE VL10**  
R.R.P. £29 £26



Casiotone VL1 R.R.P. £39 £35  
101 R.R.P. £225 £195  
202 R.R.P. £325 £275  
MT31 R.R.P. £79 £69  
MT40 R.R.P. £125 £99  
403 R.R.P. £325 £275  
601 R.R.P. £555 £495

**CRUMAR TOCCATA**  
R.R.P. £499 £299



8 preset draw bar configurations \* variable percussion volume and decay \* Key click feature \* Built-in rotary sound system including vibrato and chorale fast and slow sounds.

**CRUMAR PERFORMER**  
R.R.P. £499 £299



Crumar's completely new Performer is a professional quality strings and brass synthesiser at a not so professional 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 on-board Graphic Equaliser, variable crescendo, full brass filter and envelope controls, delay modulation, a 4-octave range keyboard and trouble-free LED switching. The Crumar Performer does a number on your ears without doing a number on your budget.

**ARP SOLINA**  
R.R.P. £799 £299



4-octave fully polyphonic keyboard with violas, violins, trumpets and brass, all mixable, to produce unlimited range of sounds including organ, electric piano, etc. Separate bass section. Attack and crescendo facility. Interchangeable with other synthesizers to produce polyphonic synthesiser sounds. Reduced from over £800 to £299! Carrying case also available for only £20 extra. This is the best bargain we have ever had on offer!

**ARP QUARTET**  
R.R.P. £649 £299



The new Quartet by ARP is a compact, preset/variable synthesiser offering the amateur and semi-professional musician a wide range of polyphonic brass, string, organ and piano — plus combinations of any or all these voices — at the touch of a button. The Quartet is the first state-of-the-art instrument in its price range featuring LED function indicators, electronically latched switches, low noise specifications, colour-coded controls, and both high and low level outputs. The sound quality is what you would expect from any ARP product: superior.

**CRUMAR MULTIMAN S/2** R.R.P. £699 £499



One master console on Crumar's versatile Multimann S/2 controls string, bass, brass and piano sounds with a brass range of 2 full octaves. All sounds can be played simultaneously to provide orchestral effects. A split keyboard permits separation of each sound quality on either lower or upper registers. Compactness, flexibility and a redesigned new look, characterise all aspects of this 20Kgs professional instrument.

**CRUMAR ROADY** R.R.P. £399 £299



Keyboard of 61 keys (5 octaves) Bass section — Volume, on/off and sustain on/off controls. Vibes section — Volume, on/off switch, tremolo rate and depth, percussion volume and decay controls. Piano section — Volume, left, right, voices 1, 2 and 3 controls. Master volume control. Other controls: Master pitch sustain pedal input.

**OBERHEIM OBSX 4-VOICE** £1799 **6-VOICE** £1999



Chase are the sole UK agents authorised by Oberheim to sell and service their products in the UK.

\* Polyphonic synthesiser with 24 pre-set voices \* Strings, brass, clarinet, organ, electric piano, bass, flute and many other voices \* Pitch bend and modulation levers \* Auto tune facility \* Hold chord feature \* Edit mode on filter, attack, decay, sustain \* Rear panel includes filter pedal, sustain foot switch, modulation and sequencer interfaces



Sequential Circuits are pleased to announce the appointment of Chase as Agents for all its products including the Pro-One, Prophet 5 and Prophet 10 and also an authorised service centre.

PROPHET X .....	£4699
PROPHET V .....	£2450
(New model now available with 120 memories)	
POLY-SEQUENCER .....	£727
REMOTE KEYBOARD .....	£727
PRO-ONE .....	£420

**CRUMAR DP50**  
R.R.P. £1149 £799

Crumar's incomparable DP/50 Dynamic Piano combines the "concert hall sound" with unparalleled playability and reliability. The electronic tone generation system utilises wave shaping techniques in combination with harmonic overtone additions, and the sound has the full-bodied realism you associate with a concert grand to a professional synthesiser.



**CRUMAR ROADRUNNER 2** R.R.P. £299 £199



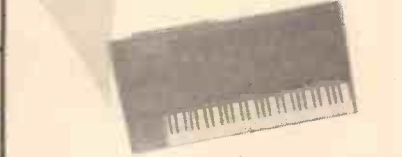
The Roadrunner 2 has been designed for a colourful new look and positive electronic and mechanical reliability. The features include a new variable "chorus" effect, an accessible pitch control and rainbow tab controls for bass and 3 different piano sounds. Still included is the two octave bass extension that can be led through a separate amplifier to give a "stereo" effect. For the ultimate in portable pianos, play Crumar's new Roadrunner 2 — the first and foremost of its kind.

**ARP PIANO** R.R.P. £1669 £699



\* Fully polyphonic electronic piano \* 4 separate voices selected by quick touch switches \* Touch responsive keyboard for piano realism \* Vibrato and tuning controls \* Headphone jack \* Lightweight multipurpose electronic piano now selling at half its normal price.

**OBERHEIM OBXa** FROM £2,850



Chase are the sole UK agents authorised by Oberheim to sell and service their products in the UK.

\* Polyphonic synthesiser with 120 programmable memories \* Complete variable synthesiser functions \* 2 memories can be played at once \* Split keyboard functions \* Cassette interface for memories \* Unique pitch bend and modulation levers \* 2 envelope generators \* 2 oscillators \* 2 LFOs \* Complete modulation assignment \* Programmable chords \* Complete rear interface jacks for sequencer and pedals.

**INTEREST FREE CREDIT FOR SIX MONTHS**

Now available at our Leicester Branch till 8th May, 1982

## CHASE

LONDON SYNTHESISER CENTRE

LONDON: 22 Chalton Street, off Euston Road, London NW1. Telephone: 01-387 7626/7449. Open Tuesday to Saturday 10 a.m. to 6 p.m.  
LEICESTER: Union Street, off High Street, Leicester LE1 4HA. Telephone: 0533 59634. Open Tuesday to Saturday 8.30 a.m. to 5.30 p.m.  
MANCHESTER: 58 Oldham Street, off Piccadilly, Manchester M4 1LE. Telephone: 061-236 6794/5. Open Tuesday to Saturday 10 a.m. to 5.30 p.m.  
Please note: Our stores are closed on Mondays & Sundays

# JEAN-MICHEL JARRE

让·米歇尔·雅尔

中国演奏会唱片



## JEAN-MICHEL JARRE

Born in Lyon, France on August 24, 1948. His parents are musicians and at five he began piano lessons. Went to Lycée Michelet Secondary School and studied harmony, counterpoint and fugue with Jeanine Rueff at the Paris Conservatoire. After gaining his Bachelor of Arts degree, his musical studies led in 1968 to him joining the Musical Research Group under Pierre Schaeffer.

He composed and recorded 'The Cage' in 1970. Performed at the Paris Opera with 'Aor' ballet in 1972. His first international success was the 'Oxygene' LP in 1976, followed by 'Equinoxe' in 1978. In 1979 at Place de la Concorde, Jean-Michel performed to a

million people at an audio-visual staging of his music. He received a gold medal for musical broadcasting from the S.A.C.E.M. for contributing to the spread of French culture throughout the world.

In 1981 his third album 'Magnetic Fields' was released and he became the first western musician to have his music broadcast by the Chinese radio. During October of the same year, Jean-Michel made his epic trip to perform in Peking and Shanghai. In May 1982 'The Concerts in China' double album was released along with the publication of a book and a 1½ hour film about the Chinese performances was made for the British ATV network.

# THE CONCERTS IN CHINA



## An exclusive interview with this most popular French electronic music composer that traces his background history from early influences to his latest epic performances in China.

I started studying music in the early 60's at the Paris Conservatoire. At that time I was studying harmony, fuge and counterpoint and at the same time I played in some local rock bands. It was not unusual, of course, for every style of music was in its 'own' world, or 'ghetto'. I felt that the world of classical music, the world of rock and other forms of music were a bit narrow and living in their own planet. I had the feeling it was the right time to explore other fields to perhaps see if a combination of different styles were possible.

Then I went to the Music Research Centre in Paris created by Pierre Schaeffer and Pierre Henry. I studied there for three years and became involved in various areas of research, during which I confronted one of the first synthesisers. Obviously, it was not called that — it was just a 'wooden' synthesiser with a bank of oscillators that could be synchronised and so on. There were also tape recorders for building up a montage.

For me, Pierre Schaeffer was one of the most brilliant guys of the century in terms of what he brought to the music world. He created the notion of 'Musique Concrète' and influenced me a lot in this direction.

It's very interesting because it was the first time that it had occurred to me that I was not thinking in terms of notes but in terms of sound. That was quite a shock for me and a very important start for what I wanted to do — a new concept absolutely for most musicians then.

At the same time I studied there because you could research a lot of different things — all the non-European music, including African, Indian, Chinese and other oriental/folk traditions. I discovered, like others, the fact that we used to be very presumptuous in Europe, thinking that the music we have done over the last four centuries forms the only significant contribution, and you learnt to be very humble when you were studying music of these cultures.

The structure and the form of the latter music is so different — it gives a breath of air too, from the very tight structure and harmonic restrictions which European Western music imposes.

Then I decided to quit the Music Research centre because it was eventually not necessary for me to go on. A very intellectual attitude at the Centre of making much more of the philosophies, sociology and the mathematics of the music existed — but it was not really practical music any more.

Step by step, I began to build up a small studio and worked freelance, including some performing. Ironically, one of my first confrontations with the public was made in the Paris Opera House when I was twenty. It was the first time that an electronic music concert was given in this kind of traditional French environment. It's obviously a wonderful souvenir because most of the time it's at the peak of your career that you do this sort of performance.

Then I realised that the mainstream of electronic music development came from the influence of Stockhausen's music — very

classical, contemporary music that was played at festivals. I felt that contemporary music had got a very elitist attitude — a bit too intellectual vis-à-vis the music and it created barriers between the audience and yourself. I wanted to be much more open to the audience.

I worked in many different fields of music before producing 'Oxygene'. It was for me just a time to make a lot of different experiences — making sound tracks for film and TV, incidental music for plays and ballet in the theatre, jingles for commercials (because that's something totally different in terms of approach), making songs and producing for some French rock singers. Having all these different experiences eventually helped me to find my own musical identity.

**Do you think that to fully exploit electronic music a broad background of musical experience is required, not just knowledge of contemporary composing techniques?**

I think you have to digest all the other music and think of electronic music as a

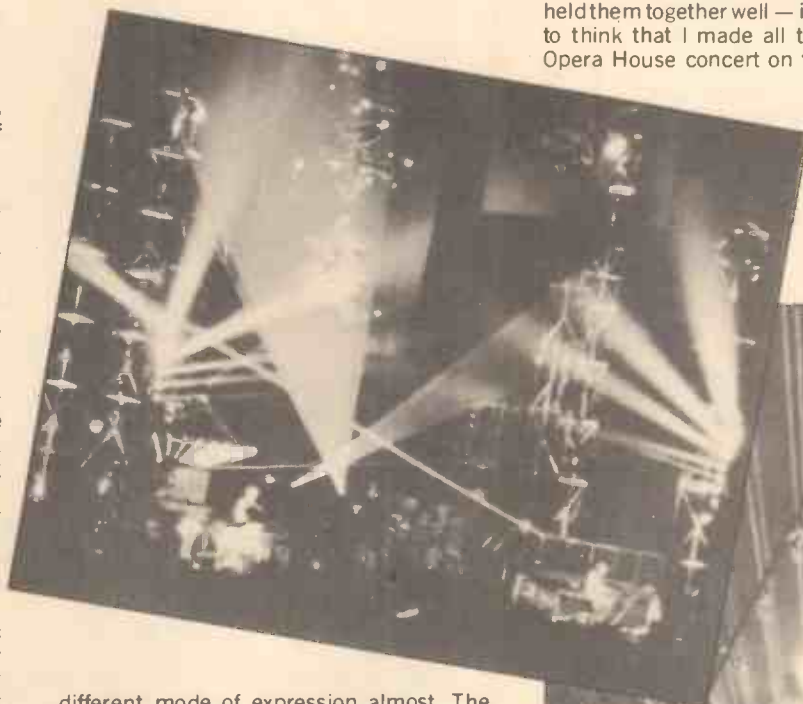
people there wouldn't recognise the piano as a musical instrument, because their own references in terms of music are just very simple tom-toms and string instruments and the piano is not a shape and a style of instrument they have culturally digested.

**So when did you first start your studio?**

Because I've been interested in experimenting with music since the age of 14, I used to work on tapes and make montages by editing and so on in my 'home studio'. So I began with the tape recorders as the first step. It was very important because it gave me very early on the initiative to explore the use of electronics. But the real studio came during '67/'68.

**I see you still use the Synthi AKS, which was one of the first compact VC systems at that time.**

I really used one of the first VCS3's — my oldest VCS3 was made in '66 I think. I was recording in stereo using a Revox — four of them in fact, with no sync but nevertheless getting good results by using the same size reels on each machine. The same tension held them together well — it is quite amusing to think that I made all the music for my Opera House concert on this arrangement



different mode of expression almost. The problem is this extraordinary confusion, that people regard electronic music as something robotised and very cold — actually, that's not so. You see, it is not the instruments alone that make the music and that's the main confusion to avoid, because even with the most sophisticated equipment, the human intervention is necessary and the music is still the human organisation of sounds. If you take away the hands of the composer/performer, the instruments become just machines.

It's a very cultural attitude to think that the synthesiser, for instance, is something robotised and something like a TV, washing machine or typewriter. It's exactly the same thing as putting a piano in the middle of the Amazonian forest. I'm convinced that the



## JEAN-MICHEL JARRE



without proper synchronisation and used lots of home made black 'wooden' boxes (holding oscillators etc)!

I did other performances whilst at the music centre and I also did a lot of painting which enabled me to earn a living from sales of pictures. I really lived like an artist. My father, Maurice Jarre, used to be quite a famous composer in the U.S. making sound tracks like 'Dr Zhivago' and 'Lawrence of Arabia'. But my parents were divorced when I was 5 and I never grew up in his influence, so you can see why I had to support myself financially.

**Was 'Oxygene' your first important LP?**

Yes, but I did make one record distributed in France called 'The Cage' that was released about six years before 'Oxygene' (in 1970).

There was also a record with a French rock group called 'Triangle', and I contributed or produced a lot of different records for quite successful rock singers. So 'Oxygene' was the first international record and was all done in my studio. It was produced on 8 tracks using a Scully recorder and a home made mixing console. The instruments used were mainly the AKS and VCS3s. There was also one ARP 2600 and an Eminent String Ensemble, plus the RMI Harmonic and a Farfisa organ.

'Oxygene' was released at the end of '76 and was seen to be one of the first electronic records that received worldwide success, reaching No. 1 in the U.K. as an LP and single, and other countries as well.

**How did you get a record company to accept something so different from the mainstream of popular music?**

You see, the irony of that is everybody refused the record at the beginning (as usual!) and a small independent record company called Freyfus (in Paris), took up the promotion of 'Oxygene', and has since been responsible for my records and music publishing also. They made a wonderful job trying to find new ways of reaching the media, not only radio and TV but through the hi-fi shops. Then Polydor became very interested and decided to take the record for the rest of the world.

**Did you ever play it live?**

No — at that time I couldn't, but now it's totally different and in the new 'China' album I played everything live.

The next step was 'Equinoxe'. This took a long time because I really wanted to use a different approach, with a 16 track recorder and other instruments, and it came out in 1968.

**So the finance from the successful 'Oxygene' album enabled you to be self-supporting as a professional composer/performer?**

Absolutely, and it was a logical progression for me, from my first little studio to the studio I have now. It would have been impossible for me to achieve this in one step — it has been built up over a long period.

**I hear the same style of music on the 'Equinoxe' LP but with a tremendous improvement in sound quality. The drums' stereo field and sequencing is also interesting. Do you run two sequences together or employ split pan techniques?**

Yes, split sounds mainly. It all depends. I have a special sequencer made for me by Michel Geiss which can allocate notes to right/centre/left in slapback fashion. I also use a strong single echo of the left hand channel note in the right channel. This method adds to the harmony by playing



# 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.



## JEAN-MICHEL JARRE • THE CONCERTS IN CHINA

notes from the previous chord into the next chord, through the time delay. Incidentally, I think of the rhythm box not as a drum, but as a specific instrument itself.

**The harmony appears to be more important than the melody, with small blocks of modulation that move the music up tonal steps.**

It was a sort of reaction. I am very pleased to talk about that, because I really tried to use very simple chords. You see, we went into a very abstract world in terms of chords also — with all serious music — and after a while when you are changing parameters, you are losing the feeling. So I have been very interested in this fact that the harmony is more important than the melody, but I think the tone colours are even more important than the harmony. I mean, they can change the harmony.

For example, if you are starting on a simple triad chord you can work on the sound much more than if you have very complicated chords, because you are trapped by the harmony of the chords themselves. You cannot create other harmonies with timbres of colours because it's too mixed down. It's a totally different approach as we are working with very pure frequencies with quite poor sounds actually (not any more with digital instruments!) just basic waveforms so that you have to create harmonies using tricks like phasing, echo, reverb and other treatments.

**How do you approach your composing?**

Sometimes I have the idea of some chords, a melody, or just a sound. I think all the time of these sounds away from the instruments. For me, everything is useful — the sound of rain on the windowpane, the talk we are having now, and natural or machine sounds and so on.

The problem is the time it takes — instead of writing just the notes you have to actually 'build' the sound. For me, the most important fact is that electronic music, for the first time in the history of music, lets a musician be like a sculptor. You are able to work with your hands on the musical material. Music has always been considered the most abstract art and with electronic music people are thinking that it is becoming increasingly so, but it's exactly the reverse! It's becoming much more pragmatic and tactile in a way. You have contact of the sounds with your hands just like the painter with his brush. It's much less abstract than ever playing the piano because the sound quality is part of the piano's construction.

**Do you go out and collect the Musique Concrète extracts?**

Oh no, most of the time I am using not just my experience of Musique Concrète, but making electronic sound samples on the Fairlight CMI. The train sound in 'Magnetic Fields' was made by sampling some printing press machinery which I looped continuously using the Fairlight controls.

In my opinion, the Fairlight is exactly like the VCS3 and the AKS, but in digital form. It has the same mistakes and attractive aspects. For me, the EMS VCS3 is one of the best synths ever made because of its matrix board. It allows you to make totally crazy combinations — and the Moog can't do that. But it has the mistakes, like the oscillators drifting. The Fairlight has different problems — being one of the first digital instruments, e.g. the digital sampling noise. Nevertheless, you can utilise this as part of the musical sound.

**What kind of success did 'Equinoxe' have compared with 'Oxygene'?**

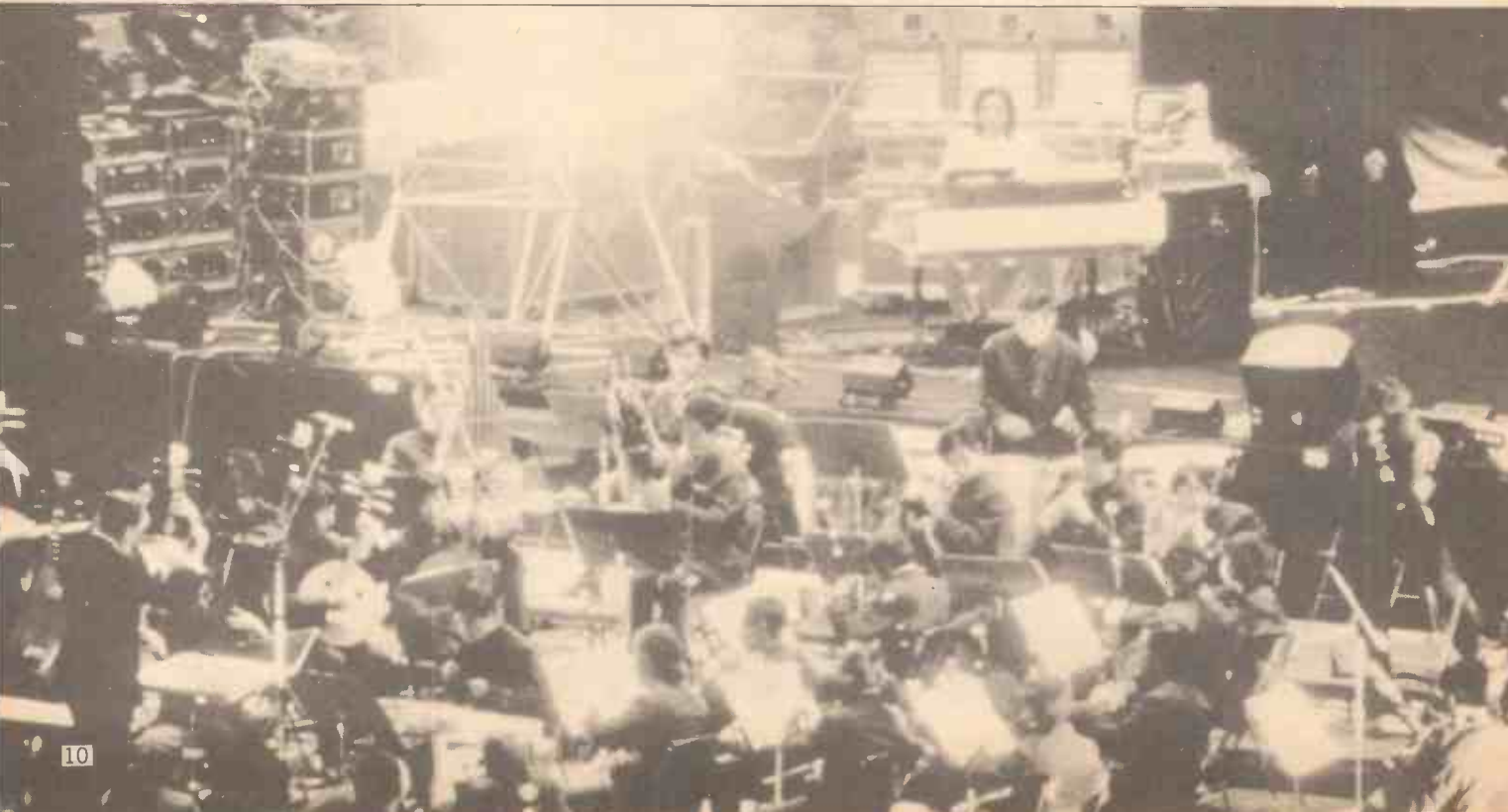
In some countries, it has been even more successful. In terms of pure sales too.

### Studio

I now have equipment by MCI with a 24 track and two 2 track recorders and an automated console JH636 having 36 inputs. It also has light meters which are very important for electronic sounds (percussion especially) because it gives you the instant real level of the dynamics. I do prefer these meters to analogue meters.

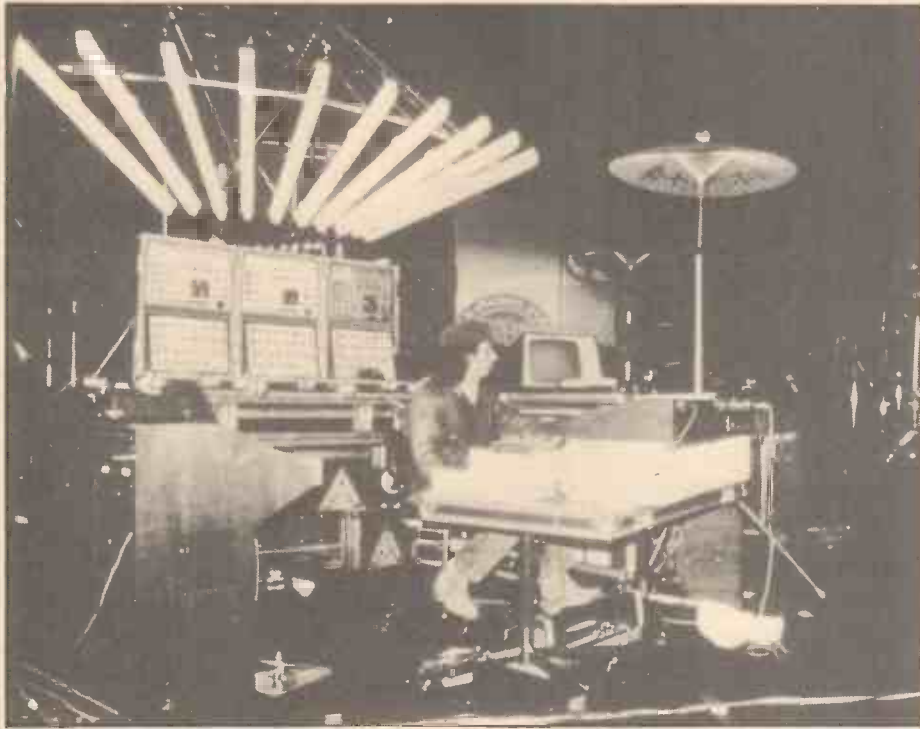
For monitoring the instruments, I use the American UREI speakers, not at too loud a level. Each year I try to monitor at lower level, because I think it's time to get away from the levels that were first attained in the 60's and to come back to the much more natural attitude to 'listen' to the music. It's interesting that engineers who went through the loud levels of performance are now not hearing very well. It's a terrible mistake not to respect your ears — like playing a piano with a hammer or a violin with a knife! And some people in studios have suffered hearing defects. The pure frequencies of electronic sounds can easily impair your hearing at high playback volumes. Every year I have an audiogram done to check my hearing.

I have quite a lot of different instruments now — for 'Magnetic Fields' the Fairlight was very important, along with the Geiss Matrix Sequencer and also (since the last concerts in China) I have been using the Paris based company MDB's Polysequencer. It's a micro-computer that enables me to make any poly-sequences I want up to 8 tracks. I think it's much more developed than the Roland MC8 — you can interface and synchronise with any rhythm box and you can actually play in real time and go step by step. Like the Micro-Composer, you can write your own score, but





## JEAN-MICHEL JARRE • THE CONCERTS IN CHINA



you can improvise with it as well. I have just heard that MDB are making a 16 second delay unit with forward and backward playback like a tape recorder that sounds very interesting.

I use it with eight RSF French synthesizers which are rack mounted and sound rather like Oberheims. They are very good and very cheap. I did try the Publison (pitch-changing) instrument but I have been slightly deceived, I must say, although it's been commercially successful. I prefer the English AMS equivalent.

**How do you manage with trigger interfacing?**

It's a rather difficult situation as you know, but I have an engineer, Pierre Mourey, who is really in charge of the studio and modifies or links equipment as required to save me all this trouble — I am not really that experienced in electronics to do it all. What we intend to do is use the MCI mixing board as the main patch of the studio. The latter is laid out like a huge control room with the instruments all around. I think I have not yet found the ideal set-up, as the instruments are often changing roles and the Fairlight immediately changed the 'geography' of the studio, so you have to be quite flexible.

### Notation and Instruments

Sometimes I use classical notation although often the tape recorder becomes the 'score'. Most of the time I write the music when I am arranging something using chords and patterns. I don't bother to write the Fairlight's settings down as it takes too long and you can easily lose your ideas during the writing.

The next digital product we should be seeing is something that allows a much more direct way of composing. Even if you want to

compose step by step it has to be much more direct.

I've mentioned special techniques like split echo with a sequencer and the Fairlight for manipulating samples in the Musique Concrète way, but the ARP 2600 is also used a lot for storm and other noise generated sounds. I have a special filter as well called the 'Little Leaper' by UREI that creates a very, very sharp notch (48dB slope). I use it to extract fine elements of sound and get the metallic effects in this way with white noise. I like to use ring modulators frequently too — they're part of the game!

**Tell me about the Geiss Sequencer.**

It's a very special sequencer and as far as I know it's totally different from available sequencers. It has a matrix board which allows up to 100 notes to be programmed. Transposition is easily done and the patch pins set triggers and basic pitches for each event. By inserting pins you can stop the sequence wherever you want — I find that interesting because I can think in terms of the sequence rather than just notes. In other sequencers which program from the keyboard, you have only your hands that make some cliché of chords. But with a matrix system you can change say just one note, one rhythm anywhere in its length as it's running. There are just two sequence layers that are nearly always placed left and right in the stereo field.

**At this point, we digressed to the E&MM Hexadrum and then the Synclock, about which Jean-Michel commented:**

That's really great, that! I am always looking for new instruments on stage and I've been using a very interesting instrument in China, the Laser Harp. It was really the first time that this instrument has been played like that. It was designed by a Frenchman,

Bernard Szajner, and built by a company called Laser Graphics. The instrument uses laser beams instead of strings, which fan out from its base vertically upwards in one plane. I use my hands stretched out to interrupt the individual beams. They trigger the particular notes I require, so you have a direct interaction with the rainbow of laser beams to make your music. I can program the notes to be semitones, whole tones, pentatonic intervals or whatever I want. For the China concerts, I used the pentatonic scale (e.g. all the black notes on the normal keyboard) and two rays were allocated for transposition.

It's wonderful because it gives you a sort of very original attitude of a musician making something with his hands. It's good for the audience who can actually see me standing in front of the beams and physically interacting. Whether it will ever become a commercial proposition is undecided, because it requires an expensive laser system. This may be repeated on stage but certainly would be too costly and impractical elsewhere. The lasers employed are in fact not dangerous as they are low powered types.

### From Equinoxe to China

'Equinoxe' was produced in '78 and that meant I was releasing a record almost every 2 years. I think it needs this time and I'm not interested in following the crazy rhythms of all show business developments.

I have been lucky because I haven't had to keep releasing new material — I've had to fight against this pressure though, for the record companies would like me to do that. I'm not given any lump sum, with a contract, to go away and make another LP, because I am producing my own LP's in my studio. This makes me free to do what I want and the record companies should at present be interested in anything new I produce.

In 1981, I made my third album, 'Magnetic Fields', which was conceived as a sort of journey through different sonic landscapes. (Two weeks after its release it was among the top 10 records of all the European charts and in the USA it appeared in three categories: pop, jazz and classical!)

And now I have just completed 'The Concerts in China' double album. Half of it is new music so it's like a new LP actually. I've mixed a lot of sounds from China into the soundscore.

It all started with my strong interest in oriental music and my desire to get away from the very tight, static attitude of classical music in performance which is not adapted for electronic music. We must find other ways. It's not like the group 'moving on stage' approach either.

Certainly, the best rock bands I have worked with over the last twenty years have always presented themselves on stage with the audience in front. But now, with lasers and other audio-visual effects, you can imagine and think of a much better presentation in terms of what's going on in your performance.

I'd like to mention that after 'Equinoxe' I worked towards this end in a big concert at



## JEAN-MICHEL JARRE • THE CONCERTS IN CHINA



the Place de la Concorde given to an audience of a million people. It was really wonderful — the biggest concert ever made outdoors I think. I used a lot of projectors screened on to buildings and monuments over a 300 metre wide area and 30 metres high. I played 'Oxygene' and 'Equinoxe' and the visuals were completed with a lot of lasers, lights and fireworks also. I played my music by myself and because of the great difficulties in setting up the right sounds alone, I had to use backing tapes as well. But although the result was okay, I felt the next step would have to be playing entirely live.

So for China I decided to work with three other musicians: Frederic Rousseau, Dominique Perrier and Roger Rizzitelli, and to present all the music entirely live, with only sound effects on tape.

The electronic keyboard instruments were shared by myself, Frederic and Dominique, whilst Roger used no acoustic percussion at all — just Simmons drums with drum machines and triggered effects (e.g. hand claps).

Frederic is really responsible for all the sequences using the MDB polysequencer in conjunction with the RSF modules and then the Yamaha CS60 is used for chords and melodies. Dominique concentrates on the string sounds using the Eminent, Prophet, and the Korg PS-3300. Roger has some specially designed electronic drums from Simmons (with the first cymbal design that's an interesting sound).

Myself, I'm using the Fairlight CMI which has two keyboards that I use for programmed effects and special sound textures (like machines, voices and saxophone). Behind me is a bank of six EMS synths, with three AKS instruments above three VCS3s. I also use the Oberheim OBXa, an Eminent that has specially modified sounds, and the Moog Taurus Pedal Synth.

We had to do a lot of rehearsing together. It was a total challenge because it's actually the first time that so many different instruments have been on stage in this sophisticated set-up. Even more crazy was the challenge to play them in China, with all the problems of administration and actually entering the People's Republic.

After the success of the Place de la Concorde concert, I was asked to many countries, but I have always dreamt about China, which for a lot of artists was the last

unexplored place — to play in front of a virgin public is the dream of any artist! It was a big responsibility also — it was almost like 'Close Encounters of the Third Kind'! The film that was shown on U.K. television on May 3rd shows that very interesting aspect.

China for me was a fantastic country and when I went there for the first time I was totally seduced by the people — they are really very sensitive and musically aware. I brought the first synthesisers to China on my first visit (from '79). I had an EMS AKS in its suitcase and the Electro-Harmonics Mini-Synth, along with some effects boxes. The people I met were so impressed by them that I did some lectures at the Peking School of Music. These personal contacts over the two years certainly helped me to do the concerts.

Each of the concerts lasted two hours and I performed two concerts in Peking and three in Shanghai. We used a lot of laser writing in the large stadiums, projected on to transparent screens suspended around the stage area. These effects were synchronised to the music and the Chinese people were totally amazed by it all, obviously. That's a wonderful souvenir really, for groups like the Rolling Stones and Pink Floyd tried to get in to China without success. I think that the reason they have chosen me rather than other groups is maybe because the music I am doing is all electronic and that represents the music of tomorrow, which is not linked in their way of thinking to a sort of 'decadent' musical tradition. They are certainly very interested in all that is new and using modern technology.

Electronic music has to get out from its own ghetto also. Even the term 'electronic music' can be very dangerous, because for a lot of people it has a very narrow, unacceptable kind of meaning. You see, the fact that we are using electronic instruments must not be a sort of justification about the originality or value of what we are doing. We are just using these instruments because they can produce new sounds and some different feelings we want to express. It's not so important that we're using tom-toms, sitar, synthesiser or sequencer — it's the end result that counts!

We took an enormous amount of equipment to Peking from Paris on October 15th, 1981 — around 300 boxes with 15 tons of equipment, including 30 synthesisers, 35 amplifiers, 120 loudspeakers, 8 lighting

towers and 3 laser tubes. With me were 60 musicians, a TV film crew and a host of technicians and journalists. The tour wasn't without its problems of course — the first Peking concert very nearly didn't take place as a missing cable carrying the main power supply wasn't located until just 2 hours before I was due on stage. But the Chinese Government were very helpful in their administration and support of the concert.

We recorded everything at the concerts for the new album and after my return to France I completed the final mixing. The music does not explore microtonal scales but is based on pentatonic and traditional major/minor scales. Nevertheless, I had to write the orchestral music in their style of notation so this alone represented a lot of work.

On the album the new material is 'Night in Shanghai', 'Laser Harp', 'Arpeggiator', 'Orient Express', 'Souvenir of China' and 'Fishing Junks at Sunset'. The latter was played with a 34 piece Chinese orchestra — a confrontation of the oldest instruments with the newest!

**Would you say the music is still in your style of strong harmonies and split channel sequencing, appealing to a very wide listening audience?**

Absolutely yes, you see at the beginning of electronic music, so many people were just technicians who made the instruments. Although they were excellent engineers they weren't necessarily good musicians, so they made results that were 'technical' rather than being musically acceptable to many people. For a musician using electronics, if he doesn't know how to build a Fairlight, it's not important — but he must know how to use it and understand its processes.

Looking ahead, I shall be playing in Spain and maybe in Egypt. I certainly don't like to follow the same pattern of activities all the time. I also have plans for doing an outdoor concert in the U.K. at the end of August. [Jean-Michel's wife commented later that it would more likely be next year].

Performing is much more important for me now and I realise, of course, that there are a lot of problems in playing electronic music live. Groups using synthesisers in a rock way do not have the same problems and I am looking for a new kind of presentation. I do prefer the 360 degree audience set-up and not just one central point of visual interest, although you can get problems with the bass response if you extend speakers right around you. I would also like to use video screens to show close-ups of performers' hands playing the instruments and manipulating controls.

**With the thoughts of the visit to China very much in your mind, this was perhaps the most important cultural event from the West since the Moscow Circus of 1950, with over 150,000 people attending the concerts and millions seeing and hearing you on television and on the radio.**

It was a dream of mine for ten years and I hope that our concerts have opened the door for other western artists to go and perform their music in China.



## An analysis of The Concerts in China double album on Polydor P0DV3

### The Album

The album was recorded during five concerts presented by Jean-Michel in Peking's Capital Stadium and Shanghai Stadium in October 1981. The concerts were the first performances of rock or contemporary music ever given in the People's Republic of China. The recording was made by Rene Ameline and Patrick Auffour on the Flight Mobile with the SAJE console. Later mixed at the Ferber studio on MCI equipment by Rene and Jean-Michel, assisted by Pierre Mourey.

#### Side 1

**Overture.** Over a sustained synth low note, the Chinese female compère introduces Jean-Michel. Through applause and audience atmosphere the familiar alternating sequencer sounds left and right stereo octaves, following the sustained chord harmony as it slowly changes. A move up a tone suggests it is 'Oxygene' derived, until drums break in with some voices mixed too (the hiss tells you they're there). Polysynth slides move left and right, whilst drums keep the pulse moving. A synth solo with plenty of pitchbending improvises on top and the music creeps up the next tone. Drums get busier and the final synth note ends with fast LFO sine modulation.

**Arpeggiator.** This new piece once again receives an announcement before the appearance of a centrally placed bass sequencer pattern (based on root, octave and minor 3rd). Out of this comes a melodic sequence right, with left echo. Percussion 'castanet' clicks sound left, with reverb placed deep right, and then mellotron style 'aah' voices sweep in majestically at centre twice. Electronic drums add accents and eventually provide a flourish which leads to a new 4-beat sequence on 'flute' synth sound. This is based on the early bass sequence which itself returns.

Another sweeping sound, this time from a brass synth preset, glides across the stereo field and drops the tonal base. The alternating left to right melody continues and develops over sustained 'voices'. These echo away rapidly to another percussion break, leading to a repeat of the flute riff. Polysynth glides right down the frequencies as bass line punches in and out, and the 'Arpeggiator' rolls on like some magic musical machine. Central polychords punctuate and then the brass glides across to announce first a tonal drop and, soon after, a tonal rise (up a whole tone). Vocoder-like jazz style interrupts add interest over sustained voice sounds. The bass and flute riffs fade over applause and Chinese traffic/children sounds in rich stereo.

**Equinoxe IV.** A white noise swirl brings in percussive taps and sustained strings. Bass line and drums form a dialogue over the familiar Equinoxe chord structure. Suddenly a bubbling pattern from the VCS3s and AKSs enters, with short brassy motives based on the chords over strong drums.

A more tranquil mood takes over whilst electronic cymbals pan continuously from



#### Musicians:

**Jean-Michel Jarre:** Fairlight CMI, Eminent Strings, Oberheim OBXa Polysynth, Moog Taurus pedal synth, EMS Synthi AKS (x3), EMS VCS3 (x3), Elka X705 organ, Linn Drum LM1, Electro-Harmonix MicroSynth, Laser Harp (by Bernard Szajner).

**Frederic Rousseau:** MDB Polysequencer, RSF rack synth, Yamaha CS60 polysynth, Korg Rhythm Boxes, ARP 2600.

**Dominique Perrier:** Moog Liberation portable synth, Sequential Circuits Prophet 5 polysynth, Eminent strings, Korg PS-3300 polysynth, Kobol synth.

**Roger Rizzitelli:** Electronic percussion and Simmons drums.

**Pierre Mourey:** Instrument Technician.

side to side (with rest of percussion remaining at centre stereo). An outburst of a chordal theme follows, using a triplet rhythm to start, and strings accompany as drums drive on. To the right and left appear strong images of high pitched synth 'bubbling' patterns plus metallic taps, and synths with glide and vibrato make the music almost run on endlessly until the penultimate fade. Noise swirls back and high pitched sequence runs are filtered into the applause.

Side 1 ends with voices of Chinese people gradually fading out.

#### Side 2.

**Fishing Junks at Sunset.** [With the Peking Conservatoire Symphony Orchestra, Conductor Huang Feili.]

This piece was specially written by Jean-Michel to allow a unique marriage of the traditional instruments of oriental China with the Western electronic music instruments. It begins with a Chinese 2-string instrument melody set against an atmospheric background of boats and harbour sounds. Bases and other instruments are added from the orchestra until a typically oriental flavour is created for the flute melodies to peacefully play over. There's plenty of repeated note playing from the orchestral strings (in plucked mandolin/banjo fashion) and this first section is followed by electronic bass and Elka organ, plus synth flutes and 'tre-

molo' strings from the Eminent. Then the theme is played again, with a distinctly Western bass accompaniment, on 'guitar' sounding synth at centre. The Peking orchestra blends in again, whilst split synth notes are faded in and out at right/left channels. There is a brief but virtuoso style performance from an orchestral player (using a horizontal multi-stringed instrument rather like the Hungarian Cymbalom) and the flutes (and slightly out of tune timpani!) dominate the fascinating Chinese melody.

More harmonies are added to the orchestral repeat with a final speeded up flourish to end — note the harplike arpeggios.

Synthesiser enters boldly with a 'harp-chord/voice' melody using plenty of echo at right. There's a high sustained string note whilst synth patterns play at both sides and chords interject.

Back comes the orchestra, now with a strong oboe/trumpet quality (the instruments responsible use a double reed similar to the oboe's reed and have a trumpet shaped body about a foot long). A rather hasty climax is reached (it reminds me of the Mikado!) and whilst some old cymbals crash, the synthesiser runs creep back in. More synth 'voice' sounds add to the harmony, plus string and brass synth. All merge very successfully together — quite an achievement! (Even the synth runs seem to fit). Reserved applause follows.

**Band in the Rain.** A background of rain and distant thunder rolls sets the mood for a melancholy 'clarinet' synth theme on this short track which is accompanied by simple chords from a tuba-like sound and swing rhythms on a hi-hat cymbal. Definitely a Parisian flavour to this piece, with the synth melody at times almost becoming a solo accordion. A meandering legato synth entry marks a change, and strings counterpoint a similar melody accompanied by occasional electronic drum 'slaps'. As the melody reaches down to the bass notes, we quickly pick up a strong bass sequence that gets the audience clapping (almost in time!). The bass drum sound punctuates a quaver/dotted crotchet rhythm, whilst the sustained string harmony let's you know we've reached **Equinoxe VII.** Around the bass sequence and strings are oscillator notes dabbed in. Then a different string sound (with top cut and more resonance) moves the music on and the beat is decidedly catchy. Even the simple harmonic structure is attractive against the forceful beat.

Upward scales pour out of the right channel to be echoed in the left, and the drums' 'white noise' filtered cymbals add interest. A vibrato-like voice 'ooh' sound leads to a change of chord and 'piano' notes play on octave jumps as the music becomes quieter. Atmospheric sounds wash across the stereo field — listen for the Fairlight's sample of a saxophone, a favourite preset of Jean-Michel's, and enjoy the rich bubbling effects and swirling filtered notes. There's not really any real melody but the bass sequence binds it all together. Over the sustained strings we hear voices, sax, bubb-



ing, percussive and other sounds that fade to leave the final sax note.

The side ends with audience applause and the immediate background music filtering through for the concert interval.

### Side 3.

**Orient Express.** The opening marks Jean-Michel's arrival (on the film) at an airport in China and the title has little relevance except to a possible train clip at the end of this track. Bass and drums (with strong off-beat high pitched noise taps) start off and a simple chord passage is taken through Jean-Michel's now recognisable harmony, laced with left and right thin, resonant bubbling (from the EMS synths) and distant portamentos.

A drum break and effective bass fills bring about further repeats. Brass synth notes at centre add to the general activity and the drum beats *rallentando* to end.

The next snippet will no doubt become the hi-fi salesman's stereo demo example for months to come, as applause is followed by table tennis (!) and suggestions of a train from the Fairlight. These herald a 'flute' synth reminiscent of the glass harmonica.

**Magnetic Fields I.** Away go the noises leaving the gentle flute and CMI looped sound that suggests a continuously turning wooden implement in water. Distant voices, wandering melody, silky strings and tinkling metallic sounds all create a tranquil feel as the loop continues and fades. A deep bass note leads the ensuing faster sequence (slightly out of tune with the bass) which begins the **Magnetic Fields III** theme.

Metallic taps right and filtered cymbal left accompany the central drum accents and sustained strings in stereo. The theme repeats a little stronger while thin synth notes pick up melody notes. Octave syn-copated notes with glide are added right and echo left. The harmony repeats and the minor section with sustained strings brings more short synth note glides. It's a nice mix that floats along despite the persistent drums. A few more chords in this one too! A synth theme tries to break through but is almost swallowed up. Metallic clicks fade into the applause.

After another Chinese announcement, a low sustained synth note is set against the background audience atmosphere. CMI bell sounds and other effects blend with strings

(with noticeable octave jumps on sampled effects from the Fairlight keyboard). It's an interesting montage that spreads the stereo image in typical J-MJ fashion. This track is titled 'Laser Harp' but I'm not so sure — there's certainly no pentatonic flavour that was set for the Laser instrument. (In the film, the opening of 'Equinoxe VII' shows the Laser Harp!)

There's applause as the music fades and in comes Chinese radio clips that include part of Jean-Michel's music broadcast.

### Side 4.

**Night in Shanghai** is another richly atmospheric piece, with a definitely Oriental feel as the flute improvises against a CMI intermittent drone sample and bright percussive ad libs. Strings enter sustained and a looped 'turning wheel' is heard. There are drum taps centre, a gong and white noise as the bass holds and a sequencer enters (the left/right image) quite high using bright short attack/decay shapes. All this blends together in an impressionistic manner.

The continuously panned hi-hat cymbal from Korg KR55 drum machine becomes more apparent as the Fairlight melody ominously digs in like a rough cello. At centre drums accent heavily and a high synth plays single notes, reverberating around the stadium. The piece is based on one chord but is not at all monotonous, because the xylophone-like sequence seems to take the music up and down, whilst the drums certainly do their job of giving rhythmic variety. A final flourish from the Liberation (or Oberheim) takes the piece to its close on quiet strings, deep CMI notes and melodic percussion ad libs.

Through applause, the Elka X705 organ twangy guitar note is sounded, to burst forth into **The Last Rumba**. There's drum machine, string chords, countermelody poked in on a synth plus a Rumba bass line (root, 3rd, 5th/minim, crotchet, crotchet) from the auto accompaniment.

This very typical Latin American music brought some audience clapping to the beat, but is not exciting or innovative to Western ears. Nevertheless, the Chinese cheered! Amazing!

A powerful rhythmic beat launches us enthusiastically into **Magnetic Fields II**, which has the strongest melodic line on the album that's played centre with left and right

echoes, synth glides and 8-notes sequenced bass lines. I like the countermelody that adds downward arpeggio-like interest. A short drum break brings a repeat. Some extra harmony lines have been added, compared with the original version on the *Magnetic Fields* LP but the chords do not bite as much. Nevertheless, the rhythm is precise and effective. A solo synth improvises with plenty of echo over tonic minor and dominant 7th (plus flattened 9th) harmony. Some good polyphonic pans left to right (with harmonised treatment) add excitement and although the bass could have been stronger, it's altogether an exciting live performance. An amusing 'nasal' bass ends with tumultuous cheering and applause.

Street noises fade in with camera clicks (that sync TV film shots) and Chinese everyday sounds — talking, street, harbour and school. Then a sudden crescendo dramatically projects a sustained voice sound. This is picked up by strings and mellotron style chords, then sustained 'plucked bass synth and left/right drums (semiquaver/dotted quaver x2, crotchet, and crotchet 'clap') with filtered resonant echoes. It's almost like a hymn for East and West, with the rich European musical texture interspersed with Oriental sounds. Children's voices penetrate the strings, bass and drums to give a melancholy quality full of reminiscence that finishes the album well. The camera clicks synchronise the music to the film shots. Brass polysynth chords add strength to the harmonies which form a continuous gentle modulation that never seems to end. Over a sustained 'aah', a voice is heard at right and a sudden percussion 'clap' ends this memorable live album.

## The Film

This 1½ hour film, *The China Concerts*, was shown on British Television on May 3rd 1981. Directed by Andrew Piddington, it is a captivating insight into the live performances in China, but at the same time forms a creditable documentary of The People's Republic of China. The film is edited so that we are continually switching from the stage performance to typical Chinese clips. The scenes of politicians, uniformed soldiers (who are well represented in the audience), industrial scenes, harbour, school and ghetto shots and in particular, peasants working in the fields have a moving and poignant quality that blends with the emotion of the music, and are underlined by the image of Chairman Mao.

There are some unique pictures of the audience reactions before and during the concerts, and the lasers and lighting provide a spectacle that many people in Western countries will not have experienced. There's no virtuoso playing by Jean-Michel, just an overall unity of performance between the players on stage. The fact that this film received 1½ hours on a National Holiday in the U.K. is tribute enough to Jean-Michel and represents yet another major advance in the general public's acceptance and appreciation of electronic music.

Mike Beecher

E&MM



# CARLSBRO

## BACKLINE

### COBRA BASS FEATURES:

- Band Pass Filters for instant sound selection.
- 60 watts RMS output.
- Hi, mid and lo controls.
- D/I output socket for slave or recording desk.
- Deep switch for bass boost.
- 15" Powertone speaker.

### COBRA LEAD FEATURES:

- Parametric Equalisation.
- Hi and lo tone controls.
- Bright switch.
- Two separate sustain systems.
- 60 watts RMS output.
- Accutronics spring reverb with new input circuit.
- Double footswitch for remote control.
- Reverb with the new Carlsbro input circuit.



**CHECK OUT THE NEW RANGE NOW!**

### COBRA BASS



### COBRA LEAD

For our new catalogue contact:  
CARLSBRO SALES LTD  
Cross Drive, Kirkby-in-Ashfield,  
Nottinghamshire, England NG17 7LD.  
Tel: (0623) 753902 Telex 377472.

# Carlsbro Minifex



The subject of effects boxes is guaranteed to put players firmly on one side of the fence, either positively for them, or equally positively against. It's understandable really: those against usually have purist instincts anyway, and shy away from any modifications to or distortions of their instrument's sound. Those in favour, on the other hand, can go too far in their direction, piling on effect after effect until you're not even sure what the instrument was in the first place. A happy medium uses effects sparingly, and thus more effectively, slotting the sounds into a total picture and resisting the 'new-toy' temptation of over-indulgence.

Without doubt, another important factor is cost (and when wasn't it, you ask?). Pouring over brochures and dreaming up all manner of outlandish sound creations is all very well, but when it comes to handing over the dosh to the shopkeeper, creativity can take a poor second place to economic considerations. Which leads us to consider three of Carlsbro's new Minifex units, made for them by Cliff Electronic Components. Those price economics we mentioned will be helped by the low to midrange prices of the boxes (inc. VAT), of which we chose three to look at: the Siren (£17.83); the Suzz (£22.28); and the Chorus (£49.91). The other units in the series are the Phaser (£35.65), the Flanger (£49.91) and the Compressor (£35.65).

The plastic cases themselves may look familiar enough to you as they've been used for various control applications, not least of which is Carlsbro's use of the multiple-function boxes for footswitch applications with their amplifiers, particularly for things like channel switching on two-channel amps. E&MM used the footswitch box for the Auto Swell project in the November 1981 issue, as well as the effects project this month.

It's easy to see why the casings are so popular: the light, strong plastic is perfectly suited to being kicked around stage and studio, and the silent, electronic switching used by Carlsbro is activated by a rounded flap on the front of the box, making it more reliable for players whose aim suffered with the old small-button type. At the top of the unit is space for a status LED which, thankfully, more and more makers are incorporating into their FX units, and on the sides are spaces for two control rotaries if needed — the actual control and interface set-up varies from pedal to pedal depending on what's required. Sockets are on the back.

The battery (9V, PP3-type) is reached by unscrewing two crosshead screws on the base, which also features a reasonably effective pair of rubber floor-grips. The battery-change unscrewing and rescrowing is a process which could prove frustrating in bad conditions (i.e. most gigs), and I must say I always seem to end up losing the screws at annoying moments (i.e. most gigs). Some sort of screwless, clipping cover would have been better although one suspects this could have put a few bob on the price. All you can do really, I suppose, is to ensure that you change batteries as in-



Suzz, Chorus and Siren Minifex units.

frequently as possible by using high-power alkaline types. There's no mains facility, which is a pity.

Let's look at the three review samples, then. We can dispense with the Siren pedal pretty quickly. There's only one socket on the back — an output, you'll be pleased to know. If you really want to, you can plug this into a spare channel on your amp — in other words it's completely separate from your instrument — and get on with your wailing. There's no LED, as it's pretty obvious when the thing's on: kicking the flap will give you — you guessed — a siren sweep, lasting for as long as your toe's on the thing. When you lift off, the siren dies away, cutting off short before the 'bottom' of the sweep. You'd soon tire of this rather daft effect, and the cut-off is annoying too. All in all, I'd spend the 18 quid on a Nickel Cadmium battery charger and batteries for the other pedals and forget this one.

And so to Suzz. This is Carlsbro's particular monicker for fuzz, overdrive, sustain, distortion, overload... call it what you will. We do have LED indication on this one — the Minifex units are actually switched on by the insertion of the jack plug into the In socket on the back, the labels for these sockets being thoughtfully moulded into the underside of the unit thus saving you the annoyance of finding labels peeled off. The controls on the side of the Suzz box are Gain (on the left) and Sustain (on the right), which are self-explanatory. The actual rotaries aren't marked, so it's impossible to line them up against anything — a dab of white paint can't cost much, and would make a lot of difference when it came to remembering settings. I found it was just possible to adjust the controls with my foot while playing, though I can't recommend the accuracy of this ploy (it was better when I took my shoes off, but this was environmentally risky).

At £23, the Suzz is fairly wild and raucous, but worth the cash. It certainly wasn't at all noisy, and I used it with varying degrees of success on guitar, bass, keyboards, and even on a drum machine, though I don't think I'll be repeating that in a hurry. Carlsbro's own description of the Suzz, that it 'produces the effect of overload distortion and sustain at all output levels', will do, and it's a good buy.

The most expensive of the three units we

looked at is, as you might expect, the Chorus pedal. The chorus sound must be familiar to most of you by now, for which Roland are chiefly to blame, having bolted chorus units into their amps and made sundry other items with the ethereal, jangling sound capability. The sort of 'multi-instrument' depth that chorus creates, through short delays and deviating sound sweeps, is particularly pleasing on arpeggiated guitar chords or on electric piano, although it's widely used in many settings — using it on bass can be rewarding, for example.

The Minifex Chorus is, like the rest of the series, relatively straightforward: it features an analogue delay line continuously varied by an LFO. The status LED is there to tell you when it's on, and either side of the case are rotary controls for Depth (on the left) and Speed (on the right). This is the usual degree of control given over chorus, although there are exceptions like the MXR Stereo Chorus which has three control constituents. Also standard on the Minifex is the fact that you can push the Speed control to a level which seems to be almost totally unusable in practice, although there may be the odd occasion when you could use the wobbly, out-of-tune effect for special things. Generally, though, you'd probably find yourself keeping the controls around their centre-points. The Chorus is a good, basic unit that does all you really need from such a device and, once again, the price is attractive.

One way of getting a slight improvement in signal-to-noise and a more powerful performance from the Minifex units is to patch them between the pre-amp-out and slave-in sockets on your amp, should it have them. Carlsbro, naturally, do — I happened to have a Carlsbro Stingray Pro amp when I tested the units, and this has the facility via 'Pre-Amp Out' and 'Slave' sockets to do the relevant business, which proved handy. The boxes do, of course, work well in the standard instrument/jack-lead/FX-box/jack-lead/amp arrangement.

Of the three boxes we looked at, the Chorus and Suzz can be recommended. We assume that the Phaser, Flanger and Compressor will be of a similar standard.

**Tony Bacon**

**E&MM**

The Carlsbro Minifex units are available from: Carlsbro Sales Ltd., Lowmoor Road Industrial Estate, Kirkby-in-Ashfield, Notts. Tel: 0623 753902.

# SALE ELECTRONIC GAMES



**NOW £40 OFF**

**ATARI T.V. GAME**  
 THE GAME WITH 50 CARTRIDGES  
 R.R.P. £129.95 (inc. VAT)  
**OUR PRICE**  
**£78.22 + VAT**  
 (= £89.95 inc. VAT)  
 The Atari is supplied with a free mains adaptor, a pair of paddles, a pair of joysticks and a combat cartridge and is the most popular television game on the market and has a range of over 40 different cartridges. In addition to the standard Atari range we also now stock the new Activision cartridges which are currently on special offer reduced from £18.95 to **£16.95 inc. VAT**

**ATARI CARTRIDGES**  
 20% OFF R.R.P.  
 Atari Soccer £29.95  
**NOW £23.95**  
 Activision Dragster £18.95  
**NOW £14.95**  
 Activision Boxing £18.95  
**NOW £14.95**

**ATARI OWNERS CLUB** — Why not join our **FREE** Silica Atari Owners Club and receive our bi-monthly newsletter with special offers and details of the latest new cartridge releases. Telephone us with your name and address and we will add your name to our computer mailing list.



**NOW £50 OFF**

**MATTEL INTELLIVISION**  
 THE ULTIMATE T.V. GAME  
 R.R.P. £229.95 (inc. VAT)  
**OUR PRICE**  
**£156.48 + VAT**  
 (£179.95 inc. VAT)  
**6 NEW CARTRIDGES JUST RELEASED:**  
 ASTROSMASH \* SNAFU \* BOWLING  
 SPACE ARMADA \* BOXING  
 TRIPLE ACTION  
 All 19 current cartridges + the six new ones above now retail at £19.95 — Silica special offer price **£17.95 inc VAT**

The Mattel Intellivision is the most advanced T.V. game in the world with a range of over 25 different cartridges all at our special offer price of £17.95. This game uses a 16-bit microprocessor giving 16 colours and three-part harmony sound. The picture quality is incredible with 3D effects and realistic animation. An add on keyboard will be available in the Spring 1982 to convert the Mattel into a full home computer with 16K RAM which will be fully expandable and programmable in Microsoft Basic. Other accessories will be added later in the year. The normal price of the Intellivision + free soccer cartridge is £229.95 but our special offer price is £179.95 inc. VAT saving you £50.00.

**MATTEL OWNERS CLUB** — Why not join our Mattel Owners Club and receive our regular newsletters containing details of all the latest cartridge releases. Telephone us with your name and addresses and we will add your name to our computer mailing list.  
**FREE 16 PAGE CARTRIDGE CATALOGUE** — If you are interested in owning a Mattel, we now have available a 16 page catalogue describing the latest six cartridges to be released, as well as a new Mattel colour leaflet with brief descriptions of all 25 cartridges. Telephone us for further details.

## T.V. GAME CARTRIDGES

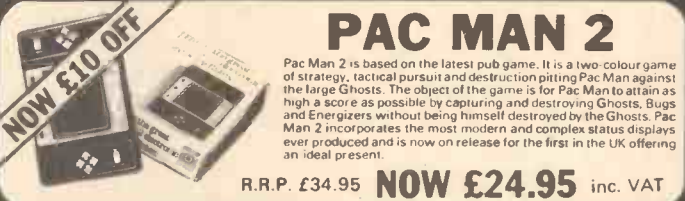
We specialise in the whole range of T.V. games and sell cartridges for the following games: **ATARI \* MATTEL \* ACETRONIC \* PHILIPS \* DATABASE \* ROWTRON \* INTERTON \* TELENG**. Let us know if you own any of these games and we will let you have details of the range of cartridges available.  
 Attention INTERTON & ACETRONIC owners we have over 75 assorted used cartridges in stock all with 1 year guarantee — **SPECIAL OFFER £8.95 each**

We also have a number of secondhand games and cartridges.



**NOW £8 OFF**

**HAND-HELD GAMES**  
**EARTH INVADERS**  
 These invaders are a breed of creature hitherto unknown to man. They cannot be killed by traditional methods — they must be buried. The battle is conducted in a maze where squads of aliens chase home troops. The only way of eliminating them is by digging holes and burying them.  
 R.R.P. £26.95 **NOW £18.95 inc. VAT**



**NOW £10 OFF**

**PAC MAN 2**  
 Pac Man 2 is based on the latest pub game. It is a two-colour game of strategy, tactical pursuit and destruction pitting Pac Man against the large Ghosts. The object of the game is for Pac Man to attain as high a score as possible by capturing and destroying Ghosts. Bugs and Energizers without being himself destroyed by the Ghosts. Pac Man 2 incorporates the most modern and complex status displays ever produced and is now on release for the first in the UK offering an ideal present.  
 R.R.P. £34.95 **NOW £24.95 inc. VAT**



**NOW £8 OFF**

**SPACE INVADERS**  
 Based on one of the most popular arcade games, Space Invader™ packs in lots of action with multi-shaped, brilliant LED vessels, including attack ships, bombs, defenders, missile rockets and a beam force cannon, plus exciting electronic sound effects. The attack ships attempt to bomb the ground defenders as they are moving. You manoeuvre the missile rockets — avoiding alien bombs — and destroy the invader force as quickly as you can Progressive degree of difficulty. Includes automatic digital scoring. For ages 6 to adult.  
 R.R.P. £24.95 **NOW £16.95 inc. VAT**



**SPECIAL REDUCTIONS**

**ELECTRONIC CHESS**  
 Liquid crystal battery chess computer with 100-200 hrs battery life and two levels of play. Comes with separate chess board and pieces.  
 NOW £6 OFF  
 RRP £24.95  
**SALE PRICE**  
**£19.95**  
 (inc. VAT)

**GRADUATE CHESS**  
 A de luxe version of the electronic chess set with integral chess board. The ideal portable chess set — see illustration.  
 NOW  
**£29.95**  
 INC VAT

**FIDELITY MINI-SENSORY CHESS COMPUTER**  
 The very first chess computer of its price to offer a portable computer with integral sensory board. Battery (6-8 hrs) or mains operated. This is a modular game and additional plug-in modules are planned for 1982 for advanced chess, popular openings, greatest master games, draughts and reversi.  
**MINI-SENSORY COMPUTER WITH STANDARD CHESS MODULE** WAS £54.50 **NOW £49.95 INC VAT**

Silica Shop are one of the country's leading specialists in Chess Computers and now stock a range of more than 20 Chess Computers, including Challenger 7/10/voice, Sensory 8 and Sensory Voice, Diplomat, System 3, Morphy, Great Game Machine, Voice Champion, and the new Scays Mark V.

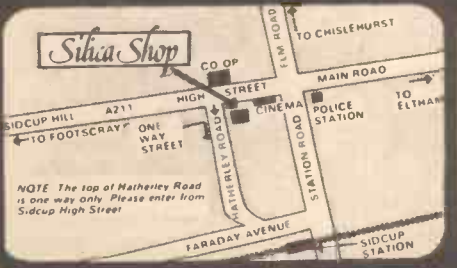
**LESS THAN 1/2 PRICE**  
**COLOUR CARTRIDGE T.V. GAME**  
 Semi Programmable T.V. game  
 • 4 cartridges  
 • mains transformer  
 NOW £43.50 OFF  
 RRP £73  
**SALE PRICE £29.50 inc. VAT**

**SCOOP PURCHASE NOW 1/2 PRICE**  
**BACKGAMMON COMPUTER**  
 Silica stock a wide range of Backgammon computers from £78.95 upwards. Special offers now available on Gammionmaster Was £99.95  
**NOW £48.95 inc VAT**

**CALL JOTTER — THE AFFORDABLE ANSWER**  
 The Post Office certified telephone answering machine  
 "Sorry darling, I will be late home — Love John"  
 The Call Jotter 1 brings the affordable answer at the amazing price of £69 (or £99 for the Call Jotter 2 with built-in remote recall facilities). These amazing telephone answering machines are Post Office certified and guaranteed for one year. They make a thoughtful gift for home or business use.  
**Call Jotter 3 illustrated TWIN TAP £139 NOW £69.00 inc VAT**

**NOW £75 OFF**  
**RADOFIN TELETEXT**  
 Plug the adaptor into the aerial socket of your colour TV and receive the CEEFAX and ORACLE television information services.  
**THIS NEW MODEL INCORPORATES:**  
 • Double strength character facility "True PAL Colour"  
 • Merit latest BBC & IBA broadcast specifications  
 • Push buttons channel change  
 • "Unnecessary" to remove the unit to watch normal TV programmes  
 • Gold plated aerial board for reliability  
**ADD-ON ADAPTOR**  
 WAS £199 inc. VAT  
**SALE PRICE £124 inc VAT**

# FOR FREE BROCHURES — TEL: 01-301 1111



For free illustrated brochure and reviews on our range of electronic games, please telephone 01-301 1111. Free delivery service available. To order by telephone please quote your name, address and ACCESS BARCLAYCARD number, and leave the rest to us. Post and packing Free of Charge. Express 48-hour delivery service available.  
**CALLERS WELCOME** — Demonstrations daily at our Sidcup shop open from 9am-6pm. Monday-Sunday (Early Closing Thursday 1pm). Late Opening Friday 8pm.  
**2 YEAR GUARANTEE** — All goods are covered by a full year's guarantee and many are further covered by our exclusive Silica Shop 2 year Guarantee.  
**MONEY BACK UNDER TAKING** — If you are unsatisfied with your purchase and return it within 7 days we will give you a full refund.  
**AFTER SALES SERVICE** — Available on all machines out of guarantee.  
**COMPETITIVE PRICES** — We are never knowingly under sold.  
**HELPFUL ADVICE** — Available on the suitability of your machine.  
**CREDIT FACILITIES** — Full credit facilities available over 12, 24 or 36 months at competitive rates of interest.  
**PART EXCHANGE SCHEME** — available on second hand machines.  
**CREDIT CARDS WELCOME** — Access Barclaycard, Diners Club, American Express.  
**SILICA SHOP LIMITED** E&MM 0682  
 1-4 The Mews, Hatherley Road, Sidcup, Kent DA14 4DX  
 Telephone: 01-301 1111 or 01-309 1111



# A HISTORY OF ELECTRONIC MUSIC

Derek Pierce

It is generally accepted that the release of Walter Carlos's 'Switched on Bach' alerted rock musicians to the potential of synthesisers. In 1966 Carlos had set up a private studio where he made electronic arrangements of popular songs including 'What's New Pussycat?' and 'Cherish'. By 1968 his album 'Switched on Bach' became the best selling 'classical' record of all time. It was nothing more than the selected works of J. S. Bach created by multi-tracking the Moog synthesiser. Whilst Carlos's craftsmanship in using the synthesiser is unquestionably good, the final result was not, in fact, 'electronic music' although many thought this to be the case. One of his better compositions 'Sonic Seasonings'<sup>1</sup> (1972) was much more in the spirit of electronic music. Divided into four movements, representing the seasons, it has the formal structuring found in the works of Henk Badings and Pierre Henry. However, Carlos's ability to realistically synthesise the timbres of musical instruments encouraged the use of the Moog synthesiser by rock musicians.

A year previous to the release of 'Switched on Bach' Electra records released 'The Zodiac Cosmic Sounds'<sup>2</sup> a mixture of poetry and music, the electronic treatments employed were by one Paul Beaver.

Beaver's later collaboration with Bernard L. Krause resulted in the release in 1970 of 'In a Wild Sanctuary'<sup>3</sup>. It presented environmental impressions recorded with Moog synthesisers, Hammond organ, congas, tablas, tambourines, drums, piano, and live voices of lions, birds and monkeys. "A celebration of life" to quote Krause. Later they contributed their electronic wizardry to albums by Simon and Garfunkel, The Rolling Stones, Byrds and The Doors, to name but a few.

Another 'electronic' duo whose work is probably better known on other people's LPs were Malcolm Cecil and Robert Margouleff. Working under the pseudonym TONTOS Expanding Head Band, an acronym for their synthesiser — The Original New Timbral Orchestra, they produced two albums 'Zero Time'<sup>4</sup> released in 1971 and 'It's About Time' in 1974. During that period they worked with soul singer songwriter Stevie Wonder producing, engineering and programming the synthesisers for Wonder's fusion of jazz-rock-soul music. A prime example being the 1973 album 'Innervisions'<sup>5</sup>. Wonder was probably the first black musician to use the synth and undoubtedly helped broaden black musicians' horizons. 1970 saw the release of 'Paul Bley's Synthesiser Show'<sup>6</sup>

Bley, a former member of Charlie Mingus' mid-1950's aggregation released the first jazz album to utilise the synthesiser as a "truly musical improvising instrument", a quote from the cover of the Milestone album. Annette Peacock, who had been given a synthesiser by R. A. Moog had also worked with Paul Bley. She concentrated on the electronic treatment of voice, and gave the first performance using a synthesiser in a 'live' situation at the 'Village Vanguard'. Amongst the curious audience were Herbie



Annette Peacock

Hancock, Tony Williams and John McLaughlin. A year later Annette signed to RCA and recorded 'I'm The One'. It was innovative in many ways, being the first album to electrically treat the drums, horns and voice. It was released in 1972, to unanimous critical acclaim: "Feeding her voice through the synthesiser, she is constantly shattering established boundaries of vocal expression, the first largely electronic album with the potential to reach a mass pop audience" — Chris Vanness, La Free Press (1972).

Although it acquired a cult following among critics and musicians, it remains an individual accomplishment a decade ahead of its own time. It did, however, stimulate Mick Ronson to release the title track on his own album 'Slaughter on Tenth Avenue', and also to record 'Love Me Tender' (an Elvis Presley song) precisely as Annette had interpreted it.

Despite the fact that David Bowie had been asked to vacate the studio during the recording of 'I'm The One', his enthusiasm for it led to her affiliation with his management 'Mainman'. She declined to appear on Bowie's 'Aladdin Sane' album or perform with him at the Radio City concert hall. Instead she chose to attend the Fulliard School of Music, appearing some while later in an exhibition of holograms with artist Salvador Dali.

These musicians were amongst the first mainstream jazz and rock musicians to employ synths. However, the rock music scene was changing; the troubles of 1968 were beginning to affect the musicians and their songs. The heady days of 'flower power' when rock music was deemed to have a somewhat more political and social function than previously gave way to a more violent and anti-establishment approach.

The Rolling Stones, whose anti-establishment-macho image had not fitted very well with the 'peace and love' approach of The Dead, Jefferson Airplane, et al, wrote some of their most compelling songs. 'Sympathy

for the Devil', 'Street Fighting Man', and 'Jumpin' Jack Flash', captured the more violent aspects of the times. Other bands developed along these lines, none more so than Led Zeppelin. Their impeccable musical skill, combined with high volume, dramatic stage effects and a sense of the grandiose led to the birth of 'heavy metal' music, with another exponent being Deep Purple. However, outside this generally accepted approach were bands influenced more by the previous psychedelic era, using for example, extended musical forms and greater instrumental colouring exemplified by the early works of the Dead, Quicksilver Messenger and Jefferson Airplane. One of the most notable of these groups being King Crimson. Led by guitarist Robert Fripp they combined a mild jazz influence with a quasi-symphonic structure and a touch of lyrical mysticism. Their debut in 1969 owed much of its impact to the use of the 'mellotron'. The mellotron-used pre-recorded tapes to produce the sounds of choirs, massed strings, brass etc, to give a grandiose and impressive quality to the music.

The timbral subtlety that the mellotron offered characterised much of King Crimson's music. One of the early works, 'Pictures of a City' (1970) combined Fripp's unique guitar sound with the mellotron and additional sonorous relations proceeded from the saxophone and flute. The song's structure was reinforced by timbral repetition, although a change in mood half way through deprived it of predictability, it ends in chaos, a cliché derived from earlier psychedelic bands. One other band, The Moody Blues made similar use of the mellotron, although they later performed with the London Symphony Orchestra.

## Part 6

### Into the Seventies



Illustration by Tony Thornhill.

Rock music was becoming sophisticated as a result of the influence of other forms of music. A band formed in 1968, yes, cited Stockhausen, Mimaroglu, Stravinsky, Jimi Hendrix, the Beatles, and jazz among their many influences. Yes approached the electronic medium via the use of orchestra, mellotron, and synthesiser and their songs contained long instrumental breaks exhibiting a wide range of timbres. In 'Close to the Edge' (1972) the opening section features filtered noise, frequency modulated tones, bells, organ chords and occasional rapid sequencer patterns. Later, equipment preset with different timbral shades was incorporated, making various sonorous possibilities a reality in a live performance. The multi-keyboard player with Yes, Rick Wakeman, contributed a great deal to this overall sophistication. His later solo work was, however, little more than a self-indulgent display of keyboard virtuosity.

One other group who employed electronics as effectively as Yes were Emerson, Lake and Palmer. Keith Emerson had played keyboards for The Nice whose 1968 recording 'The Thoughts of Emerlist Davjack' had already established Emerson as a flamboyant virtuoso of the keyboard. The Nice had previously been the backing band for British singer P. P. Arnold. However, Emerson's showmanship often upstaged her and they eventually parted company. The Nice often revamped jazz and classical themes. Amongst the most favoured of these were 'Rondo' and 'America' from West Side Story.

Emerson soon left The Nice, joining with Greg Lake, who had been in the first King Crimson, and with Carl Palmer, to form ELP. Whilst Rick Wakeman had been noted for his stylistic mannerisms lifted from classical

music, Keith Emerson chose compositions around which to base his improvisations. A good example being Mussorgsky's 'Pictures at an Exhibition' (1971). The character is retained, and indeed whole sections are left intact, i.e. 'Promenade', but the rest serve as stopping off points for group improvisation and development. Various synthesiser applications included amplitude, frequency, and ring modulation, white noise, slow filtering and oscillators tuned in seconds and fifths. Similar effects are used in Ginastera's 'Tocatta' which ELP recorded in 1973. Choral effects were produced by tuning oscillators in unison and changing waveforms.

Keith Emerson was also fond of ring-modulation and based his choice of timbre on structural relationships. His music was always interesting because it avoided triteness and unnecessary repetition.

Matching Mole, contemporaries of ELP, used electronics in a much more subtle way. In their piece 'Gloria Gloom' from the album 'Little Red Record', Brian Eno's use of simple melodic patterns on the synthesiser together with sustained tones, glissandi, filtering, ring modulation etc. combines to produce a soft and impressionistic atmosphere. Eno's contribution to 'Gloria Gloom' is obvious when the song is compared with others on this album. The other songs are much less imaginative in their use of electronics and 'Gloria Gloom' hinted at the talent of Brian Eno and his 'non-musicians' approach to the synthesiser. This non-musicians attitude was soon to be found on Roxy Music's first album. Brian Eno had joined Roxy Music in 1971. They were to become one of the most successful bands of the '70s. The original line-up had been put together by vocalist/

pianist Bryan Ferry and bass player Graham Simpson. Andy Mackay on saxophone was a former member of the National Youth Orchestra. Paul Thompson played drums and Eno, primarily the sound mixer, was joined by Philip Manzanera who later replaced guitarist David O'List, to become Roxy's long standing guitarist.

Ferry had expressed a liking for Smokey Robinson, Ethel Merman, Marcel Duchamp, Leadbelly, Andy Warhol and the Velvet Underground. Eno's antecedents were a little vague, but he had been involved in the electronic music scene and was familiar with the work of John Cage, Terry Riley, Morton Feldman et al. He also sang with his own rock band, Maxwell Demon. It was not surprising therefore that Roxy's music was unique and was to catch the ears of the media. They were soon to be managed by David Enthoven, responsible for handling ELP, King Crimson and T. Rex. Their first album, produced by Pete Senfield entered the charts as well as debut single 'Virginia Plain'. Eno's later collaborations and solo efforts will be looked at in the next part.

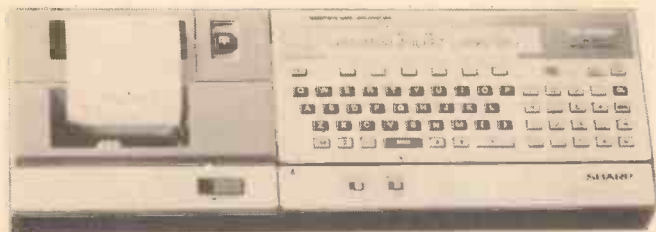
**E&MM**

#### Discography

- (1) *Sonic Seasonings*. Wendy Carlos (1972).
- (2) *The Zodiac Cosmic Sounds*. Wendy Carlos (1967).
- (3) *In a Wild Sanctuary*. W. Carlo and Krause (1970).
- (4) *Zero Time*. Malcolm Cecil and Robert Margoureff (1971).
- (5) *Innervisions*. Stevie Wonder (1975).
- (6) *Paul Bley's Synthesiser Show*. Paul Bley (1970).
- (7) *Close to the Edge*. Yes (1972).
- (8) *The Thoughts of Emerlist Davjack*. The Nice (1967).
- (9) *Pictures at an Exhibition*. Mussorgsky.

# THE SENSATIONAL NEW SHARP PORTABLE COLOUR COMPUTER

A briefcase system that approaches the  
Personal Computer in ability



**FULL SYSTEM UNDER £350 = VAT**

**PC-1500.** Up to 11.5K user memory (3.5K PC-1500 + CE-151 or 8K CE-155) maintained during power-off and battery change.

**16K Extended BASIC** language for powerful programming (PLUS CE-150 8K Graphics BASIC).

**C-150 FOUR colour high resolution (500 x 200) printer/plotter** with 9 type sizes and 4 print directions.

**TWO cassette control**, for bulk data & program storage, with remote control. Full range of science and math functions (statistics with MICROL software).

Up to **thirty-six separate programs** immediately accessible.

**Twenty-six character LCD display** doubles as 1092 point mini-graphic display with BASIC program control.

**256 frequency tone generator** with BASIC repetition, frequency and duration control.

**Built-in month, date, hours, minutes and seconds clock**, usable in BASIC programs.

One and two dimensional arrays (numeric and text).

**Full range of text manipulation functions** (LEFT, RIGHT, LEN, VAL, MID, CHR, ASC etc).

Ergonomic QWERTY typewriter-style keyboard with separate numeric keypad.

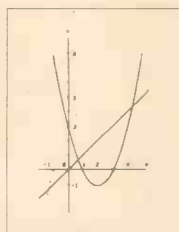
'Advanced' programming capabilities with PEEK, POKE, CALL etc.

**350+ page User Manuals**

**Sixty-way system expansion socket** for optional add-ons (see below).

Three-way power option (with CE-150) — standard HP7 batteries for PC-1500, or EA-150 mains adaptor. CE-150 contains rechargeable batteries and is supplied with EA-150 adaptor.

**Optional add-ons include:** CE-150 printer/plotter/cassette adaptor, CE-151 4K memory module, CE-155 8K memory module, CE-153 140-key custom keyboard (summer 82), RS232C communications interface (Autumn 82), custom cassette recorder (Autumn 82), custom system briefcase (Autumn 82).



Equational Graph (printout)

## PRICES, including VAT:

PC-1500 COMPUTER £169.95

CE-150 PRINTER £149.95

CE-151 4K RAM MODULE £49.95

CE-155 8K RAM MODULE £79.95

## DIMENSIONS

PC-1500: 195W x 25.5H x 86Dmm (7.11/16 x 1 x 3.375") Wt 375g (0.83lb).

CE-150: 330W x 50H x 115Dmm (13 x 2 x 4 inches). Wt 900g (1.98lb).

## MICROL 1500 SOFTWARE SERIES

Powerful ready-to-run applications software for science, engineering, business and the professions. Major features include: 100% reliable performance, user-friendly operation and instruction manuals, no computer experience required, compatible with future hardware and software developments.

## COLOUR BROCHURE ON REQUEST

Prices include Post and Packing. Delivery normally be return of post. Send cheques, P.O. or phone your Access/B'card/Visa card number to:—

# TEMPUS

Dept E&MM, 38 Burleigh St,  
Cambridge CB1 1DG.  
Tel: 0223 312866

# TEMPUS

The leading  
Casio Mail Order  
Specialists

**FREE** Accessories worth up to **£50** with keyboards **FREE!**

**COMMON SPECIFICATIONS.** All Casiotones, except VL-Tones, are 8-note polyphonic. They all have built-in amplifiers and speakers, with output jacks for headphones and external amplification and a pitch control. CT models are mains only and have a 4-voice memory function, plus Volume and Sustain pedal jacks.

## CT-403. AUTO CHORDS & BASS, RHYTHM BOX.



**£275**

**PLUS** Accessories worth **£35 FREE!**

This best selling easy-play 4-octave keyboard has 25 pre-set voices with Vibrato and Sustain. The 16 rhythm accompaniments have a drums "fill-in" variation. Casio Auto Chord function allows one-finger chord playing, plus major, minor and 7th chords. 30% x 11 1/4" x 4 1/8" inches. Weight: 17.6lbs.

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



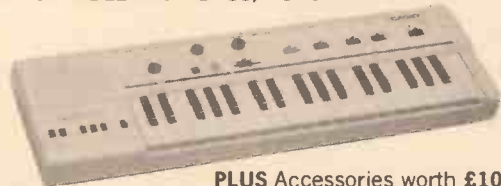
**£275**

**PLUS** Accessories worth **£35 FREE!**

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. 34 1/2" x 11 1/2" x 3 1/2" 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. 30% x 11 1/4" x 4 1/8" inches. **£25 worth Accessories £195**

## MT-40. A PORTABLE WITH BASS, AUTO & RHYTHMS.



**£99**

**PLUS** Accessories worth **£10 FREE!**

This beautiful new lightweight has a 3-octave keyboard, plus 15 key bass keyboard with automatic accompaniment feature. 22 brilliant voices, with Sustain and Vibrato; 6 superb rhythms with dual fill-in. Battery powered, or optional mains adaptor (£5). 23 x 7 x 2 1/8 inches. Weight: 4.9lbs.

## MT-31

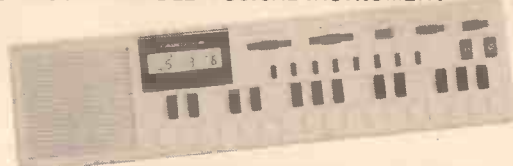


**£69**

**PLUS** Accessories worth **£6 FREE!**

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



**With 2 FREE BOOKS worth £5.90, £35.95**

Record and playback melodies with this 100-note sequencer, with editing facilities. Choose one of the 5 voices, or set ADSR and add one of the 10 rhythms, with tempo control; then playback by means of the ONE-KEY PLAY, or AUTO PLAY buttons. Also a calculator. Battery powered, with memory retention. Mains adaptor £5. 11 1/2" x 3 x 1 1/2 inches. Weight: 15.4oz. Manual & Song Book.

VL-10. Slim Executive version of VL-1. 7/16 x 7/8 x 2 1/2 inches

**£26.95**

**SEE OPPOSITE PAGE FOR ORDERING DETAILS**



# WE GIVE YOU MORE

## CASIOTONE VL-5



**CASIOTONE VL-5 (RRP £89.95) ONLY £79.95**

**PLUS Accessories worth £10 FREE!**

**PROGRAMMABLE 4-NOTE POLYPHONIC  
3-OCTAVE KEYBOARD**

**COMPLETE PROGRAMMABLE 8-NOTE POLYPHONIC  
5-OCTAVE KEYBOARD**

The VL-5 can read and store Casio's BAR-CODED music, using the light pen supplied. Enter up to 240 melody line steps into the memory from the same music books that are available for the Casiotone 701. Alternatively, you can program the memory directly from the 3-octave keyboard, with full editing controls, allowing you to add or delete notes. A digital LIQUID CRYSTAL DISPLAY is incorporated which displays the step number of the memory, the musical score and the pre-set voice which has been selected.

**REPLAY.** Select one of the 10 voices — Flute, Bagpipe, Clarinet, Violin, Trumpet, Pipe Organ, Harpsichord, Piano, Pretty and Funny. Choose the appropriate Auto Rhythm — Waltz, March, Rock, Swing, Samba, Rhumba, Slow Rock and Metronome. Set the Tempo Control, push the Auto Play button and the VL-5 will replay your stored melody. The Repeat button can give you up to 15 non-stop replays. You can accompany the melody on the keyboard, using one or two notes.

Alternatively you can play each stored note in the correct sequence simply by tapping the One Key Play button. Add an auto rhythm and an unskilled player can become an instant musician!

**MANUAL** playing can be accomplished on the 3-octave mini keyboard, playing up to 4 notes simultaneously and auto rhythms can be added.

**OTHER FEATURES.** The VL-5 has an integral amplifier and speaker, plus Line Out and Headphone sockets. There is a Volume control, Tempo control, Balance control, Pitch control, 4-voice tone memory and built-in Sustain switch. The VL-5 can be powered by 5 AA size batteries (supplied) or by the optional AC adaptor, AD-1E (£5).

Dimensions: 33 x 320 x 86mm (1 3/8 x 12 3/8 x 3 3/8 inches), Weight 510g (18oz). Supplied complete with light pen, soft cover, batteries, instruction manual and music book.

**Casiotone**  
— ELECTRONIC KEYBOARDS —

sensational



**CASIOTONE 701 £495**

**PLUS Accessories worth £50 FREE!**

**COMPLETE PROGRAMMABLE 8-NOTE POLYPHONIC  
5-OCTAVE KEYBOARD**

"One of the most advanced teaching aids so far developed... this instrument is going to be one of the biggest sellers of 1982" — *Electronics & Music Maker*. "What is going to be THE instrument of 1982... it is probably the best instructive keyboard I have come across. But it is also a top line musical instrument capable of satisfying even the most proficient musician... I suggest you place your orders now." *Keyboards & Music Player*.

**PROGRAM** an entire piece of music into the memory of this revolutionary organ. Enter the music, specially scored in bar code, by means of the light pen supplied, or program in your own melody (up to 345 steps) and chords (up to 201 steps) via the keyboard, with full editing and repeat facilities.

**PLAYBACK** the entire piece automatically. Each melody note and chord played, is indicated by LED lamps above the keys. You can even play along with the melody using up to 3 notes. Practice the timing of the melody line, using the ONE-KEY PLAY button and varying the duration and tempo of your keystroke, then add rhythm, chords and bass. Now switch to MELODY GUIDE and the keyboard lamps will prompt your fingering, indicating the next note to play, while the 701 accompanies you.

**MANUAL** playing is a pleasure on this 5 octave keyboard, split into 2 and 3 octaves. Choose any one or two of the 20 "breath-takingly clear and bright" (K & MP) preset voices for the two manuals.

**CHORDS.** Select one of the 3 chord functions. OFF for normal playing without auto accompaniment, FINGERED for automatic accompaniment by fingering the chords, ON for automatic accompaniment using one finger. Chords, walking bass and arpeggio will be synchronised with the rhythm chosen. 16 superb rhythms are available, with a drum "fill-in" variation and two sound effects buttons.

**CONTROLS.** Variable Vibrato and Sustain. Volume, Tempo and Balance. Rhythm Start/Stop and Synchro buttons. Full range of programming and editing controls with a digital display. Pitch control. Foot volume and sustain pedal jacks, headphone and line out jacks. Mains only. Dimensions: 958 x 341.5 x 127.5mm (37 3/8 x 13 1/2 x 5 inches). Weight 12.5kg (27.6lbs). Supplied with instruction manual and music books.

**CASIOTONE 601 £395**

**PLUS Accessories worth £50 FREE!**

Identical to the 701 above but without the programming facilities and the keyboard lamps. Weight: 12kg (26.5lbs).

PRICES are inclusive of VAT and Carriage.  
FREE ACCESSORIES must be requested and specified when ordering.  
SEND cheques, PO or cash (Registered) by FREEPOST — no stamp required — or telephone your ACCESS/VISA/BARCLAYCARD number to:—

# TEMPUS

Dept E&MM, 38 Burleigh St,  
Cambridge CB1 1DG  
TELEPHONE: 0223 312866

### ACCESSORIES

VL-1 Song Books nos: 2, 3, 5, 6, 7	Each £2.95	
60 of the World's easiest-to-play Songs	£4.50	
800-page Music Encyclopedia	£14.95	
Bar-coded/standard notation Music Books (pair)	£5.25	
CS-H Domestic stand for CT models	£30.00	
CS-P Stage stand for CT models	£35.00	
CS-E Second keyboard extension for CS-P	£12.00	
VP-E Volume pedal for CT models	£25.00	
SP-E Sustain pedal for CT models	£6.50	
HC-2 Hard case for CT 101/403	£44.00	
HC-3 Hard case for CT202	£44.00	
HC- Hard case for CT701/601	T.B.A.	
PC-2 Hard case for MT31/40	£9.95	
AD-1E AC adaptor for MT31/40/VL-5	£5.00	
AD-4160 AC adaptor for VL-1	£5.00	

**FREE SECURICOR 24-hour delivery on CT models only.**  
**Same day despatch by Post for smaller models.**  
**Extended 18-month guarantee by TEMPUS.**

FREE CREDIT (subject to approval) on CT models. 0% interest, 20% deposit, 12 monthly repayments, OR reduced rates for longer periods.  
FREE CREDIT (0% interest) for the first 8 months with ACCESS, BARCLAYCARD or VISA purchases. Send for full details of our credit terms.

# TEMPUS

FREEPOST,  
Dept E&MM, 38 Burleigh St,  
Cambridge CB1 1DG.

Tel: 0223 312866

Please send details of: Model(s).....Credit terms.....

PLEASE SUPPLY.....Keyboard(s). Total £.....

Plus my choice of FREE accessories valued at £.....

Total remittance enclosed £.....

Or debit my ACCESS, BARCLAYCARD or VISA account:

Number: .....

Name: .....

Address: .....

.....E&MM

# E-mu Systems Emulator



The rest of the '80s looks set to be the age of the musical biopsy, courtesy of machines dedicated to sampling your favourite miaow / bark / scream / cackle / moo (delete where appropriate) and letting you play with such more or less musical inputs until the synthetic cows come home. Moving to the analogies department, it's a bit reminiscent of the "Carry on Screaming" film where a severed finger (a digital sample...) was regenerated into a fully-fledged hairy monster after a judicious jolt from the National Grid. And whilst instruments like the E-mu Emulator aren't exactly capable of making something out of nothing, they are capable of making a lot out of a little, whether it be an entire string orchestra from a single violin, or a dawn chorus from a single, solitary tweet.

The principle of digital sampling is fairly straightforward: firstly, a sound is 'caught' by converting a certain length of sound into a stream of data via a fast A/D converter; secondly, this is stored in a suitable chunk of RAM and loop points are set up so that a particular segment of the 'captured' sound is repeated when a key is held down; then, thirdly, the data is 'released' out of memory and passed through a D/A converter at rates dictated by pitches entered from a keyboard. As far as putting this theory into practice is concerned, the Fairlight CMI beat everyone else to the goal of high quality sampling, and the reputation that it now enjoys is thoroughly justified. The Emulator, on the other hand, is much cheaper (£4,750 for the 8-voice version, as opposed to £17,500 for the Fairlight), much easier to use, and produces sounds of stunning quality.

## E-mu Systems Inc.

E-mu Systems don't have quite the fame (and fortune) of Sequential Circuits, but they have been making their name felt (and heard) for the past 10 years in the States. E-mu's founder, Dave Rossum, moved from working on the biochemistry of ribosomes to designing and manufacturing modular synthesizers with the idea of making the best instrument that money could buy. His modular systems certainly are superb and their use in many studios attests to this. They're also very expensive; the Audity, a computer-controlled polyphonic synthesiser, with dual floppy disks, 16-channel polyphonic keyboard/sequencer with its own disk for sequence storage, and 16 analogue voice cards, costs the princely sum of \$69,200!

Dave Rossum was also responsible for much of the development of the Solid State

Music series of synthesiser chips and some of the design work behind the Prophet 5 and Oberheim synthesizers. The Emulator is, therefore, something of a radical departure for E-mu Systems and represents their first wholly digital 'synthesiser' (or, more strictly, a 'reproducer'). Modular systems are obviously tricky breadwinners, and the attention that the sampling capabilities of the Fairlight was getting convinced Dave Rossum that the Emulator should be something that the electronic music community would take to.

## Design

The design of the Emulator is nothing if not rigorous, and the sleek, grey, roadie-resistant, steel case shows this — even down to the nice touch of a recess in the top for storing floppy disks. The keyboard is a standard, 4-octave unit and, on the left hand side, there's some reassuring Moog-type modulation/pitch bend wheels. In the same area, there's also a 5¼" disk drive that's angled for easy disk insertion, and the controls for the polyphonic sequencer. The rest of the controls are well laid out with plenty of LEDs for status indication and so on. Inside, the same quality of construction is continued (though we can't show it) with a main processor board (high speed Z80, 128K of RAM, firmware ROM, and various parallel/serial interface chips) linked by ribbon cable to the two 4-voice cards, disk drive, keyboard, and front panel controls. Sampling of sounds is from a mike or line input with low-pass filtering and a programmable threshold to start the procedure. A sample rate of 30kHz is used, but the bandwidth is limited to 10kHz — well below the Nyquist limit of 15kHz for this sample rate.

Of the 128K of RAM, something approaching 120K is reserved for sounds, so that, with the normal 2-octave upper/2-octave lower keyboard split, approximately 60K is allocated to each sound, i.e., enough memory for 2 seconds duration. The Emulator uses companding 8-bit A/D and D/A conversion, giving a signal to noise ratio of around 72dB (compared with approximately 52dB for straight 8-bit conversion). There's also that troublesome thing called quantisation noise (a product of the roundoff error encountered with only 256 amplitude steps in 8-bit conversion) to bear in mind, but E-mu's quoted performance of 72dB signal to quantisation error suggests that they have this licked. Rather than using a fixed low-pass anti-aliasing filter on the output (at 10kHz, for instance), E-mu have elected to put a tracking VCF on the outputs. Thus,

whatever the pitch that's being outputted, the relationship between bandwidth and anti-aliasing filter cutoff frequency can be constantly adjusted — a very slick idea.

In use, the Emulator is phenomenally quick at loading and saving large chunks of sound/sequence data from and to disks. E-mu use a super-duper Magnetic Peripherals disk drive which makes my Apple disk drive green with envy at the idea of shifting 60K of data in just a few seconds, but, then, that's the great benefit of DMA (direct memory access). It's not for nothing that DMA is called the I/O superhighway! E-mu also have another trick up their sleeves when it comes to outputting sounds at a required pitch: they use high frequency VCOs to direct the data flow rate in the output channels and therefore to determine the pitch of the DMA'd sound data.

So, on the technical side, the Emulator is a very clever piece of design, but, before I get too carried away with what goes on under the bonnet, let's return to its musical attributes.

## E-music

The first thing that happens when the Emulator is switched on is that all the panel LEDs light up and the disk drive motor starts whirring into action. This is the machine's way of saying that it's waiting to be fed with a diskfull of data. Each Emulator disk comes charged with a couple of 60K sounds (or multi-sample subdivisions of this amount), a 900-note sequencer file, and some software. The software serves to update the routines contained in the firmware ROM. This way, any software improvements are as simple as feeding the disk drive with a new disk. The only trouble with this approach, rather than updating firmware, is that every disk in your catalogue of sounds would also have to be updated (using the Software Replicate function), and that could be quite a task if you collect sounds like a squirrel collects nuts. Both sounds on a disk are loaded into memory immediately after the system software, and the keyboard becomes active just a few seconds after the booting-up procedure.

GET LOWER and GET UPPER load the two halves of the keyboard with sounds from a different disk. A nice feature of the Emulator is that both halves of the keyboard remain active during the load procedure, though the results of playing on the half of the keyboard into which the load is happening depends on the relative lengths of incoming and outgoing sounds. So, if they're both short sounds, it should be possible to play the new sound after only a second or two of the load



# The best of both worlds



PPG combines the best of both analog and digital technology allowing you to change the sound quickly and effectively whether on stage or in the studio.

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.

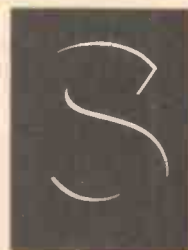
The Wave 2.2's advanced digital recording system allows eight tracks to be recorded, either

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.

The Wave 2.2 can also be expanded into a full waveterm system allowing real sound sampling, digital wave synthesis and so real time composition.

The PPG is the only synthesizer that offers the combination of the best in analog and digital sound.

Syco Systems Ltd.,  
20 Conduit Place, London W2.  
Tel 01-723 3824/44  
for an appointment.



**Digital wave Synthesis plus analog filtering polysequencer expandable to the full waveterm system. Prices start from only £2,995.**

## E-mu Systems Emulator



The Sequencer section.

cycle. Other functions in this area of the Emulator include SWAP, which swaps around the upper and lower sounds, and SAVE, which stores both sounds currently in memory on to disk together with anything in the sequencer. The disk operations of the Emulator really seem impeccable; indeed, E-mu mention that they were able to load sounds 56,000 times in succession from a single disk without any problems!

Most of the ever-propagating library of sounds supplied by E-mu are in what they call a 'short release' mode (exceptions are sound effects and percussion sounds, which are preset in 'natural release' mode). With short release, releasing a key always results in the immediate termination of the sound, regardless of whether or not the recorded sample has come to its end in being accessed from memory. The alternative of natural release means that pressing a key results in the complete sample being played, regardless of when the key is actually released. Release time options of either 0 or 2 seconds may seem a bit extreme, but various other features make this choice more flexible. Firstly, a release foot switch can be used to change the release mode from natural to short, or vice versa, i.e., something like a digital sustain pedal. Secondly, the natural release can be tailored by truncating the actual sample length to something in between the minimum and maximum. This takes us to the sustain/filter section of the unit. A couple of sliders are assigned to various functions according to the status of the TRUNCATE/FILTER button. When engaged, this button sets the upper slider as a means of adjusting the truncation or end point of a sound. Similarly, the lower slider then determines the cutoff point of the output filter. With this button's LED off, the sliders then serve to determine the start point and length of the sustain loop. In practice, all this is reasonably common-sense, and it's really just like getting a tape loop into the exact synchronisation that you're after. However, the Emulator goes one step better than this because it also adds a 3-stage envelope to the sampled sound, and, by manipulation of sliders and so on, the attack, sustain loop, and decay portions can be set. Generally speaking, short sustain loops, with a small number of waveform changes, work best with relatively unmodulated sounds, but instruments with a lot of modulation, like breathy flutes, strings, or voices, need rather longer waveform loops. Of course, these sustain controls can also be used to create new timbres in addition to just recreating the originals as authentically as possible.

The satisfactory editing of a sound is probably the most time-consuming (but very satisfying) side of using the Emulator, and there's no way that any micro can actually

improve the decision-making that goes on in your brain between hearing a sound and accepting that it's just what you're looking for! In fact, looking for sounds could become something of a preoccupation for Emulator owners — forget the etchings, come up and hear my emulates...

With sounds firmly ensconced in memory, the Emulator also adds a generous helping of real-time performance controls: firstly, a doubling mode, selected by a foot switch, allows one to play notes on the lower keyboard section and have these notes automatically doubled by whatever sound is programmed into the upper section; secondly, there's the vibrato and pitch bend wheels, with the options of assigning vibrato control to either or both of the keyboard sections and using another foot pedal in place of the modulation wheel for vibrato depth. Other features include dynamic keyboard allocation with channels assigned on a last-key-pressed priority basis (great for auto-anti-phonical effects), a tuning control for both halves of the keyboard, and a choice of either separate left and right outputs or a mono mix.

### Multi-sampling

Unfortunately, some sounds with pronounced resonances tend to work less well with the Emulator's pitch shifting technique than others. This is particularly true of the saxophone and the male voice, where the shifted resonance frequency automatically resulting from any attempt to change pitch tends to demolish the identifying characteristics of the original sound, or, as E-mu put it, "the effect is not that of a person singing different notes, but of bigger and smaller people". To overcome this, E-mu have introduced a multi-sampling technique that uses 8 samples over the 4-octave range of the keyboard, so that, on playing, no single sample will be shifted more than a few semitones in either direction, thereby preserving the correct resonant frequencies. In addition, by recording different sounds into each half octave section, it is quite feasible to have, for example, eight entirely different percussion sounds or sound effects available on the keyboard at one time. To do the multi-sampling yourself, another piece of software is needed (costing an extra £250). With this Multi-Sample program, each time you make a recording, the Emulator uses all the currently available memory. Truncating that sample then frees memory for use by the next half octave section, and so it continues until all eight samples are loaded or you're out of memory. Furthermore, each half octave section can have its own loop and filter settings and be individually tuned to match the other sections. So, if one's aim in life is to make the Emulator sound like a



The Sustain/Filter section.

cathedral organ, Steinway grand, or whatever, then multi-sampling is the ideal way of achieving a result which is virtually indistinguishable from the real thing.

### Sequencer

A recent addition to the formidable armoury of the Emulator is the polyphonic sequencer, and this can also be retrofitted to earlier versions of the instrument. The Sequencer section is situated to the right of the modulation/pitch bend wheels and comprises just six buttons. In fact, this simple façade is deceptive, for the E-mu sequencer is a pretty powerful beast. A total of 900 notes can be stored in the combination of two sequence 'bins', though there's also an 'extra' bin designed to be rather like an emergency fuel tank, as it makes sure that one doesn't inadvertently store something over a sequence that was essential to one's musical existence, the old sequence simply being shunted into the extra sequence bin out of harm's way. By judicious manipulation of the STORE, RECALL, and STOP buttons, all the usual behaviour patterns of polyphonic sequencers can be emulated, but more complicated stuff is also possible, including adding notes to the end or beginning of a sequence, truncation, and overdubbing. With the latter feature, the sequencer both stores and recalls sequences at the same time. Even this is rendered fairly painless because the extra sequence bin is always used for storing the original sequence as it was before an overdub was added — E-mu's anti-goof facility! Sequences can be overdubbed as many times as one likes, even with all 8 sounds from a multi-sample, but you're obviously restricted to the number of simultaneously sounding notes on the Emulator and the sequencer memory note limit.

### Conclusions

It's hard to pick holes in such a well-designed instrument — it must be the keyboard of '82. And for those wishing to strike a balance between emulation and financial emulsification, it is possible to start off with the 2-voice (£2,450) or 4-voice (£3,650) versions and then upgrade at a later date.

Finally, I can't resist quoting this wonderful tongue-in-cheek(?) comment at the end of the Emulator manual: "The Emulator can be a very powerful tool for the creative artist. If enough people take advantage of its capabilities, we are going to make one hell of a lot of money." I wouldn't be at all surprised!

David Ellis

E&MM

The Emulator is distributed in the U.K. by Syco Systems (UK) Ltd, 20 Conduit Place, London W2. Tel: 01-723 3844.

# HOME ELECTRO MUSICIAN

**E**lectronic music, for me, started in September 1978, when I sent off for a set of printed circuit boards and circuit diagrams for the Practical Electronics Sound Synthesiser. At the time it was a big jump into electronics for me as I had built practically nothing electronic up until then, the exceptions being the usual baby alarms, MW radios etc.

In some ways the choice of the PE Synthesiser was a mistake since it had really been designed for a more advanced electro-musician than me. However, I bravely sent off a large order for components and a keyboard (optimistic?) to a then non-computerised Maplin Electronics and set about building the synth.

By Christmas the keyboard, VCOs and VCAs were working as well as my technical skill allowed. The envelope shapers refused to work and so I ended up adapting a completely separate design. Interest in construction of the rest of the synth quickly waned once it was making sounds and it took a year for the rest of the synth to be finished. Amongst the lessons to be learnt from this first experiment of mine in electromusic was never to skimp on components. I used 5% resistors throughout and the cheapest capacitors I could find for each value. The result was that the oscillators would not stay in tune for longer than ten minutes at a time, the keyboard did not remember too well (sample and droop), and the output was to say the least, noisy.

By the following Summer things had really got moving on the electronics front and I built the PE String Machine, followed later that year by the Powertran Transcendent 2000 which I built in a day and a half. The PE Strings were sold in 1980 to buy the Transcendent DPX which I was soon fiddling around with (no pun intended) to get more sustain and chorus out in an attempt to use it as a polysynth.

When the Transcendent Polysynth was published there was only one thing stopping me from buying it straight away — the price. Undeterred, I promptly designed and threw together a polysynth which although having a totally polyphonic keyboard, had an eight-note assigned filter and envelope shaper bank. The sound is, to say the least, impressive even though it cost less than the Transcendent DPX or 2000 to build. The DPX was quickly moved off its stand into the corner to be replaced by the new polysynth.

By that time I began to get fed up with bouncing tracks between two cheap cassette recorders, but after looking through the Exchange and Mart for several weeks in succession, I gave up looking for a cheap multi-track thinking that I would never be able to afford even a decent two-track. It was then that a friend of mine found a studio selling a broken TEAC 3340S cheap — very cheap. Being in a 'permanent on-going off-going mode situation', it didn't work, but several weeks part-time work later, I took a chance on being able to fix it and so bought it. Half an hours work and a 15p resistor later I had an 'as new' TEAC 4-track tape-recorder.

In my home studio at the moment, the keyboards comprise the Transcendent  
E&MM JUNE 1982



2000, and DPX, which I still use for the strings, the polysynth, the Phoenix 8 and a two oscillator monosynth which I have recently designed and built which has taken over from the 2000 for most lead work. This new synth, named the Phoenix 2, looks strangely like the Prophet 5 but there the similarity ends. All the switching is push-button latching and plenty of small LEDs give it that impressive look.

Effects include a stereo flanger/phaser adapted from the Maplin 5600S and a Maplin spring line reverb and driver all in a 19 inch rack-mounting case. The E&MM Digital Delay is already on order and should arrive any time now. The Clef master rhythm provides all the drum sounds. Mixing at home is via a Powertran MPA100 amplifier into one of the new mega-fantastic looking JVC KD-D cassette decks which has a five-band spectrum analyser, twin VUs and PPM, four-digit tape counter, remaining time on tape calculator, track search and stop watch. (It also plays cassettes!) A recent review said that it looked slightly better than it sounded.

Amplification until recently was by the Powertran amp driving a home built cabinet, but now I use a pair of E&MM 65 watt Mos-Fet amps into Mission 700 speakers which are also wired up to a Rega Planar Two record deck. The monitoring quality from this system is very good.

The music I have recorded myself has been almost totally electronic and I haven't done any serious recording which hasn't been direct injected into the tape recorder. All the tracks apart from the drums are put down from keyboards, mainly the two home-built synths.

Mixing, for now, is done at Goldsmiths College where I do an evening class in electronic music. There I have the use of a complete electromusic studio (which had the distinction of owning the first French Publison Pitch Transposer in the country).

Although I have tried many styles of recording, the main influence in my music seems to a form of 'disco-funk' which seems to work well with my style of playing. In fact one of my pieces has been provisionally entitled 'Disco Cliché'.

Now I am beginning to get out of the four track drums-bass-backing-lead syndrome,

my music is becoming more experimental and I am trying to be less careful about precisely what I record in the first place. So I won't spend a couple of evenings working out a complete piece, then recording it, but find say, a chord sequence I like, record it, and then write a bass or harmony line while listening to the first. In this way the overall effect can be controlled more easily as I go along, maybe even re-recording the first track at some point.

The problem with this 'record it as you make it up' technique is that without a start, a middle and an end the usual result is for the music to become repetitive. Although repetition in itself is not bad (listen to Terry Riley or Mike Oldfield), it can easily become boring.

Therefore, I have developed a system whereby I record a set of tracks as I mentioned and then have a go at it with a razor blade and sticky tape, editing the four track recording, re-recording over some of the edits and generally tidying it up. This continues in the mixing process where I sometimes leave whole tracks out of the mix if the music is building up too quickly. This technique of editing individual tracks can give very interesting results, breaking up the music into a more musical form and making repeated phrases sound different.

I hope to eventually complete a 16-track mixer that can be used first in my home studio and later as part of a professional setup or mobile studio.

The actual design of the mixer will allow it to be hooked up to the proverbial 'micro-processor' although an internal processor will allow it to store a series of 'mixes' itself. During the mixdown each change in the mix is punched into the memory and on playback the processor will 'fly' the mixer through the mastering. All you have to do is hit the STEP button to go onto the next section in the mix at the right time. This method is far cheaper than the Roland Computamix idea which synchronises the mixer to a spare track on the tape recorder and the operator just sits back and lets the whole caboodle get on with the mastering or mixdown. Will the next one do the whole mixing process, one wonders?

David Pallant

E&MM

# 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!

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.

### Tape of the Month

**DAVID SYKES** (London). 18 tracks, recorded between October 1981 and February 1982, all untitled. All composed, produced and recorded by Sykes. Gibson Paul and Peavey T60 guitars; Aria SB1000 bass, Ibanez bass, Casio MT30, Wasp synth, Hohner Pianet, Roland CR8000 Compu-Rhythm, E-H drum machine, E-Bow, various FX including H/H, MXR, Morley, Aria, Ibanez, Maestro, Boss and Roland. Recorded direct to Teac Portastudio 144, mixed to Teac cassette deck. One track features Andrew Simmons on bass and Sony rhythm machine. TDK SA.

This month's best tape wins on variety and invention, two attributes much valued here on the Cassette Review page. All Sykes' songs are untitled, so it's difficult to pick out particular tracks which come from a body of about eight hours of recorded material that David has made since buying his Portastudio in November 1980. Although all the tapes are made 'to personal satisfaction', the results are very listenable: his guitar style is melodic and thoughtfully structured, and we are pleased to feature prominently a tape from someone who is primarily a guitarist, for a change. The keyboard role is essentially atmospheric, textural and supportive, and the use of the limited four tracks is straightforward and effective. Sykes says, "I try to get the best quality and clarity possible, so I don't bounce tracks, and try to keep the arrangements as simple as possible. I'd get an 8-track Fostex tomorrow if I had the cash." Our only technical criticism is of a slight over-modulation at transfer stage, causing a little annoying distortion on some peak signals, but it's a minor point. We look forward to hearing Sykes' work condensed into more concise statements — songs, perhaps?

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

**BILL WRIGHT** (Sleaford, Lincs). Guitar, banjo, bass, Crumar Performer, Korg Minipops rhythm box. Teac A3340S 4-track, Teac X7 cassette deck, Tandberg 3300X for echo, Teac Model 2 6/4 mixer, various FX including home-built projects, Sanyo cassette deck.

43-year-old Bill is the first Cassette Review correspondent to come up with the idea of talking to us on the tape before and in between the music, including a 'tour round the studio'. We're surprised no one else has come up with this yet, it seems the perfect medium. Well done Bill! Wright started his musical career some time ago playing banjo music in jazz bands, moving, more recently, to pop and cabaret work: his main use of his 'studio' is for making backing tapes for live work, including harmony vocals as well as basic instrumentation, over which he'll sing a live vocal on stage, plus the occasional instrument. On our tape he demonstrates this with a variety of songs, including Paul Anka's 'Diana', a relatively wild 'Hound Dog', some banjo work, Abba's 'Does Your Mother Know', a self-written 'theme song', and a sped-up guitar version of 'Tiger Rag'. Bill also suggests a sort of 'tape exchange' extension of the Cassette Review format, where correspondents could circulate one another's tapes to each other. As he puts it: "I'd like to share my hobby with those people who also record music like I do; I'd just like to see what sort of music they do. I reckon it would give young people more enthusiasm to stick to music lessons or whatever when they hear other guys making nice sounds." Bill's obviously full of good ideas — any other readers interested?

Music: 5 Production: 5 Presentation: 7 Tape: 4.



David Sykes



Bill Wright



John Stevens and Peter Fearn

### Best of the Rest

**JOHN STEVENS** (Bath). Six pieces, recorded February 1982. Side one: John Stevens; electric guitar with E-Bow, Boss FX and Roland RE301 echo. Side two: John Stevens as side one, plus Peter Fearn on Korg Delta synth to Roland echo and Peavey combo. Recorded direct to cassette deck, live.

These six largely improvised pieces (although the duet material naturally has more structure) have led John and Peter to recruit drummer Roger Robinson for what they describe as an "embryonic group in the rehearsal stage, aiming to combine guitar, synth and drums to create original electronic music." On the basis of the pre-group material on the cassette, the music depends heavily on the spacious atmosphere created by the echo box, and recordings are (as they admit) one-off takes of spontaneous work, giving the tape a bright, uncluttered, human feel that balances the machines perfectly. They "hope to be able to afford to go into a studio to multitrack, refine and enhance the music further" — but will they lose the spontaneity in the process? Let us know, John.

Music: 5 Production: 4 Presentation: 5 Tape: 4.

## Cassette Review

**ADVANCE ROUTINE** (Peterborough, Cambs). All instruments and recording by S. Gilbey. Various guitars and keyboards. Recorded by bouncing back and forth between Tandberg 2-track stereo and Teac 6100 2-track. Home-built 8-channel mixer, TDA1022 flanger, home-built spring reverb and six-head tape echo, Bell ADT, "occasional borrowed drum machine." TDK D.

This is an extended version of a tape which Gilbey sent out to record companies without much success — perhaps it was too diverse for them? A&R people love singularity, which presumably comes from a mania for pigeon-holing — if it's defined, it's safe. Anyway, we like Advance Routine a lot — Rough Trade apparently suggested that Gilbey make the rather daft 'Growing Song' into a single, but it's our least favourite of the eight tracks here, all affected high vocals, treated sounds and distorted drums. 'S' - no first name given - has achieved a decent sound from his limited bouncing efforts and plans to go 4 or 8-track soon. 'Asia Minor' is a strong instrumental, bedouin guitar weaving around single-note keys, and 'Inside Bel View' plays an intriguing music-box-like synthetic game. 'Buy Product' is a deft mixture of flanged guitars which recalls Crawley's wonderful Cure and, along with the muddled but attractive 'Reproduction', is the best of the bunch. Definitely this month's E&MM Gold Star for Effort.

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

**KEN CHOLSTON** (Cotgrove, Notts). 'Explodercaster' guitar to various amps, recorded on to Amstrad 7090 cassette deck. BASF LH.

A unique racket dragged by Ken from the unique Explodercaster guitar with self-built pickups, which he describes as follows: "You can be forgiven for thinking that I'm using three guitars and doing double-tracking, but I'm not! It's one guitar live! Sixth string tuned E as normal, but played through an E-H Octave Multiplexer and 100W Hiwatt amp and 4 x 12. Fifth string tuned E as sixth but played through fuzz/sustain pre-amp and Maplin 50 hi-fi amp and 2 x 12 Hiwatt cabinet. Fourth string tuned to B above the E and played through system as fifth. Third string tuned A two frets higher than normal, through fuzz/sustain and shares same amp as first string. Second string tuned as down-tuned first to D through Maplin auto-swell pedal. First string tuned to E, as second fret of fourth



Ken Cholston

**ATTRITION** (Coventry). Four tracks. Ashley Niblock: Korg MS20, Powertran Transcendent DPX string synth. Julia Niblock: vocals, Maya bass. Martin Bowes: vocals, Clef drum machine, tambourine. FX include echo and reverb; recorded through Schneider rack hi-fi into Teac Portastudio. Recent additions include Roland TR606 drum machine 'for studio use', stereo chorus unit, and a Wasp synth. TDK D.

Attrition reckon that they were, until about eight months ago, a 'more traditional live band', but now favour electronic-orientated studio work, and cite E&MM as a 'considerable influence' on this decision. Well, we're pleased to have produced such immediate results - what we would loosely describe as doom-rock ensues and, although there is little humour evident on this tape, the group soldier on through music which they say is influenced mostly by the Banshees, the Cabs, Joy Division and PiL, and will doubtless realise their own aim: "We plan to release more recordings and play a lot more places."

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

string, through pre-amp before E&MM harmony generator." The noise produced is as odd as the description — a sort of expanded, distorted blur with slightly out-of-tune lines suddenly popping their heads through. If you're still interested, dig out Guitar magazine of January 1978, where Adrian Legg attempted a then-current description of the ravaged Strat of Mr Cholston. Ken says: "That is all scrap now!"

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

## BINDERS

### NOW AVAILABLE

Keep your copies of **ELECTRONICS & MUSIC MAKER** in this elegant silver binder (holds 12 copies) with our special E&MM logo in blue and red on the cover and spine.

**Price £3.95**

Please allow 28 days for delivery.

*Overseas payments including Republic of Eire should be covered by Bankers draft in pounds sterling — subject to availability.*

Send this coupon and cheque/P.O. to:  
**ELECTRONICS & MUSIC MAKER (Binders)**  
282 London Road, Westcliff-on-Sea, Essex SS0 7JG.

Please send me the E&MM Binder @ £3.95

I enclose a cheque/P.O. payable to  
Electronics & Music Maker for: £.....  
PLEASE PRINT

Name: Mr/Mrs/Miss .....

Address: .....

E&MM/6/82

*The price shown includes VAT, postage and packing  
Overseas orders — add 11p extra for postage*

## MUSIC KITS

### ALL WITH PRINTED CIRCUIT BOARDS!

Kimber-Allen Keyboards	SEE LISTS	P.E. Minisonic Synth	SET38	181.56	
128-Note Sequencer	SET76	120.45	Phaser	SET88	21.08
16-Note Sequencer	SET86	64.63	Phasing & Vibrato	SET70	36.25
3-Channel Mixer	SET107	21.50	Practise Amplifier	SET106	22.15
3-Microphone Mixer	SET108	12.99	Pulse Generator	SET115	24.84
6-Channel Mixer	SET90	96.67	Rhythm Generator	SET103	SEE LISTS
Analogue Reverb	SET83	45.92	Ring Modulator	SET87	13.62
Audio Effects	SET105	15.12	Sewar	SET101	31.85
Chorosynth	SET100	125.04	Signal Tracer	SET109	17.50
Compressor	SET120	25.05	Simple Phase Unit	SET25	10.54
Digital Reverb	SET78	75.50	Smooth Fuzz	SET91	11.68
Discostrobe	SET57	39.78	Speech Processor	SET110	12.18

## ALSO

Over 40 new general interest kits in catalogue. Lots under £5, most under £10. Ideal for beginners.

Drum-Synthesiser	SET119	50.11	Split-Phase Tremolo	SET102	29.98
Enlarger Timer	SET93	39.22	String Ensemble	SET77	214.47
Formant Synthesiser	SEE LI	342.71	Switched Treble Boos	SET89	12.51
Frequency Doubler	SET98	11.75	Synthesiser Interface	SET81	9.49
Funny Talker	SET99	16.55	Transient Generator	SET63	16.86
Guitar Effects	SET42	15.92	Tremolo	SET116	13.47
Guitar Multiprocessor	SET85	79.15	Tuning Fork	SET46	37.04
Guitar Overdrive	SET56	21.17	Voice Operated Fader	SET30	9.85
Guitar Sustain	SET75	11.77	Voice-Scrambler	SET117	21.81
Headphone Amplifier	SET104	21.15	Voltage Cont Filter	SET65	15.58
Metronome	SET118	10.58	Wah-Wah	SET58	14.01
Microphone Pre-Amp	SET61	11.32	Waveform Generator	SET112	23.13
Noise Limiter	SET97	15.96	Wind and Rain Unit	SET28	11.39

## PHONOSONICS

DEPT. MM26, 22 HIGH STREET,  
SIDCUP, KENT, DA14 6EH.

Telephone: 01-302 6184

SETS INCLUDE PCBs, U.K. P&P, 15% VAT, RES, CAPS, S'Cs, POTS. MOST ALSO INCLUDE. KNOBS, SW's, SKTS, WIRE, SOLDER, BOX, PHOTOCOPY OF ORIG. TEXT. FULLER DETAILS AND MORE GREAT KITS IN OUR FREE CATALOGUE. PLEASE SEND S.A.E. FOR COPY.

Prices correct at Press, E. & O.E., subject to stock



# CLASSIX NOUVEAUX

**C**lassix Nouveaux formed in 1979 when some members of two disbanding groups, The News and X-Ray Spex, combined into the new group. A first single was released on their own ESP label; then came a contract with United Artists, more singles, two albums ('Night People' May 1981, and the new 'La Verite' April 1982), and a succession of tours rang-

ing from early attempts to help expose other new groups to more recent treks to promote their success in parts of the world where rock rarely sets foot. The group use an electric yet precise instrumentation of Casios, Wasps and guitar synths against traditional bass and guitar sounds, more recently underpinned by Simmons electronic

drums. The key seems to have remained in self-sufficiency: their records are largely the result of Sal Solo's developing production skills, and even Mik Sweeney's bass guitar is home-built. Tony Bacon talked to these two founder members of Classix Nouveaux just as their second album was about to be released.

## Basses, LEDs, and Perspex

Mik Sweeney: "I was about 10 when I started playing upright bass. I made the fretless bass I'm using now, and I've been playing fretless for about four years. I've always dabbled in making things — I don't really understand the logistics of electronics, but it's like painting by numbers these days: you just get the PCB and bung in whatever components you need. It means you can put things together for next to nothing, really. It's amazing what you can get away with for £10 — I made a chorus pedal for £30 or something. These things do tend to fall apart, but you get better at it as you go along.

"I've always made guitars as a sort of hobby. I made my first bass with the help of a woodwork teacher at school, a 24-fret version of a Precision. The lump of wood he got me — I can't remember what it was, but it was so heavy! The intonation got really dodgy when you got past the 12th fret, but for the time it was quite an achievement. The trouble was I left out the truss rod. I didn't know how truss rods worked, and I wondered why the neck was doing this Robin Hood number on me. So I dumped that and started buying cheap copies, and went on to the standard Rickenbackers, Precisions and stuff.

"I was digging frets out of basses early on, but I got a regular Precision when I was with this band whose management had money to chuck away. So I took it down to Andy's (guitar workshop in central London), had the scratchplate removed, the front made plain and black, the neck sprayed black with white binding, an ebony fingerboard, and all gold parts — that was really tasty. Trouble was, when we lost the record deal, I lost the bass!

"I had a Dan Armstrong plexiglass bass once, that was a bit of a disappointment. The G, the D, and the A were fine, but when you got to the E (makes flopping sound). And it was short-scale too, heavy but thin. I used to love them to look at, though. The whole thing about Dan Armstrong was that, to my eye, his ergonomics and actual body shapes were always brilliant. Everything he made, even the slider pickup things, had really nice cuts about them. I owned a few Dan Armstrongs and they were always good to look at, but not too good to play.

"I've turned a Gibson Grabber into an eight-string bass. You can't play a thing like that all the time — it sounds like a million guitars, it's great for those big Gary Glitter-type choruses! First, I just made a bridge out of an angled aluminium strut with eight notches in it, then I got some different bridge saddles and gave them the right notches — so it doesn't have eight individual saddles, but the intonation's OK, it does the job. It's just about in tune most of the time. I was going to convert a Dan Armstrong but I found the neck was a bit thin for the eight strings.

"I have a fervour for guitar making. When

I started out it was like: Dad, can I have a Gibson? No you can't. So I'd be bunking off school and going up Shaftesbury Avenue lusting after all these really tasty guitars. You build up this sort of wonder about certain things, and it stuck with me. And after a while ... I mean, these days, I'm dead sure that the snobbery surrounding guitars, American guitars, is just bullshit. This whole mythology which has built up is why they sell guitars, basically — status-symbols amongst musicians. Once you get past that, you know ... the best guitars in the world these days have to be Japanese.

"I mean, I was going through one of these Freemans-type mail order catalogues the other day. I can remember going through them about five years ago and coming to The Music Page, and you'd have like a Satellite guitar, plywood, one half-coil pickup. But in this one they had, for £116, this Jap guitar which goes under the guise of Kay — it had a standard three-piece spliced neck, maple body, two Mighty Mite-type pickups, coil tap switches, all brass fittings, and it looked really tasty. You could see that if you got something like this, replaced a few things, it'd be as good as anything with a bit of work.

"The thing that gets me about some guitar makers, they have to understand that if someone's going to buy a guitar — same with me and every kid I know — it's got to look great. Then you worry about what it sounds like, because in truth everything sounds more or less the same. Sometimes I wonder how they can possibly think that these are what people want. They get complacent, they think: We are the standards, people will buy our products whatever happens.

"So I started to build the fretless bass I use now. It's got LED fret markers, which I borrowed from Alembic — they've got theirs



on the side, I've got mine on the front, so everyone can see them! It's a flash number, but it is pretty useful, because with *Classix*, one moment you're standing bathed in smoke and red lights, the next minute it's total darkness. And playing fretless bass through that's bad news. It started off as the basic: Oh, wouldn't that look flash. But I've found it to be really helpful. The fingerboard is black perspex — I found I was gouging great trenches in wooden fingerboards from my Rotosound roundwounds — and the actual LEDs are set into holes drilled into the perspex. They're filed totally flush because the LEDs are in fact solid perspex themselves. At the moment they all work from a PP3 — I'm putting together a small pedalboard system from which I'm eventually going to have a phantom power line. After the battery is a fuse, and a resistor to keep the voltage down — if the LEDs go you'd have to rip the fingerboard up to replace them, a real headache, so I just give them enough juice to keep going and never warm them up too much.

"The only thing I didn't make on the original version was the machine heads, which were actually a set of Ibanez nylon-bodied guitar machines: the tuning is the best I've ever had, you can put it in its case and take it out four weeks later and the tuning hasn't moved an inch.

"Then I wondered about pickups, and looked at all the frightening prices for DiMarzios and Mighty Mites and what-have-you — you have magnets with a certain amount of insulated wire round and you have to lash out £30. That seemed totally outrageous so I made a couple of coil formers, went to a hardware shop and bought a couple of bar alnico magnets, shoved them through a few pieces of shaped formica, sent them down to Roka's, and for £8 I had perfectly decent pickups. That was three years ago — one of the pickups has got a bit knackered from my slapping tendencies so I replaced that with a Mighty Mite in a

E&MM JUNE 1982

different case — it basically sounds the same, I couldn't tell the difference.

"There's no truss rod: there's a T-section aluminium strut as in the Kramer, except that it's a wooden neck with the T-section buried, and then the perspex fingerboard sits on top of that. What really bothered me when I'd put it together was, I'd got a neck here that's aluminium, wood and perspex — I thought, I'm going to go from here to Madrid and the whole thing's just going to fall apart. Well, it's been three years now and it's been to just about every climate in the world. For example, we did a few days where we went from Naples to Helsinki to Madrid — no problem! I did it with Araldite, no magic to it. Just score whatever you're working on, a few clamps, slap on the Araldite, a couple of bricks overnight ... when you do these things, you actually learn the amount of bullshit that is shoved down you. It's lasted better than any bass I've ever had."

## Production, EMI, and Computers

Sal Solo: "I finished the 12-inch of our new single yesterday, it's called *Because You're Young*. I spent ages on it — the thing was the other 12-inch, *Is It A Dream*, sold more than any 12-inchers EMI have ever done, you know. I received that piece of information while I was in doing the new single, so I thought OK, if that's the case then I can justify spending a fair bit of time doing it. Whereas normally you feel that a studio at £45 an hour or whatever it is, spending maybe half a day remixing a 12-inch doesn't really justify 10,000 sales or something. On this one I actually said I'll take as much time as I need to do the best thing I can think of. When you start off as a new act nobody's quite sure if you're going to sell records or not, there's always this nagging feeling that not too much money should be spent because you never know if you're going to get it back. As soon as you have some success, then people start thinking: Oh, well, it's all right then! So the budget on our second album was twice the first one, and on our next album will be twice what this one was.

"All but about one of the tracks on our

new album I mixed on the Harrison computer system, which uses two tracks. It doesn't record EQs or anything, all it does is fader levels. So really, it's not that helpful, because you can't come back to anything afterwards, unless you've written down all the EQs and everything, and get the same thing. The only thing it does is, if you've got 22 tracks, as it is with this system, of things that need final adjustments or you want to mute it and so on, and you haven't got enough hands to do it, then quite often in a normal mix you'd let those things go. There might be a noisy guitar track or something, with loads of hissing on it, that you normally have to leave in because you're busy doing other things. That's what I like about this system, I can do it all myself once the engineer has set it up, I can just go through it run by run, and do it.

"With the first album we were recording songs which we'd played live for quite some time, and so we tended to go in and record them as they were and then just add a few things and that was it. This one, we did a lot of demos first on the 16-track downstairs at EMI. *Is It A Dream* we'd done in demo form as an instrumental which was really good, and I put it together with some other bits and pieces. So we'd tried everything once as demo things, and we started to record the album on the 16, and went to 24 afterwards. Everything was pretty worked out, not in the live sense but soundwise.

"The main difference recording this album to the first one, was that I tried to listen to every sound before it went down. The Simmons helped a lot with drum sounds, there are very few duff sounds that you can get out of it, tom-tom-wise anyway. Also, I was listening quite a lot to panning, listening to things on headphones and making sure that all the things that alternate are in different places. Every night when I had a monitor mix I'd go out and listen on the headphones, splitting things, putting them on either side. You will actually hear things moving about on this album, or coming out from different places.

"I think the general sound, the production, on this new one is about as good as anyone else that's about, but at the same time it's not perfect, there are still mistakes and things that could be better. But I think it's better that way, I wouldn't want to make a totally clinical album where it's a sort of state-of-the-art thing, that's not what I'm into.

"You learn as you go along — as a producer I'm learning all the time. It's part of the whole philosophy, where we're just amateurs dabbling. I wouldn't like to be like one of the established, name producers where you just go and you produce records all the time. For me, every record we make is a bit of an experiment. On the first album I didn't dare touch EQs, whereas on this new album I did one of the tracks just with a tape-op. It's not desirable to get too hung-up with the technical side, but you want to make the best product you can.

"We're going to try to make records that will still sound good in ten years time, and so you do have to force yourself to make use of all the modern things there are." **E&MM**

**Tony Bacon**

# America

Jerry De Muth

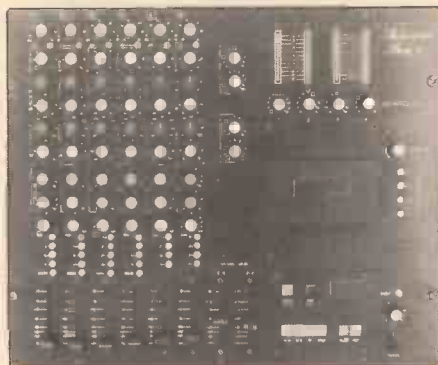
As small independent record labels proliferate in the States, it sometimes seems that every rock band that has played even one high-school dance or one weekend in a lounge at a run-down motel now has a record out. Even if the record doesn't get air-play or get stocked at a record store, musicians can at least sell their record, usually a single, wherever they play and hope that eventually it will get into the hands — and ears — of a major record company executive who will promptly sign them to a contract. However, making a tape, even at the least expensive studio, is costly. But now companies have been releasing various recorders and mixers that are designed to meet the budgetary requirements as well as technical needs of musicians and professional recordists.

A four-track cassette mixer/recorder combination has been introduced by Studiomastrer Inc. Called the Studio 4, it features six electronically balanced XLR mic input channels switchable to line inputs, each with the Studiomastrer three-band semi-parametric E.Q., two auxiliary sends and direct in/out effects jacks. The recorder section features a special-design head allowing for simultaneous four-track recording utilizing fulltime Dolby "B" noise reduction.

Studiomastrer's system has some of the same features offered in two four-track cassette systems introduced here by Tascam, the professional audio division of TEAC Corporation of America. With its Portastudio Model 144, Tascam offered the first integrated four-track mixer with a built-in four-track sync cassette recorder. Now Tascam offers even greater flexibility and better performance with its new Portastudio Model 244. It has built-in dbx noise reduction to eliminate tape hiss and lower distortion and has four-track simultaneous recording capability which, together with the four-channel tape outputs, permits cassettes to be copied from one unit to another. Also new to this unit is a second headphone jack, a stereo tape cue output and a stereo auxiliary mix that can be used for echo/effects or for an additional cue feed. The mic/line-tape switches now have a third off/mute position and there are peak overload LEDs on each input and on the mixing busses.

Peavey Electronics Corp., which has been adding simplified and down-sized units to its lines, now has its no-frills M-2600 power amplifier. Rated at 130 watts RMS per channel (both channels driven), it features a unique DDT compression circuitry which electronically senses the onset of clipping and automatically activates to maximize headroom and prevent clipping and distortion. The M-2600 is designed for both a medium powered full range system and for the high frequency section of a two-way or three-way system.

Crest, a division of Dallas Music Industries, now offers a complete line of professional power amplifiers ranging in power from 55 watts per channel up to 1600 watts and intended for sound reinforcement, professional recording and selected MI applications. The line starts off with the compact and efficient Series 1001 model



Studiomastrer Studio 4.



Crate amplifiers — anniversary edition.



Shure Green Bullet.



Audio-Technica PRO-series microphones.

which offers 55 watts per channel into 4 ohms. Moving up through the wattage range, there is the Series 2001 (120 watts per channel into 4 ohms), the Series 2500 (300 watts per channel into 2 ohms), the Series 3000 (400 watts per channel into 2 ohms), the Series 3500S (800 watts into 8 ohms mono) and the Series 4000 (1600 watts into 4 ohms mono).

Two limited-edition Crate amplifiers have been introduced by St. Louis Music Supply Co. to commemorate its 60th year in the music business. Although St. Louis Music's affiliate, SLM Manufacturing which produces Crate amps, was not started until 1978, the parent company began in 1922 with the creation of Alvarez guitars which were built to their design and specification, and a special anniversary edition of Alvarez amps will also be introduced this year. Only 650 of each of the two anniversary amps will be made. Each model will have a special anniversary band on the oak grill strip of each amp and will feature a special vintage-looking ivory vinyl covering. The CR212-AV Twin Twelve will carry a list price of \$449.95 and feature 60 watts RMS, two 12 inch specially-designed speakers, reverb and channel switching. The Crate Sequential Cascading Gain will be included for tube type tonality. The CR-160AV commemorative Crate will list for \$399.95 and feature 60 watts RMS with one 12 inch specially-designed speaker, reverb, channel switching and Sequential Cascading Gain.

For the other end — the input end — of the sound system, Shure Brothers Inc. have announced the return of its Green Bullet 520 microphone, but for its harmonica amplifying qualities, not for its original role as a dispatcher microphone. The 520 initially was in great demand as a base station paging and dispatching unit until it was replaced by the current Shure Model 450. However, shortly before the Green Bullet was due to disappear from the market-place, harmonica players discovered that it had fine tonal qualities for their instrument. With that use in mind, the new limited edition Green Bullet, designated 520D, is conveniently shaped to fit the cupped palm of a harmonica player while providing performance qualities that are ideal for both traditional and contemporary blues arrangements. The Green Bullet, which has a suggested list price of \$80, is a dual impedance microphone and comes supplied with a 20 foot non-detachable, two-conductor shielded cable. The unit has a frequency response of 100 to 5,000Hz and comes as the head assembly only.

For AKG Acoustics Inc., the C-414EB Large Diaphragm Professional Studio Condenser Microphone has been extremely popular. Now AKG have developed a new version, the C-414EB/P48, which is designed to meet the high standards of PCM (pulse code modulation) digital recording technology which, in response to success by audiophile record labels, now is increasingly being used for classical, jazz and some popular music by the major record labels. This new addition to AKG's C-414 line has greatly improved dynamic range, an im-





Takamine F379.



St. Louis Music's  
Alvarez Model 5072.



Gibson Chet Atkins.

proved equivalent noise level and increased sensitivity. Supplied in satin-black chrome finish for 48 volt phantom powering only, it is available at a suggested list price of \$750 on special order for delivery within 30 days.

Audio-Technica have added four models to their PRO-series microphones, all of them priced between the \$45 and \$215 suggested list prices of the original two models in the series — the PRO 1 and the PRO 5. According to Charlie Winkler, professional products national sales manager: "The four new models were created to fill a void in microphones for the buyer who, despite budget restrictions, requires rugged microphones offering high-performance characteristics."

The PRO 2 and PRO 3 have integral cables while the PRO 4H and PRO 4L have separate cables with XLR/A3F connectors. All four mics are dynamic types provided with an on/off switch. The PRO 2 is a Hi-Z unidirectional vocal/instrument model; the PRO 3 and PRO 4H are unidirectional Hi-Z vocal types, and the PRO 4L is a unidirectional Lo-Z vocal type. Suggested list prices are \$62 and \$97 respectively, for the PRO 2 and PRO 3 and \$125 for both PRO 4 models.

While overall the musical instrument business has slowed, guitars haven't lost any of their popularity. Beginners, amateurs and professionals not only haven't lost any of their interest in the instrument but are still seeking to find newer and better guitars to meet their needs and interests. Guitar manufacturers, as a result, haven't slowed their activities and dozens of new models bearing such names as Gibson, Alvarez, Matao, Kaman, Dean, and Dobro have been introduced so far this year. Biggest news is the start of a new affiliation involving the Gibson Company and legendary country artist Chet Atkins. Since the middle 1950s, Atkins has been identified with Gretsch, some of whose models he has endorsed. Now he has switched his allegiance to Gibson who, in a collaboration between the E&MM JUNE 1982

singer-guitarist and the firm's research and development team under Bruce Bolen, has introduced the Chet Atkins model classical electric. The design is unique in that it is a 'solid body' classic instrument with built-in electronics for amplification. Acoustic resonance chambers are routed through a single cutaway mahogany body. The chambers are sealed with a spruce top and the guitar is finished in high gloss with multiple brown and cream coloured binding. The Chet Atkins model is available in two neck widths — the CE model neck is 1.814 inches wide at the nut and graduates to a width of 2.234 inches at the twelfth fret while the CE-C neck, which is designed to appeal to traditional classical guitarists, is graduated from a 2.0 width to a 2.420 width.

Another guitar which will appeal to country-oriented musicians is the Dobro Lap Steel which is being re-introduced by the Original Musical Instrument Co. Inc. Made of all hardwood materials and finished in a walnut/dark brown sunburst with a one-piece neck through the body, it is equipped with bronze anodized aluminium hardware and chrome-plated screws, individual machine heads, steel guitar pickup and tone/volume controls. The scale length is 23 inches. The 8-string model has a \$450 suggested list price and the 10-string model lists at \$480.

Kaman Music Distributors have introduced four new guitar models. The new Takamine Koa wood model acoustic, the F379, features Koa wood top, sides and two-piece back joined with inlaid natural wood marquetry, bound rosewood fingerboard, top and back, and deluxe individual machine heads with a 12:1 ratio. Kaman's three other new models are all acoustic electric cutaways. The J15E Jaxx has a fully-bound rosewood arched back with matching rosewood sides, arched top, Palathetic pickup system and antiqued tailpiece. The EF381M Jumbo, a close cousin to the J15E, is

available in either maple or rosewood (EF381R) with spruce top and the Palathetic pickup system. The E9 nylon string is from the Hirade signature classic line and has the Palathetic nylon string pickup system.

A new series of five Alvarez acoustic electric fusion guitars, which blend a true acoustic sound with feedback free electronics, has been introduced by the St. Louis Music Supply Co. The fusion guitar has a cutaway body available in either the standard dreadnought thickness or a special 'thin-line' body for players who desire more of an electric guitar feel. An important feature of all five is a specially-contoured bowed back and internal lacquering which provide improved sound projection. A compensated saddle is included for proper string intonation. A balanced phase pickup, which requires no pre-amps, batteries or equaliser devices, produces a natural sound. A special EQ circuit, consisting of a treble/bass control and volume/presence control, is located on the upper bout of the new fusion models. The five models, which have varying woods, inlays and finishes, are the models 5071, 5072, 5073, 5074 and 5075 and the suggested list prices are \$585, \$595, \$675, \$685 and \$750, respectively.

Six new guitars and three mandolins have been introduced by Matao Corp., bringing their total fretted offering to 63 models and finishes. The new ME-12 electric acoustic guitar, which incorporates the dreadnought body design with a single cutaway and spruce top, includes a 14:1 gear ratio; an ivory-bound body, neck and sides; transducer with gain and EQ and choice of sunburst or natural spruce top. The ME-22 features a popular body design of solid mahogany and a single cutaway with an adjustable chrome-plated bridge, and stop tailpiece. Two humbucking pickups with exposed coils and individual volume and tone controls, together with a three-position switch for individual or simultaneous pickup operation, comprise the guitar's electronics.

Two of the three new mandolin models feature solid-spruce tops and show exceptional detail. Other features include maple backs and sides, an artist shape peghead, rosewood fingerboards, pearl inlays and bridge and saddle ivory bindings.

A small sized guitar, the Dean Baby, has been introduced by Dean Guitars Inc. While substantially smaller than standard guitars, it retains the standard 24 3/4 inch scale. The Dean Baby, which comes in V and Z body styles, features a two-piece body, glued-in neck, a specially made DiMarzio humbucking pickup and Grover tuning keys. Colours available are white, black and red. The suggested list price is \$599.

An entirely new line of electric guitars and basses, Walker Guitars, has been introduced by BKL Music Products Inc. Manufactured in the firm's Neptune Plant, New Jersey, 35 miles south of Manhattan, the instruments feature a new concept in neck construction that should interest guitarists who have been plagued with problems of necks splitting, expanding, compressing and in other ways of losing their shape. Quarter-sawn hard maple is

## America



Matao M50 Mandolin.



Dean Guitars.



Walker Pacer Guitar.



Manufacturers and companies mentioned:  
 AKG. Atlantex Music Ltd, 1 Wallace Way, Hitchin, Herts.

Audio-Technica. J. H. Skewes.  
 BKL Music Products Inc., 1111 Green Grove Road, Neptune, NJ 07753.

Dallas Music Industries, 150 Florence Ave., Hawthorne, NJ 07506.

Dean Guitars Inc., 6417 N. Ravenswood, Chicago, IL 60626.

Gibson. Rosetti Ltd, 138 Old Street, London EC1.  
 Kaman Music Distributors, P.O. Box 1168, San Carlos, CA 94070.

Matao Corp., P.O. Box 583, Bellevue, WA 98009.  
 Original Musical Instrument Co. Inc., 18108 Redondo Circle, Huntington Beach, CA 92648.

Peavey Electronics U.K., Unit 8, New Road, Ridge-wood, Uckfield, Sussex.

St. Louis Music Supply Co., 1400 Ferguson Ave., St. Louis, MO 63133.

Shure Electronics Ltd, Eccleston Road, Maidstone, Kent.

Studiomaster. RSD, Alcock Works, Chawend Lane, Leigh Groves, Luton, Beds.

TEAC. Harman U.K., Mill Street, Slough, Berks.

used for the back or shaped part of the neck matched with a synthetic fingerboard. A specially designed vertical dual-truss rod adds re-inforcement. According to the manufacturers, this marriage of new and old technologies yields a neck which is extremely rigid and immune to many of the normal problems found in conventional

necks. Walker guitars and basses are available in six different models, all of which feature brass hardware and various arrangements of pickups. The body shapes range in style from traditionally accepted shapes to classic contemporary ones. All models have Seymour Duncan pickups as optional equipment.

E&MM

## LOOK TO THE FUTURE

by wearing a Sweatshirt with the special Electronics & Music Maker symbol.

These superior quality Sweatshirts have our symbol printed in white on the front, and come in red or black and S, M, L or XL sizes, price £5.99 inc. VAT & p&p. T-Shirts are also available in the same colours and sizes, price £2.75 inc. VAT & p&p.

Overseas payments including Republic of Eire should be made by Bankers Draft in Pounds Sterling.

Sweat Shirt size guide:  
 S 30-34; M 36-38; L 38-42; XL 40-44

T-Shirt size guide:  
 S 28-34; M 34-36; L 36-40; XL 40-44

E&MM T-Shirts Dept.,  
 Maplin Publications,  
 282 London Rd, Westcliff-on-Sea,  
 Essex SS0 7JG.

Please allow 28 days for delivery.

Subject to availability.



Please send me:

	Red/Black/S/M/L/XL	Quantity	Price	Total
Sweatshirt			£5.99	
T-shirt			£2.75	
			£	

I enclose a cheque/postal order payable to: Electronics & Music Maker

PLEASE PRINT

Name .....

Address .....

E&MM/6/82



Just **50p** will bring you the latest Wilmslow Audio 80 page catalogue packed with pictures and specifications of HiFi and PA Speaker Drive Units, Speaker Kits, Cabinet Kits ....

1000 items for the constructor.

**CROSSOVER NETWORKS AND COMPONENTS. GRILLES, GRILL FABRICS AND FOAM. PA, GROUP DISCO CABINETS - PLUS MICROPHONES - AMPLIFIERS - MIXERS - COMBOS - EFFECTS - SPEAKER STANDS AND BRACKETS - IN-CAR SPEAKERS AND BOOSTERS ETC. ETC.**

★ Lowest prices — Largest stocks ★

★ Expert staff — Sound advice ★

★ Choose your DIY HiFi Speakers in the comfort of our listening lounge.

(Customer operated demonstration facilities)

★ Ample parking ★

★ Access Visa American Express accepted ★



0625 529599

35/39 Church Street, Wilmslow, Cheshire SK9 1AS



Lightning service on telephoned credit card orders!



## Casiotone

ELECTRONIC KEYBOARDS  
INTEREST FREE CREDIT

SECURICOR "NEXT DAY" DELIVERY

(Models CT-701, CT-601, CT-403, CT-202, CT-101 only - subject to availability)

NEW MODEL STAR OF JAPANESE MUSIC FAIR

CT-701

5 OCTAVE PROGRAMMABLE POLYPHONIC KEYBOARD



with  
Prelude

20 accurate and very lively preset voices. Programmable and playable using a light pen to scan unique Casio prepared music. Plays back melody and chords with bass and drums. Easy play Casio chord accompaniment, 16 rhythms, full editing facilities, sustain, vibrato. A true computer aided keyboard built-in amp/speaker. Full line out, phones, volume jack facilities. Mains only.

£495

CT-601

- \* Identical to 701 but without the programming facilities and keyboard LED's

£395

- \* CT-403 NEW MODEL. CHORDS-BASS-RHYTHM



with  
Prelude

Back up your performance with the Casio chord system plus bass and 16 rhythms with "fill-in". Same specification as CT-101 for voices and facilities. Beautifully compact and lightweight, mains only.

£275

- \* CT-202 49 POLYPHONIC VOICES "GIGGING MODEL"



with  
Prelude

"Sparkling harpeichords", "simply superb cellos", "impressive clav", just a few quotes from recent independent reviews, 49 voices, 4 octave keyboard, tone memory, vibrato, sustain, pitch control, integral amplifier/speaker, mains only, instruction manual.

£275

- \* CT-101 NEW MODEL. ENTERTAINER & EDUCATOR



with  
Prelude

New creative keyboard. 25 voices, 4 octave keyboard, tone memory, integral amplifier/speaker. Jacks for swell, sustain, phones and line. Pitch control. New synth. voices plus Casios famous authentic orchestral voices. Polyphonic., mains only.

£195

OTHER CASIOTONE KEYBOARDS MT-31 £69,

MT-40 £99, VL-1 £35.95

ALL WITH FREE MAINS ADAPTOR, WORTH £5

\*EXCLUSIVE TO MICRO MUSICAL\*

# A FREE Prelude

## Electronic Keyboard Tutor

Normal  
price

£19.95

Teach  
yourself  
chords  
and scales-  
Quickly  
and simply



WHEN YOU BUY YOUR CASIOTONE CT-701, CT-601, CT-403, CT-202 OR CT-101 FROM MICRO MUSICAL YOU WILL RECEIVE ON REQUEST YOUR PRELUDE ABSOLUTELY FREE

The Prelude is a neat hand-held calculator type device which gives an instant visual guide to more than 800 chords as well as all major and minor scales.

To use it, you select the root note on the touch-sensitive key pad - and the major chord appears on a black and white keyboard display. Add minors and diminisheds, sixths, sevenths and ninths, and you can see immediately which notes change.

What's more, there is a key which you can use to show all available inversions - the different ways of grouping the notes - which is very useful for "buskers" and "jazzers" putting a left hand to the melody line.

Scales are also shown on the 31-note keyboard display, and this can be a useful guide if you're transposing between keys.

All free offers must be requested when ordering

Leaflets & Accessory Price List available on request

### Micro Musical Code of Practice

- \* Lowest possible fully inclusive prices
- \* No quibble 18 month unconditional guarantee
- \* Money back guarantee if not satisfied
- \* Same day dispatch - subject to availability
- \* VAT, packing and carriage included in price
- \* 14 day free trial period

Send cheques, P.O.s, cash (Registered) by Freepost (No stamp required) or phone your Access Card Number.

## Micro Musical Limited

British Musical Fair, May 14th-18th, NEC Birmingham  
All models available from our Stand.

FREEPOST  
37 WOOD LANE  
SHILTON  
COVENTRY CV7 9BR  
TEL: (0203) 616760

# MAKING NOTES

by Brenda Hayward

## PART 6. Intervals and Cadences

What is Harmony? In its basic form it is the method of chord construction and the relationship of successive chords to each other, also called 'Harmonic Progression'. I really started the subject of Harmony way back in Part 3, on Major Scale formation and then subsequently Left Hand Chord formation, which we now know is reliant upon note numbers of the scale.

The notes forming a chord not only have a relationship to the scale, but also have a relationship regarding distances from each other, musically termed 'Intervals'. If the higher note of the Interval is part of the Scale of the lower note, the Interval is PERFECT, or MAJOR.

A MINOR INTERVAL is one Semitone less than a Major Interval and a DIMINISHED INTERVAL is one Semitone less than a Perfect Interval.

Counting from the Root Note of the 'C' Major Scale for example, we have the intervals shown in Figure 1.

- |  |
|--|
| C to D is a MAJOR 2nd.                 |
| C to E is a MAJOR 3rd.                 |
| C to F is a PERFECT 4th.               |
| C to G is a PERFECT 5th.               |
| C to A is a MAJOR 6th.                 |
| C to B is a MAJOR 7th.                 |
| C to C is a PERFECT OCTAVE.            |
| C to D $\flat$ is a MINOR 2nd.         |
| C to E $\flat$ is a MINOR 3rd.         |
| C to F $\flat$ is a DIMINISHED 4th.    |
| C to G $\flat$ is a DIMINISHED 5th.    |
| C to B $\flat$ is a MINOR 7th.         |
| C to C $\flat$ is a DIMINISHED OCTAVE. |

Figure 1.

This rule of Intervals within the octave from the Root Note, will apply to all Major Keys of music.

Intervals of music are also reckoned by the number of note names in a consecutive sequence, inclusive of the upper and lower notes. C to E, is an Interval of a THIRD because it uses three note names: C - D - E. C to F $\sharp$  and C to G $\flat$  look identical on the keyboard but C to F $\sharp$  is an Interval of a FOURTH because it contains four note names: C - D - E - F and C to G $\flat$  is an Interval of a FIFTH because it contains five note names: C - D - E - F - G.

Briefly, there are two forms of 'Intervals' in the make up of a chord; CONSONANT - 'Perfect' and 'Imperfect' and DISSONANT Intervals, which create the musical effect that you hear.

The PERFECT CONSONANT Intervals are the Perfect 4th, Perfect 5th and Octave. The IMPERFECT CONSONANT Intervals are the Major & Minor Third, Major & Minor 6th and the Major 7th.

The DISSONANT Intervals are the Major Second (Ninth), Fourth (Eleventh) and Minor Seventh.

There are two groups of Chords: CONCORD and DISCORD. Chords in the CONCORD Group contain only Consonant

Intervals. These chords of Major, Minor, Major Sixth, Minor Sixth and Major Seventh do not require a 'Resolution', a need to be followed by another chord, as their notes combine in an agreement of sound.

Chords in the DISCORD Group contain one or more Dissonant Intervals. The Seventh, Minor Seventh, Ninth, Eleventh and Thirteenth Chords do require a 'Resolution' as their combination of notes create a restless sound, always needing to move on to another chord. 'Discord' in this context does not imply that the overall sound of the chord is 'Discordant'.

Prove this point by playing a 'Concord' such as a 'C' Major or 'C6' which sounds complete in itself, no Resolution needed. Now play a 'Discord' such as a 'C7' and hear the effect of a need for movement or Resolution to another chord, in this instance 'F' Major.

The CIRCLE OF KEYS (Figure 2) forms the basis for creating Harmonic Left Hand Chord progressions, Modulations and musical Introductions and Endings.

The Circle is interpreted by reading it in a clockwise and anti clockwise direction and seems to be complicated to use, perhaps because of the unfamiliarity of reading a clock face backwards.

In my teaching, I use the Circle of Keys adapted into a 'Musical Ladder' • Figure 3,

containing exactly the same information as the Circle but much easier to use. The Circle has been turned around so that the 'F $\sharp$ ' and 'G $\flat$ ' Key Notes are at 3 O'Clock and by opening the Circle out the 'F $\sharp$ ' Key Note is at the TOP and the 'G $\flat$ ' Key Note is at the BOTTOM of the ladder. On each step of the Musical Ladder a KEYNOTE is displayed, representing a Major 'Key' of music. Here I must establish again that a 'Key' of music is also a Scale of music.

Before learning about Left Hand Chord progressions it is necessary to understand how music is written, or constructed. The notes of a Major Scale have already been given numbers and they are also known as 'Degrees' of Scale. Their technical names are given in Figure 4.

The starting base for 'Middle of the Road' music (or Standards as they are called) uses three basic chords, formed upon the TONIC (Root Note), the DOMINANT 5th Note and the SUBDOMINANT 4th Note of the scale. Music written in the Key of 'C' Major (the 'C' Major Scale C D E F G A B C) will include a Major Chord formed upon the Tonic ('C' Major), a Seventh Chord formed upon the Dominant 5th Note ('G7') and a Major Chord formed upon the Subdominant 4th Note ('F' Major). Prove this information by studying a very simple arrangement in the Key of 'C' Major, when the three chords of 'C', 'G7' and

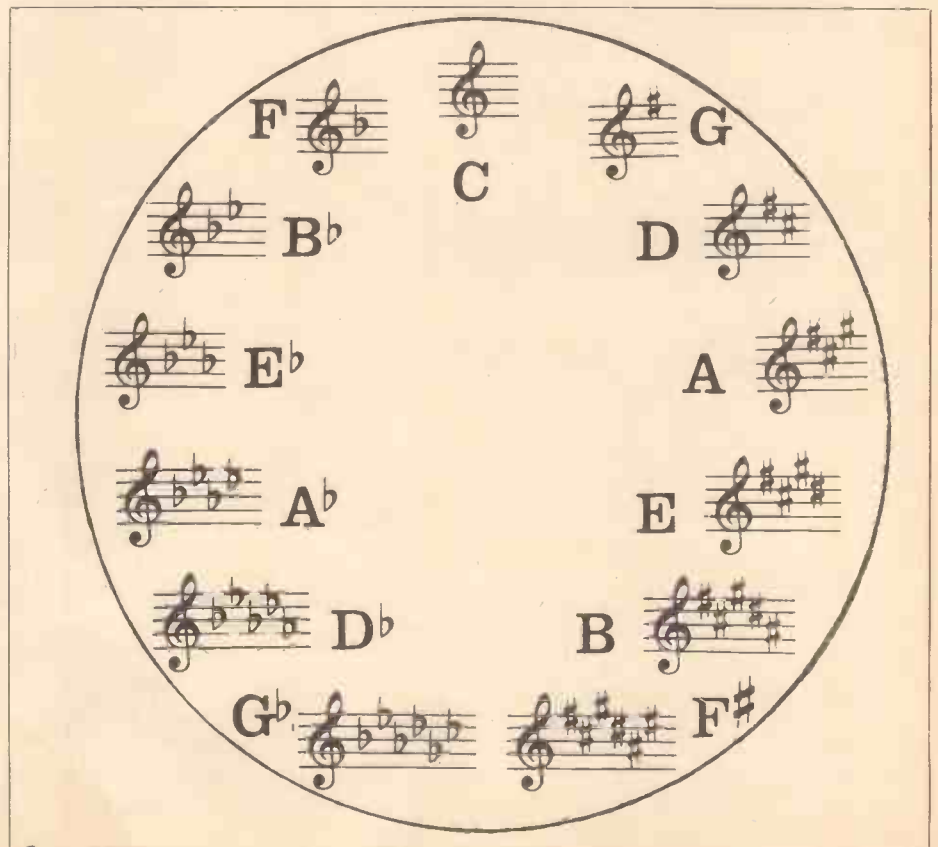


Figure 2.

'F' are basically adequate to accompany the melody.

Referring to the 'Musical Ladder' (Figure 3), these three 'Keynotes' 'G', 'C' and 'F' are grouped together. The middle one of 'C' being the name of the 'Key' of the music and also the Tonic Note of the scale.

Further chords added to a relatively simple 'Standard' type of musical arrangement will be within the immediate location on the Ladder of the Keynote of 'C'. The chords of 'Am7' and 'Dm7', formed upon the next two Keynotes UP the ladder from 'G', combine HARMONICALLY in this Key and are in familiar use with the chords of 'C', 'G7' and 'F'.

Play a Chord Progression where Discords; 'Am7', 'Dm7', 'G7' are followed by a 'Concord' of 'C' by starting on the Keynote of 'A' on the ladder and moving down one step at a time to the Keynote of 'C'. The chord leading into the 'Concord' on the Tonic Keynote will always be a Seventh Chord, not a Minor Seventh Chord.

The 'Discord' Minor Seventh Chords provide a more subtle change of tone colour for the sweeter types of music such as Ballads and Waltz's etc., as against the Seventh Chords (still Discords) which create a cleaner, sharper, purer tone effect which is highlighted in music such as 'Five Foot Two, Eyes of Blue'. This tune also uses the 'E7' Chord formed upon the Keynote one up the ladder from 'A'. There are however no hard and fast rules to the composers or arrangers use of chords and their progressions, but as I am talking of the very basic construction of

written music my method can apply to every Major Key of Music.

Experiment by finding another arrangement in the Key of 'Eb' Major for example, which establishes the Keynote of 'Eb' on the ladder. Follow the same procedure, identify the three basic chords of 'Eb', 'Bb7' and 'Ab' and also included in the music will usually be the chords of 'Fm7' and 'Cm7', the two further steps up the ladder from 'Bb' as before.

To create a melodious Left Hand Chord Progression, start at the top of the Musical Ladder to play an 'F#7' Chord. Add a Seventh Note of 'E', and play 'F#7' to its resolution of 'B', which is one step down the ladder. Add a Seventh Note of 'A' to play 'B7' to its resolution of 'E' etc. Following this procedure through each Keynote of the ladder to 'Gb' will bring you back to the starting point of 'F#', ('Gb' Enharmonic).

To create a smooth finger movement between the chords, play them all between the octave 'F' to 'F', creating inversions as necessary. If playing a pedal board instrument, play the Keynote as the pedal note.

In the ascending form, each step of the Musical Ladder progresses by Dominant Fifth Notes of the Scale i.e. 'C' (1) to 'G' (5); 'G' (1) to 'D' (5) etc.

In the descending form, each step of the ladder progresses by Subdominant Fourth Notes of Scale i.e. 'C' (1) to 'F' (4); 'F' (1) to 'Bb' (4) etc.

Ascending from the Keynote of 'C', the Sharps (#) are built upon and added to the 'F#' of the 'G' Major Scale and each new added '#' for each Keynote is the new Number Seven, or Leading Note, of the new Scale (Figure 3). Their formation on the staff as a Key Signature is also built upon the 'F#' of the 'G' Major Key Signature, (Figure 2).

When descending the ladder, the Flats (b) are built upon and added to the 'Bb' in the 'F' Major Scale and each new added 'b' for each Keynote is the new number four, or Subdominant Fourth Note, of the new Scale (Figure 3). Their formation on the staff as a Key Signature is also built upon the 'Bb' of the 'F' Major Scale, (Figure 2).

## Cadences

Music is written like a letter, with commas, full stops and phrases representing sentences. Left Hand Chords are selected and arranged in these musical sentences, or phrases, to flow correctly, to blend in harmonically and to create an ending. A 'Cadence' is an ending to a musical sentence and appears in three forms: Perfect, Plagal and Imperfect.

A PERFECT CADENCE will use a seventh chord built upon the Dominant Fifth Note followed by a Major Chord formed upon the Tonic Note (5 to 1).  
E.g. (A) 'G7' Chord followed by the 'C' Major Chord.

(B) 'Bb7' Chord followed by the 'Eb' Major Chord.

The simplicity of using the Musical Ladder can now be appreciated by recognising that the two Keynotes upon which these chords are formed are one above the other on the ladder. The chord on the upper Keynote with a '7th' added, moves down one step to the next Keynote to form a Perfect Cadence, or Ending (5 to 1) -

$\frac{G7}{C}$  and  $\frac{Bb7}{Eb}$

A PLAGAL CADENCE will use a Major Chord formed upon the Subdominant Fourth Note followed by a Major chord formed upon the Tonic Note. Now the order is reversed and the Major Chord of the lower Keynote up the ladder to play a Major Chord on the Tonic (4 to 1).

E.g. 'F' Major Chord moves up to the 'C' Major Chord -

$\frac{C}{F}$

The IMPERFECT CADENCE, also called a 'Half Close', suggests that although the chords of the music indicate the end of a phrase there is more to follow. The two simplest chord formations to give this effect are:

(A) A Major Chord on the Tonic Keynote followed a Major Chord on the Dominant Fifth Keynote (1 to 5).

(B) A Major Chord on the Subdominant Fourth Keynote followed by a Major Chord on the Dominant Fifth Keynote.

E.g. (A) 'C' Major to 'G' Major -  $\frac{G}{C}$

(B) 'F' Major to 'C' Major  $\frac{C}{F}$

Most music will end on the Major Key-note Chord. Use the Musical Ladder to embellish and extend a simple ending by identifying the Keynote Chord, step one rung down the ladder to the Subdominant Fourth Note and form a Sixth or Minor Sixth chord upon this Keynote. Then move back to the Major Keynote and form a Sixth Chord upon it.

In Figure 5, the music ends on the 'F' Major Keynote Chord. The extended ending chord of 'Bb6', or 'Bbm6' are followed by the 'F6' Chord.

$\frac{C}{F}$  (Major Keynote Chord)  
 $\frac{Bb}{F}$  (Extended Ending Chord)

The melody note of 'F' can be maintained for the extended ending as it occurs in all the chords. The original 2 Bar ending formed a Perfect Cadence (5 to 1). The extended ending is a Plagal Cadence (4 to 1). Now experiment in other Keys of music, creating your own endings by following the same procedure. **E&MM**

	KEY
F# C# G# D# A# E#	F#
F# C# G# D# A#	B
F# C# G# D#	E
F# C# G#	A
F# C#	D
F#	G
	C
Bb	F
Bb Eb	Bb
Bb Eb Ab	Eb
Bb Eb Ad Db	Ab
Bb Eb Ad Dd Gb	Db
Bb Eb Ad Db Gb Cb	Gb

COPYRIGHT © 1981. ORGAN MASTER PUBLICATIONS, Metfield, Harleston, Norfolk.

Figure 3. The Musical Ladder adapted from the Circle of Keys.

1st TONIC (Root)	2nd SUPER TONIC	3rd MEDIANT	4th SUB DOMINANT	5th DOMINANT	6th SUB MEDIANT	7th LEADING NOTE	8th TONIC
------------------	-----------------	-------------	------------------	--------------	-----------------	------------------	-----------

Figure 4.

Figure 5 shows a musical staff with two endings. The 'ORIGINAL ENDING' consists of a C7 chord followed by an F chord. The 'EXTENDED ENDING' consists of a Bb6 or Bbm6 chord followed by an F6 chord. The melody note 'F' is maintained throughout the extended ending.

Figure 5.

# Micromusic

Paul B. Kaufman

## Music Generation on the Microtan 65

The extreme modularity of the Tangerine Microtan 65 system lends it an advantage when considering computer controlled music synthesis projects. A variety of memory cards, parallel and serial I/O cards are available giving the user the flexibility to configure the system to match his exact needs. Due to the use of a motherboard concept this flexibility allows other manufacturers to step in with their own contribution to the system.

One such manufacturer in the OEM market has developed a nine voice sound card, originally intended for in-house use for the manufacture of professional arcade video games based, incidentally, entirely on Microtan boards.

This card makes use of GI's popular AY-3-8912 programmable sound generator chip (Figure 1). This gives three separate tone channels, a white noise channel, gain control for each tone channel and a single envelope shaper. The various sound channels can be used either singly or in combination. Due to there only being one envelope shaper, all tone channels trigger at the same time making multipart music difficult unless the computer takes control of each amplitude channel and adjusts it as the music is actually playing, which would be a laborious and time consuming task. As there are three of these chips on the board, giving nine tone channels and three noise channels, the simplest solution is to tie the tone channels of each chip together giving three individually triggered sounds with separate envelopes which is probably the minimum permissible for recognisable multipart music. Each chip is provided with an amplifier on the board allowing the use of small 3 inch speakers which give sufficient volume for most purposes.

The board is supplied with some installation notes and a copy of GI's manual for the PSG chip. As no software comes with the unit it is up to the user to design his own.

I considered using machine code and BASIC at first but decided that machine code takes too long to develop and BASIC runs too slow, so I plumped for Tangerine's new Forth compiler which allows for fast development and editing of software while giving a very high execution speed.

The listing given is a complete music generation program allowing the production of 3 part music with a fixed envelope for each note, in this case sounding vaguely like a harpsichord or clavichord. Although I don't intend to analyse the complete program some sections would bear a closer look.

Lines 0, 1 and 2 of screen 1 (SCR #1) define Forth words (a Forth program, or in this case 'Programlet' is called a 'Word', which starts with a colon followed by its name, then the instructions to be executed and closes with a semicolon). PLAY 1, PLAY 2 and PLAY 3, which allow me to easily access the three music chips directly, for instance by typing: 3 6 PLAY 2 (CR) would put 6 into register 3 of chip number two.

INIT 1, 2 and 3, simply initialise the sound chips by putting zero into each register.

Line six defines a Forth word which, when called, sets the current number base to 8, which is useful as all the examples given in GI's manual use octal notation. SETUP 1, 2 and 3 are used to define the amplitudes of each channel, the envelope period and shape, and to disable the noise channel. N1, N2 and N3 are the words which actually play a note through one of the three channels.

Screens two and four contain the lookup tables for the notes covering the fifth and sixth octaves, and these were found to be sufficient for experimental purposes. So, to play a note of A# through channel 3, one would specify: A#5 N3. To play A# and C together (or virtually together) one would specify: A#5 N1 C5 N2.

Screen 3 contains the delay values which specify how long to wait before playing the next note (or group of notes). DY is a whole note, 2DY is a half note and so on. The Forth construct 8000 0 DO LOOP would have the equipment in BASIC of:  
FOR I = 0 to 8000: NEXT

Such is the speed of Forth that these large values are necessary to slow the playing down to a reasonable tempo.

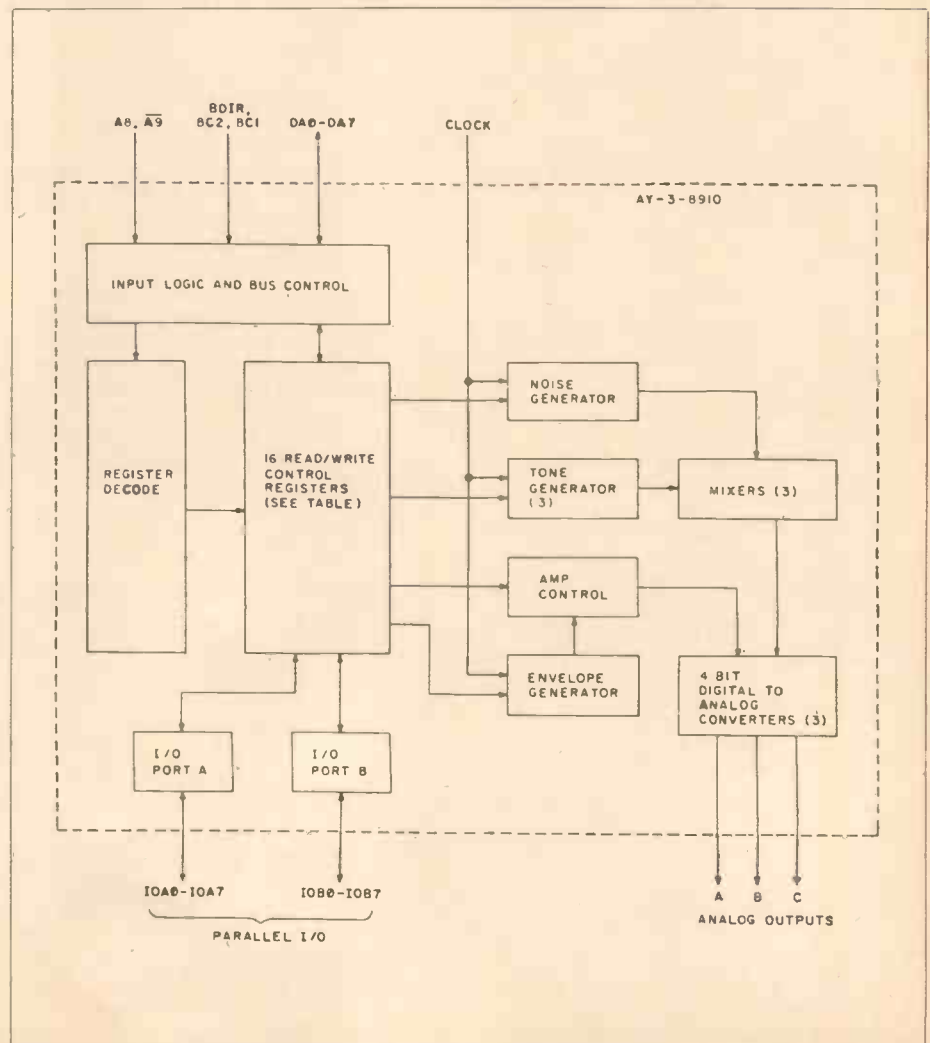
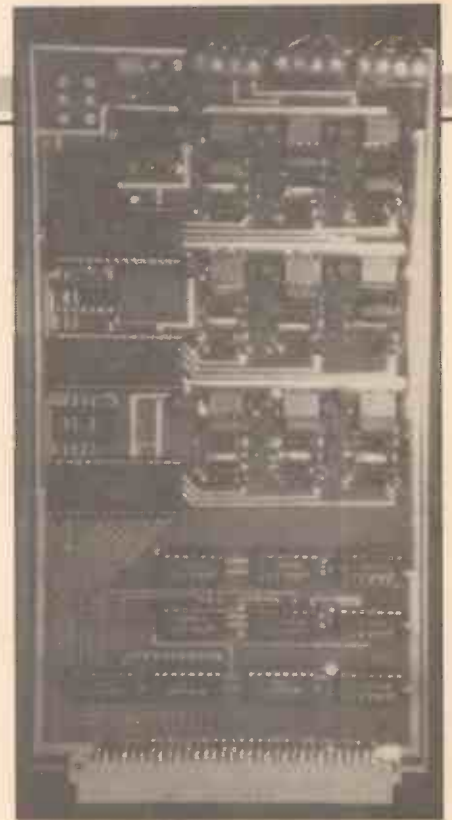


Figure 1. Block diagram of GI AY-3-8912 Programmable Sound Generator.

# MICROTANIC HARDWARE

## Step by step with the computer system designed for tomorrow.

- ★ 6502 Microprocessor
- ★ 2K Monitor TANBUG
- ★ Intelligent socket accepts keypad or full ASCII Keyboard
- ★ Chunky Graphics and Lower Case Options
- ★ Connects to unmodified B/W or Colour TV

For the first time buyer or experienced user, Microtan 65 is a superb route into personal computing. If you are looking for a sophisticated machine with the capability of expansion into a professional system, then this is the



computer for you. Step-by step with the computer system designed for tomorrow. . . .

### 6502 Microprocessor

Probably the most popular CPU (central processing unit) for personal computers, having a powerful instruction set and architecture.

### 2K Monitor TANBUG

The built-in 'mind' of the machine, TANBUG controls all system functions and gives comprehensive machine-code facilities. Functions include:- set and clear breakpoints, single step through program, execute program, copy block of memory, modify memory locations and much more.

### Intelligent keyboard socket

For absolute beginners we can supply an easy to use 20-way Hex keypad; for the more experienced user there is a full typewriter style ASCII keyboard. Either way, Microtan will work out exactly which type you are using and act appropriately.

### Chunky Graphics Options

For drawing simple lines and graphs, or for animated games, Chunky Graphics is a low cost answer. This set of chips plug into the Microtan board

## Microtan 65

£79.00 Ready  
+VAT Built

£69.00 Kit  
+VAT

and allow graphics to be built up on the screen at a resolution of 64 rows by 64 columns.

### Lower Case Option

To extend the character set to 128 characters, allows for real descenders on lower case characters and a set of extra symbols and characters for simple graphics.

### Microtan Accessories

20-way Hex keypad MPS 1 Basic power supply

Aerial connector lead

Full ASCII Keyboard

MPS 2 Full system

power supply

Mini — motherboard

Microtan is available ready-built or as a kit. We recommend that you should have some soldering experience before attempting the Microtan Kit, although if you do run into problems you can make use of our "Get you Going" service

(telephone for details).

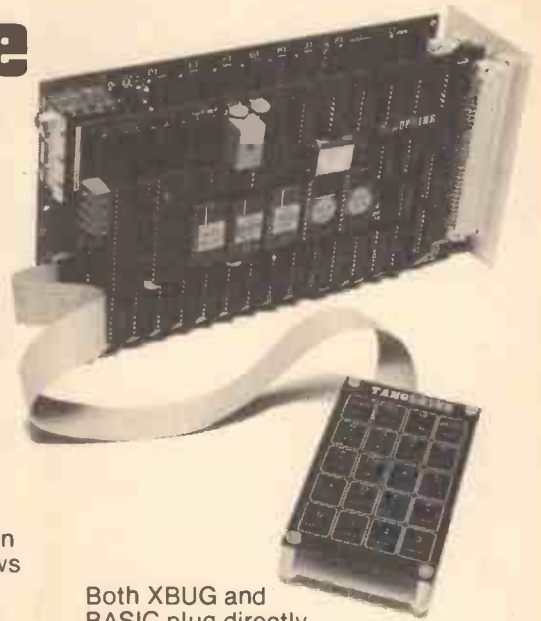
### TANEX

- ★ 7K Static Ram
- ★ 10K Microsoft Basic
- ★ 32 Parallel I/O lines
- ★ 1 Serial I/O port
- ★ XBUG
- ★ Cassette Interface

The first step in expanding your system. Tanex provides the extra facilities necessary for the serious programmer. Memory expansion: Tanex has provisions for up to 7K of static RAM and up to 14K of EPROM using 2716 or 2732 chips.

### XBUG and BASIC

XBUG is a 2K extension to TANBUG that contains a mnemonic assembler and disassembler and cassette firmware running at 300 Baud CUTS, standard or high speed, 2400 Baud Tangerine standard with 6 character filenames. Tangerine have taken out a full O.E.M. licence for Microsoft BASIC, the microcomputer industry standard, this is a full feature implementation with interrupt and machine code handling, and a superb program editor.



Both XBUG and BASIC plug directly into Tanex and are supplied with comprehensive user manuals.

### Parallel I/O

When fully expanded Tanex includes two V.I.A.s (Versatile Interface Adaptors) which implement the cassette interface and the parallel I/O ports. Software in TANBUG V2.3 enables you to plug in and use a Centronics type printer. The two V.I.A.s also contain counter timers that can be used for a variety of applications enhanced by the use of the integral handshake facilities.

### Serial I/O

Also on the expanded board is a serial I/O port that can be used to interface RS232 or 20Ma loop terminals or VDU's, again all controlled by TANBUG V2.3.

Dealer and O.E.M. enquiries welcomed

tangerine  
computer systems ltd

The Science Park, Milton Road,  
Cambridge, CB4 4BH.

TO TANGERINE COMPUTER SYSTEMS LTD.,  
THE SCIENCE PARK, MILTON ROAD,  
CAMBRIDGE CB4 4BH.

#### PLEASE SEND ME:

- MICROTAN 65, READY BUILT £92.35 incl. VAT +P&P.
- MICROTAN 65 KIT £80.85 incl. VAT and P&P.
- TANEX (MIN CONFIG) KIT £50.95 incl. VAT and P&P.
- TANEX (MIN CONFIG) ASSEMBLED £62.45 incl. VAT & P&P.
- EXPANDED TANEX KIT £104.66 incl. VAT and P&P.
- EXPANDED TANEX ASSEMBLED £116.16 incl. VAT & P&P.
- PLEASE SEND ME THE NEXT SIX ISSUES OF TANSOFT GAZETTE AT £15.00.

I enclose my cheque for £ .....  
or debit by Access/Barclaycard

Signature .....

Name .....

Address .....

(Block capitals please)

E&MM/6/82

Screens 5 and 6 define the actual tune — in this case the Morris dance 'Staines Morris', divided for ease of editing into individual bars which are then grouped into lines until in screen 7 the final piece is defined.

The music is quite pleasant to listen to although without any changes in tempo or expression, it is rather a wooden performance, probably much less sophisticated than the old Player pianos.

It is probably true that electronic and computer music is more constrained by the amount and quality of the software than by any limitations of the hardware actually playing it.

This article then, has shown that from fairly humble beginnings, passable music can be created with only a moderate understanding required of the fundamental techniques. It would be interesting to see what advances could be made from these basic program constructs.

Enquiries concerning the availability of this board should be directed to the author c/o Tangerine Computer Systems. **E&M**

REGISTER		BIT	B7	B6	B5	B4	B3	B2	B1	B0
R0	CHANNEL A TONE PERIOD	8 BIT FINE TUNE A								
R1		4 BIT COARSE TUNE A								
R2	CHANNEL B TONE PERIOD	8 BIT FINE TUNE B								
R3		4 BIT COARSE TUNE B								
R4	CHANNEL C TONE PERIOD	8 BIT FINE TUNE C								
R5		4 BIT COARSE TUNE C								
R6	NOISE PERIOD					5 BIT PERIOD CONTROL				
R7	ENABLE	IN / OUT		NOISE			TONE			
		IOB	IOA	C	B	A	C	B	A	
R10	CHANNEL A AMPLITUDE					M	L3	L2	L1	L0
R11	CHANNEL B AMPLITUDE					M	L3	L2	L1	L0
R12	CHANNEL C AMPLITUDE					M	L3	L2	L1	L0
R13	ENVELOPE PERIOD	8 BIT FINE TUNE E								
R14		8 BIT COARSE TUNE E								
R15	ENVELOPE SHAPE / CYCLE					CONT	ATT	ALT	HOLD	
R16	I/O PORT A DATA STORE	8 BIT PARALLEL I/O ON PORT A								
R17	I/O PORT B DATA STORE	8 BIT PARALLEL I/O PORT B								

Figure 2. Map of the AY-3-8912 control registers.

```

SCR # 1
0 : HEX : PLAY1 SWAP BC00 C! BC01 C! ;
1 : PLAY2 SWAP BC03 C! BC04 C! ;
2 : PLAY3 SWAP BC06 C! BC07 C! ;
3 : INIT1 10 0 DO 1 0 PLAY1 LOOP ;
4 : INIT2 10 0 DO 1 0 PLAY2 LOOP ;
5 : INIT3 10 0 DO 1 0 PLAY3 LOOP ;
6 : OCT 8 BASE C! ;
7 : SETUP1 C SWAP PLAY1
8 7 38 PLAY1 8 10 PLAY1 9 10 PLAY1 A 10 PLAY1 D 9 PLAY1 ;
9 : SETUP2 C SWAP PLAY2
10 7 38 PLAY2 8 10 PLAY2 9 10 PLAY2 A 10 PLAY2 D 9 PLAY2 ;
11 : SETUP3 C SWAP PLAY3
12 7 38 PLAY3 8 10 PLAY3 9 10 PLAY3 A 10 PLAY3 D 9 PLAY3 ;
13 : N1 PLAY1 PLAY1 PLAY1 PLAY1 PLAY1 20 SETUP1 ;
14 : N2 PLAY2 PLAY2 PLAY2 PLAY2 PLAY2 20 SETUP2 ;
15 : N3 PLAY3 PLAY3 PLAY3 PLAY3 PLAY3 20 SETUP3 ; --)

SCR # 2
0 OCT
1 : C5 0 326 1 0 2 326 3 0 4 326 5 0 ;
2 : C#5 0 312 1 0 2 312 3 0 4 312 5 0 ;
3 : D5 0 276 1 0 2 276 3 0 4 276 5 0 ;
4 : D#5 0 264 1 0 2 264 3 0 4 264 5 0 ;
5 : E5 0 252 1 0 2 252 3 0 4 252 5 0 ;
6 : F5 0 240 1 0 2 240 3 0 4 240 5 0 ;
7 : F#5 0 227 1 0 2 227 3 0 4 227 5 0 ;
8 : G5 0 217 1 0 2 217 3 0 4 217 5 0 ;
9 : G#5 0 207 1 0 2 207 3 0 4 207 5 0 ;
10 : A5 0 177 1 0 2 177 3 0 4 177 5 0 ;
11 : A#5 0 170 1 0 2 170 3 0 4 170 5 0 ;
12 : B5 0 161 1 0 2 161 3 0 4 161 5 0 ;
13 : C6 0 153 1 0 2 153 3 0 4 153 5 0 ;
14 DECIMAL --)
15

SCR # 3
0 : DY 8000 0 DO LOOP ;
1 : 2DY 4000 0 DO LOOP ;
2 : 4DY 2000 0 DO LOOP ;
3 : 8DY 1000 0 DO LOOP ;
4 : 16DY 500 0 DO LOOP ;
5 OCT --)
6
7
8
9
10
11
12
13
14
15
OK

SCR # 4
0 : C#6 0 145 1 0 2 145 3 0 4 145 5 0 ;
1 : D6 0 137 1 0 2 137 3 0 4 137 5 0 ;
2 : D#6 0 132 1 0 2 132 3 0 4 132 5 0 ;
3 : E6 0 125 1 0 2 125 3 0 4 125 5 0 ;
4 : F6 0 120 1 0 2 120 3 0 4 120 5 0 ;
5 : F#6 0 114 1 0 2 114 3 0 4 114 5 0 ;
6 : G6 0 107 1 0 2 107 3 0 4 107 5 0 ;
7 : G#6 0 103 1 0 2 103 3 0 4 103 5 0 ;
8 : A6 0 100 1 0 2 100 3 0 4 100 5 0 ;
9 : A#6 0 74 1 0 2 74 3 0 4 74 5 0 ;
10 : B6 0 71 1 0 2 71 3 0 4 71 5 0 ;
11 : C7 0 65 1 0 2 65 3 0 4 65 5 0 ;
12 --)
13
14
15

SCR # 5
0 : BAR1 A5 N1 E6 N3 2DY C5 N1 A6 N3 2DY
1 D5 N1 F#6 N3 2DY E5 N1 G#6 N3 2DY ;
2 : BAR2 A5 N1 E6 N2 A6 N3 2DY G6 N3 4DY
3 F6 N3 4DY
4 C5 N1 E6 N3 2DY E5 N1 4DY F6 N3 4DY ;
5 : BAR3 D5 N1 G6 N3 4DY A6 N3 4DY
6 G6 N3 4DY F6 N3 4DY
7 C5 N1 E6 N3 2DY D5 N1 D6 N3 4DY C6 N3
8 4DY ;
9 : BAR4 G5 N1 B6 N3 4DY A6 N3 4DY
10 B6 N3 4DY C6 N3 4DY
11 A5 N1 E5 N2 A6 N3 DY ;
12 : LINE1 BAR1 BAR2 BAR3 BAR4 BAR1 BAR2 BAR3 BAR4 ;
13 --)
14
15

SCR # 6
0 : BAR5 C5 N1 G5 N2 C6 N3 4DY
1 D6 N3 4DY G5 N1 B6 N2 E6 N3 4DY
2 F6 N3 4DY C5 N1 C6 N2 E6 N3 2DY
3 D6 N3 4DY C6 N3 4DY ;
4 : BAR8 B6 N3 16DY C6 N3 16DY
5 G5 N1 B6 N3 4DY
6 A6 N3 4DY B6 N3 4DY C6 N3 4DY
7 A5 N1 E5 N2 A6 N3 DY ;
8 : BAR9 C5 N1 G5 N2 2DY C5 N1 G5 N2 4DY
9 C5 N1 G5 N2 4DY G5 N1 D5 N2 2DY
10 G5 N1 D5 N2 2DY ;
11 : BAR10 A5 N1 4DY B5 N1 4DY C5 N1 4DY
12 D5 N1 4DY E5 N1 C6 N2 E6 N3 2DY
13 C5 N1 4DY F6 N3 4DY ;
14 : LINE2 BAR5 BAR4 BAR5 BAR5 ;
15 : LINE3 BAR9 BAR10 BAR3 BAR5 ; --)

SCR # 7
0 : STAINES-MORRIS LINE1 LINE2 LINE3 ;
1 CR CR . " STAINES-MORRIS LOADED " CR
2

```



**HAVE YOU RENEWED YOUR SUBSCRIPTION?**



# BECOME AN ELECTRO-MUSICIAN!

Join the many thousands of people who have subscribed to E&MM since the magazine was launched in February 1981.

For just 75p each month you can read and learn about Electro-Music - the music of the future!  
 Music making in the home, on stage and in the studio with today's electronic instruments is opening up new realms of creativity for more people than ever before. E&MM keeps you up-to-date with the important music makers and discovers new talented musicians too! With reviews of the latest music and instruments, top quality music equipment to build, plus technical and musical workshops and features, E&MM promises an exciting year ahead.

## E&MM - The No. 1 Magazine for the Practical Musician

Make certain of your copy each month (or renew your subscription) by simply filling in one of the coupons below. Direct subscriptions for 12 issues are available as follows:

UK ..... £10.75    Europe & Overseas (surface) £11.65    Airmail (inc. Europe) ..... £25.95

PLEASE CUT OUT AND SEND TO:

**SUBSCRIPTIONS DEPT., ELECTRONICS & MUSIC MAKER, 282 London Road,  
Westcliff-on-Sea, Essex SS0 7JG**

Please send me the next 12 issues of E&MM. I enclose a cheque/postal order for £.....

Name ..... Subscriptions to start from ..... issue

Address .....

Tel No. ....

Office Use: INLAND/OVERSEAS / /82

PLEASE CUT OUT AND HAND TO YOUR NEWSAGENT

**Electronics &  
Music Maker**

Dear Newsagent,  
 Please hold/deliver one copy of Electronics & Music Maker every month commencing with the current/next issue.

Name ..... Address .....

To the Newsagent: Copies are readily available from your wholesaler from the 2nd week of each month prior to the cover date.

## Build it yourself and save ££££s!

### **NEW!** ELECTRONIC PROJECTS FOR MUSICIANS

Available in the UK at last! - a great do-it-yourself manual from GUITAR PLAYER BOOKS. 27 projects that will save you £££s! Build a Preamp, Compressor/Limiter, Ring Modulator, Phase Shifter, Talk Box plus 22 more electronic accessories. Easy-to-follow diagrams. Clear-as-crystal instructions. Novel step-by-step technique means you can't go wrong... even if you are an absolute beginner! Unique recording of electronic effects included FREE with every book. GP 10031 £9.95

### **PLUS!** THE YEAR'S BIG SURVIVAL MANUAL FOR MUSICIANS...

Ever felt you might be getting 'ripped off' by fast-talking studio technicians? Well, now you can beat them at their own game: STUDIO RECORDING FOR MUSICIANS tells you how. Simply, clearly, in-depth. From basic recording equipment and how best to use it... to mixing and mastering techniques. Reading this book can save you hours of time in the studio... and time is money!  
 AM 30727 £6.95

### **AND** FIRST-EVER UK GUIDE TO SYNTHESIZERS - THE COMPLETE SYNTHESIZER

Tells you everything you need to know about synthesizers. How they work. Getting the best out of them. Straight-forward, easy-to-follow language plus dozens of clear diagrams and photos. Covers Three Elements of Sound, Standard Tuning, Frequency and Music, Types of Synthesizer, Voltage Control, The Filter, Synthesizer Accessories and much more besides. Don't be bamboozled by know-it-all salesmen! Read this book before you buy!  
 OP 41649 £4.95

**PRIORITY ORDER FORM**

To: Mail Order Music,  
 Camden House, 71 High Street,  
 Newmarket, Suffolk

Please send me:

- \_\_\_ copy/ies Electronic Projects For Musicians at £9.95
- \_\_\_ copy/ies Studio Recording For Musicians at £6.95
- \_\_\_ copy/ies The Complete Synthesizer at £4.95

I enclose £..... which includes flat-rate 75p for post/packing.  
 Barclaycard/Access holders telephone (0284) 703097

Name .....

Address .....

E&MM6/82                      Allow up to 21 days for delivery

# STUDIO SOUND TECHNIQUES

by P. A. Becque



## Part One

This series of articles is aimed at the operators of any recording equipment which might be called a studio. The intention is to relate the theory of sound recording to the practice of getting tapes which are up to scratch, both from the technical and artistic viewpoints. Although the sound engineer is to some extent at the mercy of his equipment, by knowing its strengths and weaknesses, it is possible to optimise the performance of the entire studio system. To do this we have to familiarise ourselves with the basics of sound reproduction. Remembering that, for all its faults, the average ear, once trained, is one of the most sensitive measuring instruments-cum-analysers readily available.

I hope to pass on to the reader many useful tips by going through an imaginary session i.e. from checking out the equipment prior to recording, to playing back test pressings or freshly cut acetates. Also there will be a 'what to do when the worse happens' section covering the many calamities that befall the hapless recording engineer on 'one of those days'.

The following diagram (Figure 1) may be useful in assessing the importance of getting to know your equipment. I have included an approximate indication of where you might expect to find some common instruments. The actual sound pressure level (SPL) of drums, say, is naturally dependent on both how hard you hit them and how far you are from them. So the SPL and frequency content vary enormously from moment to moment. It is these two dimensions which we perceive at any given point. The time axis would run into the page on this diagram. Figure one also represents the dynamic range and frequency range covered by our

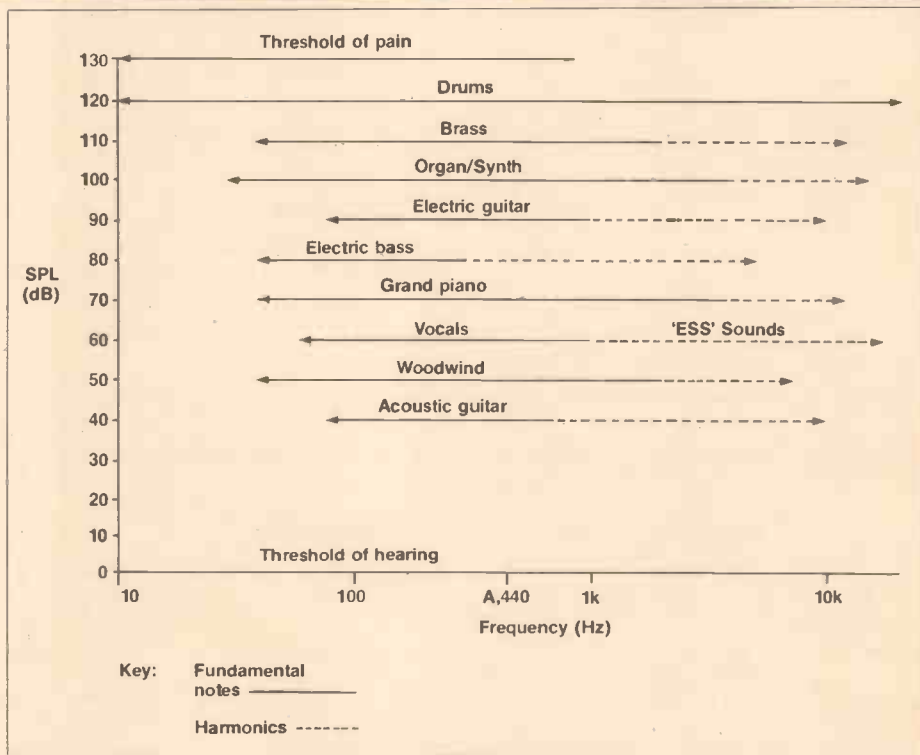


Figure 1. Instruments and vocals related to sound level v. frequency range.

aural system. Consequently it defines the area over which our equipment has to work. The closer our equipment comes to covering this area, the more faithful the reproduction will be. However, this should not become an aim in itself, for the aim is to cover as much as we need to.

Most modern music has a limited dynamic range, so there is not much point in paying out for expensive gear which may not be fully utilised. Frequency response is another matter. It is generally speaking possible to cover the entire spectrum provided a few basic rules are observed. More on these later. So before the session starts let's make sure the equipment is giving its best.

## Microphones

Microphones (mics) are delicate electro-mechanical devices and should be treated with care if they are to perform consistently. They are easily upset by fine dust from cigarette smoke, spit from vocalists and dents in the protective wire mesh from careless handling or inaccurate drumming. Most mics can be taken apart with a set of jeweller's screw drivers. If you are the sort of person who has taken the back off a mechanical wrist watch, cleaning most mics should present you with few problems. You will need:

- 1) A clean, flat, well lit bench or table top.
- 2) A set of jeweller's screw drivers.

- 3) Two small, fine camel hair paint brushes.
- 4) Distilled water.
- 5) Soft white tissues.
- 6) A number of small clean containers (egg cups will do fine).
- 7) A pencil and pad.

The basic procedure is the same for all devices: disassemble to reveal diaphragm; clean diaphragm and inside of wire mesh; allow mic to dry; reassemble. The actual cleaning of the diaphragm is quite delicate work. So before you start, go through the procedure mentally and work somewhere free from interruptions or anyone nudging your elbows at the wrong time!

**Preparation**

Half fill two of the cups with distilled water. Keep the others for small screws etc, allocating one for each mic you intend to clean. Lay the screw drivers, paint brushes, etc, out in convenient positions.

**Disassembly**

Most mics are screwed together in some way or other. If there are no obvious screw heads showing, check around any cylindrical rings where they are often hidden. It may be that you will have to hold the mic top and bottom and twist it anti-clockwise to reveal the insides. Beware of diaphragm assemblies (inserts) which are not fixed themselves, but rely on pressure from the parts which you have removed to keep them in place. Normally the gaskets they are seated in will hold them for the required duration. If not, unsolder the leads, noting their position and colour with a diagram in your pad, so that you can work on the insert itself. You may also want to make a note of what goes where as it comes apart so you can reassemble it confidently.

**Cleaning**

Having revealed the diaphragm, make a detailed inspection of the surface. If the mic has never been used for vocals or live gigs, it may only require a gentle blow across the diaphragm to remove whatever dust may have built up. If that is insufficient, take one of the paint brushes and work from the centre outwards with gentle strokes. Have only the tips of the bristles in contact with the surface.

If the diaphragm looks tarnished (from condensation), or appears to have small particles stuck to the surface, light brushing will not be enough. Take the other paint brush and use it to transfer one or two drops of distilled water to the centre of the diaphragm. Work gently towards the

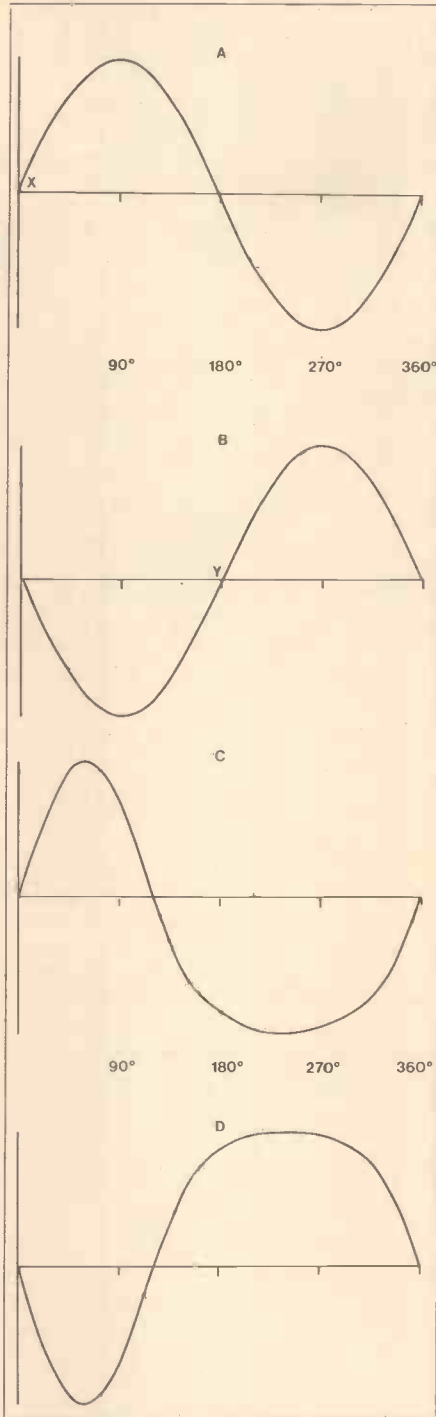


Figure 2. Microphone phasing.

edge in a spiral motion, mopping up the drops of water with the tissue paper at the edge. Normally the capillary action of the tissue paper sucks up any particles suspended in the water. However, this can happen in the bristles of the brush as well, so use the other container to swish out any particles and keep the brush clean. Repeat this procedure until the diaphragm is free from surface asperities.

Leave the mic/insert in a warm (safe!) place for about half an hour to dry. While it's drying, check the inside of the wire mesh for dust and dents, etc and do whatever seems appropriate. Some people may argue that all of this effort can be avoided if a windshield or some other type of screen is used. And that these have no effect on the performance of the mic. Fair enough. Some people have not had a producer asking them for a very intimate female

vocal sound full of breaths!

**Phasing**

If you have a number of mics of different makes, it will certainly be worth checking them to ensure that they are phased uniformly, i.e. all the same. Phase is often misunderstood so a few words here on, what it is, and what it means to the sound of something, should not go amiss. You are probably aware that if you accidentally reverse one of the speaker connections on your stereo, the bass response virtually disappears. In non-technical parlance this is because when one is sucking, the other is blowing and the pressure waves tend to cancel out.

Figure 2 shows that 'A' is 180° out of phase with 'B' and, 'C' is 180° out of phase with 'D'. What does this mean? If we take the points 'X' and 'Y' we can see that they correspond, i.e. both are going positive, also we note that 'Y' is at the 180° point. One could be forgiven here for thinking that we simply displace the waveform by half of one cycle to render it 180° out of phase. However, when we look at 'C' and 'D' we find we can't make the same evaluation because 'C' and 'D' are asymmetric waveforms, whereas 'A' and 'B' are symmetric, i.e. the positive half cycle is the same shape as the negative half cycle. This throws into sharp focus the fact that relative phase response is an instantaneous or simultaneous phenomenon, not strictly related to time at all. Time modulation devices or reflected waves often produce phasing type sounds because the input waveform is symmetric and fairly well sustained. The crunch comes when we start mixing various waveforms together. If we mix equal amounts of 'A' and 'B', the resultant sound will be next to nothing. Similarly, if we mix equal amounts of 'C' and 'D', the net result is nearly zero. This is because when one is going positive, the other is going negative *by the same amount at the same time*. It is, therefore, better to think of out of phase signals as being mirror images of each other, as this embodies the 'simultaneous aspect' which is so crucial in music and sound engineering.

In practice, sounds rarely cancel out completely, which often makes it difficult to tell if there is a phase problem or not. If we go back to our suspect microphones, we can do a simple experiment to make sure their phase response is similar. You will need a constant low frequency sound source (preferably sine wave) e.g. synth or oscillator through a combo amplifier at roughly 100Hz and a way of mixing the



output of two microphones together. Arrange the mics so that they are close to each other, pointing at the speaker, at least three feet from the floor and six feet from the speaker. Plug the mics into the mixer and set each channel gain one by one for a level of -7dB (VU) or PPM 4 on a group output meter. Compare the first two mics by mixing them into the group output. If the mics are in phase the output will rise approximately 6dB to about -1dB (VU) or, halfway between marks 5 and 6 on a

PPM. If they are out-of-phase it will fall. Sort the mics out by marking them type one or two, depending on whether they add or subtract. If they all add relax, you have no more to do. If not, select the type in the minority for further attention. These will require the leads reversing at the output connector (pin 2 and 3 for XLR types). If that is impractical the voice coil leads may be reversed on dynamic mics. Most professional mics are 200 ohms impedance and of the balanced/

floating configuration which means that the signal is not directly connected to earth or the screen on the input cable. The most common connector, and by far the best, being the standard three pin XLR series. If your mics have 'single ended' outputs i.e. only two connectors, one of which is earth or screen, then you may have trouble reversing the phase. One course of action is to use a phase reversing transformer which may also adjust the impedance to the preferred 200 ohms. When you have corrected the errant mics, give them a final check as outlined before. It may be instructive at this point to play some music through the combo amplifier and move the mics into different positions. You will find that the balance of the sound changes according to whether specific frequencies are adding or subtracting. This is also a good way to get to know your room. **E&MM**

Photos kindly provided by The Manor Recording Studio, Sipton on Cherwell, Kidlington, Oxon.

# 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.

**SPECIAL OFFER!**  
Send your entry before the end of June and we'll place your ad in the next 6 issues — all for £1 only!

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, -  
Clive Allen, Llandudno, Gwynedd, 0492 82930, G, M, B, -  
Martin Davies, Bridgwater, Somerset, 0278 55060, D, M, V, -  
Mark Woodham, Northampton, Northants, 0604 45622, KOC, A, E, N.  
Chris Askwith, Leeds, West Yorks, 0532-682816, G, M, R, -  
Steve Gould, Halesowne, West Midlands, 021 5594602, K, B, E, -  
R. Pearson, Whitechapel, E. London, 01-986 7407, K, B, E, -  
Colin Potter, York, N. Yorks, 0347 810188, KGEV, M, PE, -  
Andrew Walden, Capel St. Mary, Suffolk, 310439, K, B, E, C.  
Gareth Prosser, Ipswich, Suffolk, 0473 58647, G, A, PRE, DC.  
Kevin Bantoft, Ipswich, Suffolk, 0473 213632, E, B, R, N.  
Nigel Langford, Ipswich, Suffolk, 0473 75118, EG, B, RE, N.  
Jim Black, Newcastle, Tyne & Wear, 0632 329418, G, A, RPB, DC.  
Philip Hammond, Maidstone, Kent, 0622 677776, E, M, EV, C.  
Neil Cox, Preston, Lancs, 0772 35350, K, B, EV, N.  
Andy Pask, Gloucester, Glos, 045282 2770, KMC, MMB, CPE, D.  
Nick Broom, Norwich, Norfolk, 0603 712646, KD, B, P, C.  
Gareth Hughes, Swansea, West Glamorgan, 0792 464792, GM, M, E, C.  
Kendall Wrightson, Hungerford, Berks, 0488 62309, KC, BM, EVPR, C.  
Derek Purden, Stalybridge, Cheshire, 061 3037330, D, A, V, N.  
Chris Allard, Hampton, Middx, 01-979 5185, KGD, A, JRV, N.  
Bill Woods, Westhill, London, 01-341 0130, G, A, JPR, N.  
Dennis Clapham, Carew, Dyfed, 06467 453, KGES, A, PREGV, C.

Chris Varnam, St Albans, Herts, 0727 55005, KO, M, PR, N.  
B. Kear, Hounslow, Middx, 01-577 3118, GE, A, REG, N.  
C. Reeve, E. Putney, London, 01-870 5590, GW, A, V, N.  
Bob Stennett, Southfields, London, 01-874 3486, G, A, Y, N.  
Neil Johnson, Southend-on-Sea, Essex, 0702 67375, KGB, A, JPR, N.  
Dillon Tonkin, Whetstone, London, 01-445 2617, KOG, A, CPRE, N.  
Richard Young, Clapham, London, 01-223 2811, KG, A, CJRE, N.  
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, KOG, 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.  
Michael O'Connor, Morden, Surrey, 01-648 5901, K, B, ER, N.  
Nigel Turner, Durham, Co Durham, 0385 64500, G, BM, RE, C.  
Ron Berry, 13 Lawson Terr., Durham City, KGEMC, 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, KVVBC, 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.  
Peter Massey, Bexleyheath, Kent, 03224 37082, GEKC, M, V, C.

<b>NAME</b>	<b>INSTRUMENT</b>	<b>E=ELECTRIC BASS</b>	<b>S=STRINGS</b>	<b>LEVEL</b>	<b>TYPE OF MUSIC</b>	<b>R=ROCK</b>	<b>V=VARIOUS</b>	<b>ELECTRONICS</b>
<b>TOWN</b>	<b>K=KEYBOARDS</b>	<b>M=SOUND ENGINEER</b>	<b>W=WOOD</b>	<b>B=BEGINNER</b>	<b>C=CLASSICAL</b>	<b>E=EXPERIMENTAL</b>		<b>D=DESIGNER</b>
<b>COUNTY</b>	<b>O=ORGAN</b>	<b>D=DRUMS</b>	<b>B=BRASS</b>	<b>M=AVERAGE</b>	<b>J=JAZZ</b>	<b>B=BEAT</b>		<b>C=CONSTRUCTOR</b>
<b>TELEPHONE</b>	<b>G=GUITAR</b>	<b>V=VOCALS</b>	<b>C=COMPOSER</b>	<b>A=ADVANCED</b>	<b>P=PROGRESSIVE</b>	<b>G=REGGAE</b>		<b>N=NEITHER</b>

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 May 1982). Cheques made payable to Maplin Publications. £1.00 for 3 insertions.

## George Duke



"The sound of the instrument is, of course, extremely important to me. I've been going back to a lot of natural sounds, not so many effects, getting to the real sound of the instrument. I'm trying to clean up everything I do, to make it as clear as possible."

### Keyboards

Prophet-5; Emulator; ARP Odyssey; Minimoog; Rhodes Stage 88 (modified pre-amp etc.); Castlebar Clavinet (with pitchbend bar). "Sequential Circuits have made me essentially a remote Prophet, the ideas coming from my Clavitar that Wayne Yentis put together — they changed the guts so I could have a programmable Prophet from anywhere on stage. I've always been changing my Fender Rhodes around: for looks on-stage it's in plexiglass. The neoprene tips are all hard to achieve more harmonics and attack. A lot of people think the Castlebar Clavinet is a synth — it's like a guitar, bending the pitch up or down. The next thing I hope to get into is the Fairlight or the Synclavier. I'm probably going to have to go to computer school — eventually I'm going to have to get into that area. It's something I've been avoiding because I've been more involved in production recently.

"I think what's going to happen in the future is it'll come down to one or two instruments that can do anything. It's getting too expensive to carry all that other stuff around, and you don't really need it."

### Sequencers

Oberheim, but, "Not recently."

### Playing live

Three-way speaker system: Gauss, JBL. Crown amps, "They don't ever break."

### FX

Tape echo in studio; analogue or digital delay live. Also Yamaha pedalboard live.

### Percussion/drum machines

Linn on recent Larry Graham production.

### Favourite studio/engineer

### Home recording

"My own studio, LeGonks West in LA. Tommy Vicari is my favourite engineer. I've been mixing at Fantasy D, sometimes at Sound Lab. I use the Mitsubishi digital 2-track for my masters now, from the analogue multitrack."

## Ross Middleton *Leisure Process*



"We don't call ourselves a synth band: I'm a guitar player and Gary's a saxophone player, even though our first single's very keyboard-oriented. We tend to use synths cautiously, we don't know a great deal about them technically, we just like the noises they make. We don't let them overwhelm us."

### Keyboards

Sequential Circuits Pro-One; Yamaha CS20; "Various Casio keyboards." Studio: Roland System 100; Roland MC8; "The normal variety of string synths and so on." I think the Pro-One is great for the money. We wanted a small synth for home demos, and at first we wanted to get the Rogue, but with the sequencer and all the rest we decided on the Pro-One. The first synth I ever had was a CS5 — the CS20 is good, convenient, and easily operated. They're making synths smaller which is fine. We find you can get a good sound from the Casios for home demos, especially if you put them through a harmoniser or something. The combination of an acoustic instrument like saxophone, which has a lot of expression, going through a synthetic instrument can be really good.

"I think they could do with standardising technical terms for sounds or effects which tend to have different names on different synths. I'd like to see the built-in sequencer becoming more common in fairly cheap synths, it's such a useful thing to have."

### Sequencers

System 100 in studio: "It's tempting to make everything sound like Giorgio Moroder."

### Playing live

"We could easily augment ourselves to play live — there are plans."

### FX

"Not much on demos; I like chorus on bass guitar."

### Percussion/drum machines

Roland TR808; Linn in studio.

### Favourite studio/engineer

Genetic Sound/Dave Allen. "Martin Rushent is so easy to work with, very quick and very efficient."

### Home recording

Two Portastudios; Fostex A8 8-track. "Extra money goes back into equipment."

## Salvator Mulligan *Fashion*



"I'm a sound freak. If I'm laying down several sequences I'm doing what the rhythm guitarist used to do, so I'm leaving more freedom for our guitarist and more room for the drummer and bass player. The other three can play from the guts, whereas my keyboards are from the head: very methodical and straightforward."

### Keyboards

Own: Roland JP8; Roland SH09; Moog Source (mod for Roland interface). Studio: Polymoog; Minimoog; PPG Wave II; Sennheiser 32-filter vocoder. "I'm thinking of having the JP8's oscillators slowed down slightly, they're quite high. The PPG has the most incredible sounds; it would be the one that I'd really like to have, but the JP8 is a bit more practical for live. I chose the SH09 because there's the facility to put a polyphonic keyboard into it and use a trigger to gate it through — its top end is good too. The Source for the opposite, it's got a fantastic bottom end. Also, it's very easy to use live, you've literally got one control. We use a Roland guitar synth to control the vocoder, not keyboards.

"If the interfacing problem was solved you could play around with any combination of keyboards, but that's the key to why people sound different, the way they get round that problem."

### Sequencers

Roland CSQ600; ARP (in studio).

### Playing live

Roland PA80 mixer/amp; trigger track to keyboardist and drummer; additional tape/sequences. All DI'd.

### FX

Roland Space Echo, "All the time. A lot of splitter boxes." E-H Clone Theory; MXR Flanger.

### Percussion/drum machines

Roland TR808: use trigger outputs to control sequence gate. Simmons kit.

### Favourite studio/engineer

Studio Jean-Jaures/Jean-Pierre Masiera, "A total nutcase." Studio St Nom la Bretche/Christian Gence, "He plays the desk."

### Home recording

Roland mixer/amp as live, to Akai 2-track.

# ELECTRO-MUSIC ENGINEER

## Transistor Power Amplifier Surgery

by Ben Duncan

**A**long with loudspeakers, transistor power amplifiers are the prime cause of spuriously extinguished music; but their erratic reliability isn't, as in the case of speakers something to be mitigated by sensitive husbandry. On the contrary, the vast majority of power amplifiers using bipolar transistors fail quite randomly, regardless of design sophistication or elaborate 'protection' networks. This calls to mind a large and libellous body of information about the suicidal predilections of allegedly 'professional' power amplifiers featured in the dynamic adverts of other magazines.

In this article though, we are primarily concerned with a down-to-earth method of *repairing* power amplifiers, and a discussion of design shortcomings is an idea for a future article. Indeed, the DIY approach described here hinges upon the assumption that the amplifier design is inherently a going concern, even if it has faults which cause occasional failures, and clearly any mass-produced amplifier will meet this criterion.

### Initial Observations

As the vast majority of power amplifier failures are catastrophic, we'll begin with the assumption that the amplifier is initially dead. Begin by disconnecting the mains and removing the cover(s). Then, using a small hand torch, make a careful physical inspection looking for loose wires or screws, bad connections, dry joints or damaged PCB tracks. If you encounter blown fuses or burnt/discoloured components, then serious failure can be assumed. Otherwise, the fault is quite possibly something 'subtle', such as a wire hanging from an input socket or a blown mains fuse. So, if nothing horrendous appears to have taken place internally, it's sensible to make good the loose screw, wire or blown fuse and then go on to test the amplifier, with due precautions, as enumerated shortly.

Returning to 'well cooked' components, our first task is to remove the PCB. At this point, it's very important to make notes and sketch plans of any wiring which has to be desoldered. Alternatively, if such an invaluable record is bound to be mislaid, use a water-based felt tip pen or apply self-adhesive labels to identify terminations in situ. Also take care to retain nuts and bolts removed during dismantling; placing them in a resealable plastic bag to be firmly gaffer taped to the lid is a neat anti-disappearance precaution. Once the PCB is removed, the amplifier chassis can be put to one side and surgery can commence. Before proceeding, it's worthwhile laying your hands on a good desoldering tool, to ease the task of component removal and avoid serious damage to the PCB, particularly when an awkward component has to be replaced several times.

Our first setback is the anonymous value of badly charred components, although some of these may turn out to be merely covered with a layer of soot. Revelation begins with a generous squirt of aerosol foam cleanser followed by vigorous scrubbing with a toothbrush and a rinse in hot, soapy water. This will remove most of the



carbon deposits from the board and components alike, though care should be taken, as over-enthusiastic scrubbing may obliterate crucial markings. Usually, we're then left with a handful of charred resistor and transistor skeletons.

If the amplifier is a stereo model, values or type numbers can obviously be ascertained by reference to the other channel. Failing this, there are other avenues. First, try phoning the manufacturer or importer (written communications rarely work here) asking for someone who can answer a 'technical query'. Engineers are generally quite happy to discuss component values quite openly in response to sensible and lucid descriptions and you may even be able to obtain a circuit diagram, particularly if you patronise the company in purchasing replacement semiconductors from them. Or you may discover a colleague owns identical amplifiers in working condition, whereupon a casual glance inside will bring the information you require.

When in desperation, it's possible with a practical knowledge of power amplifier topology to make an inspired guess as to the mystery component, particularly if you have a number of circuit diagrams to draw order-

of-magnitude values from. Last of all, don't ignore the possibility of measuring a badly charred resistor to discover that it still reads within 10% of its original value!

The next task is to replace resistors and capacitors lying in the vicinity of the recent fireworks display, particularly those which bear visible burn or scald marks or were coated with vaporized copper or soot prior to cleaning the board. Such components may measure satisfactorily, but intense heat won't enhance their long term reliability and as their cost is usually small, replacement outright is a sensible means of avoiding needless failures in future. As regards replacement values, if you can't copy the originals exactly, err on the side of generosity, whilst maintaining the intrinsic nature of the component. For instance, we can replace  $\frac{1}{4}$  watt carbon resistors with  $\frac{1}{2}$  or even 2 watt versions, but a 1 watt wirewound resistor would be inadvisable, because its construction may introduce inductance problems. Similarly, replacing a 10 volt 22 $\mu$ F PC electrolytic with a tantalum capacitor of identical value would render the circuit susceptible to misbehaviour whenever small reverse voltages appeared across the capacitor and this inversion might be an

# CLEF ELECTRONIC MUSIC



## ELECTRONIC PIANOS SPECIALISTS SINCE 1972

Clef Pianos adopt the most advanced form of Touch Sensitive action which simulates piano Key inertia using a patented electronic technique.

**7 1/4 OCTAVE  
DOMESTIC MODEL  
COMPONENT KIT £244  
COMPLETE KIT £399.90  
MANUFACTURED £675**



Two Domestic Models are available including the 88-note full-size version. Four intermixable Voice Controls may be used to obtain a wide variation of Piano Tone, including Harpsichord.

Both Soft and Sustain Pedals are incorporated in the Design and internal Effects are provided in the form of Tremolo, Honky-Chorus, and Phase/Flanger.

A power amplifier integrates into the Piano Top which may be removed from the Base for easy transportation.

**SIX OCTAVE  
DOMESTIC MODEL  
COMPONENT KIT £217**

**COMPLETE KIT £363.90 MANUFACTURED £595**



Component Kits include Keyboard, Key-switch hardware, and all electronic components and may be purchased in four stages at no extra cost.

Complete Kits further contain Cabinets, wiring harness, Pedals and in the case of Domestic Models both Power Amplifier and Speaker.

The Six Octave Stage Piano has the same range of Voices and Effects and is designed for use with an External Amplifier and Speaker.

**SIX OCTAVE  
STAGE MODEL  
COMPONENT KIT £217**

**COMPLETE KIT £349 MANUFACTURED £530**

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**



**MANFD.  
£399**

### A revolution in the field of Computer Music Generation!

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

The BAND-BOX provides an Electronic Backing Trio consisting of Drums, Bass, and a Chord Instrument (one of 16 Waveform/Envelope combinations), with the capacity to store over 3,000 User Programmable Chord Changes on more than 120 different Chords. Using advanced Microprocessor technology, Playback of 50-100 Scores can be executed in any Key and at chosen Tempo. Complete Music Pad is electronically Indexed and stored on secondary battery back-up. Facility exists for composition of Intro, Repeat Chorus, and Coda sections including Multiple Score Sequences. Sockets are provided for Volume Pedal and Footswitch plus separate and mixed instrument Outputs. Total size 19" x 11" x 4 1/2" incorporating Master Rhythm.

## THE Programmable DRUM MACHINE

(As Published in conjunction with 'Practical Electronics')

**EIGHT TRACK PRO-  
GRAMMING/TWENTY-  
FOUR PATTERNS/  
TWELVE INSTRUMENTS/  
SEQUENCE OPERA-  
TION.**

**COMPLETE KIT £79.00  
MANFD. £119.00**

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

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".



### STRING ENSEMBLE

(As Published in conjunction with 'Practical Electronics')

Versatile String Synthesiser with split keyboard facility and impressive voices. 49 note organ diode keyswitch system with four pitches plus two phase Chorus generator. Kit includes Swell Pedal.

**COMPONENT KIT £179.00**

### ROTOR-CHORUS

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.

**COMPONENT KIT £89.00**

### KEYBOARDS

Our Square Front Keyboards are chosen for their superior feel to the discerning musician whilst giving adequate physical strength for the high impact playing present in the Piano application.

**88 NOTE (A-C) £57.00  
73 NOTE (F-F) £47.00  
FIVE OCTAVE £38.00  
FOUR OCTAVE £28.75**

PRICES INCLUDE VAT, UK CARRIAGE & INSURANCE (CARRIAGE EXTRA ON MFD PIANOS). Please send S.A.E. for our complete lists, or use our telephone. VISA/ACCESS Service. Competitive quotations can be given for EXPORT orders — in Australia please contact JAYCAR in Sydney.

ALL INSTRUMENTS MAY BE SEEN IN OUR SHOWROOM

# CLEF PRODUCTS (ELECTRONICS) LIMITED

(Dept. E&MM/6/82), 44a Bramhall Lane South, Bramhall, Stockport,  
Cheshire SK 1AH 061-439 3297

## Transistor Power Amp Surgery

entirely normal aspect of the circuit's behaviour. Hence the original choice of electrolytic, which wouldn't be damaged by small reverse voltages. On the other hand, replacement with a 63 volt 33uF electrolytic would be unlikely to give rise to problems.

Generally, the only truly critical passive components in power amplifiers are small ceramic or polystyrene capacitors with values in the range 10 to 820pF, which govern the high frequency power response

Applied polarity	Resistance	
	NPN	PNP
Base +ve, Emitter -ve	low	high
Base -ve, Emitter +ve	high	low
Base +ve, Collector -ve	low	high
Base -ve, Collector +ve	high	low
Emitter +ve, Collector -ve	high	high
Emitter -ve, Collector +ve	high	high

### Notes:

- 'High' indicates near infinity on ohms x 100 scale.
- On most analogue multimeters the lead polarity when on ohms ranges is opposite to that when on voltage or current ranges, viz; common terminal becomes positive.

Table 1. Transistor testing.

Type	Polarity	V <sub>CE0</sub> (V)	I <sub>c</sub> (mA)	P <sub>max</sub> (mW)	HFE @ I <sub>c</sub> (mA)	f <sub>t</sub> (MHz)	Leadout
BC556	PNP	65	100	500	75-250 @ 2	150	A
BC546	NPN	65	100	500	110-450 @ 2	300	A
BC639	NPN	80	1000	1000	40-100 @ 150	130	C
2N5401	PNP	150	600	310	60-240 @ 10	100	B
2N5550	NPN	140	600	310	60-250 @ 10	100	B
MPSA06	NPN	80	500	500	50-100 @ 10	100	B
MPSA56	PNP	80	500	625	50-100 @ 10	50	B
MPSA42	NPN	300	500	625	40-60 @ 30	50	B
MPSA93	PNP	200	500	625	30-150 @ 30	50	B

Table 2. Small signal transistors.

Type	Polarity	V <sub>CE0</sub> (V)	I <sub>c</sub> (A)	P <sub>max</sub> (W)	HFE @ I <sub>c</sub> (A)	f <sub>t</sub> (MHz)	Leadout
BD849	NPN	140	1.5	10	40-250 @ 0.15	150	D
BD850	PNP	140	1.5	10	40-250 @ 0.15	150	D
2SC1624	NPN	120	1	15	70-240 @ 0.15	10	E
2SA814	PNP	120	1	15	70-240 @ 0.15	10	E
2N6254	NPN	80	15	150	20-70 @ 5	0.8	F
2SD424	NPN	160	15	150	14-140 @ 2	3	F
2N3773	NPN	140	16	150	15-60 @ 8	0.7	F

Table 3. Drivers and output transistors.

and compensate the negative feedback so as to restrain it from becoming positive feedback at high frequencies. Thus values deviating greatly in either direction from the original may give rise to HF oscillation.

After the reinstatement of damaged or suspect passive components, we proceed with the assumption that all the semiconductors on the board are faulty and go on to test every one. Although pessimistic, this assumption is reasonable in respect of transistor power amplifiers, because their direct-coupled configuration implies mutual dependence, and a blown transistor at the output, say, will usually precipitate a chain of destruction throughout the amplifier.

## Semiconductor Assessment

To test a transistor, use an analogue multimeter switched to 'Ohms x 10 or x 100'. (Many digital multimeters lack the biasing voltage necessary to make definite 'go/no go' judgements and making sense of the readout takes longer in any case). Remove each transistor in turn and check for the pattern depicted in Table 1. Although this data implies a knowledge of the transistors terminal configuration, in practice this

information isn't necessary, for devices showing the appropriate pattern are invariably okay. This confidence is particularly welcome when a board bristles with T092 encapsulated devices, where of course the leadout configuration is entirely spurious.

If any readings differ in any respect from the general pattern, for instance the collector-emitter resistance isn't near infinite, assume the device to be guilty and make a note of its position and orientation on the PCB. Naturally, devices which measure satisfactorily are replaced on the board, taking care to solder them the right way round!

Aside from transistors, other semiconductors which may require testing include diodes, zeners and op-amps. The latter can't readily be tested without specialist jigs and substitution is usually the most sensible course of action. The other two devices are invariably okay if they have a high — but not necessarily infinite-resistance in one direction and give a low reading in the opposite, and whilst this measurement obviously can't take place with the components in circuit, in contrast to transistor checks, it's only neces-

frequencies above 10kHz at high levels (viz: treble amplifiers in active systems). At the other extreme, excessive fit might at worst lead to HF instability, so it's wise to aim for fit values similar to the original unless you have access to an oscilloscope in order to confirm that no instability has arisen. Table 2 lists high voltage small signal transistors which will suit the majority of transistor power amplifiers, whenever numerical replacements are unavailable.

Ad-lib power and driver transistor replacement is altogether a more dicey art because subtle parameters such as fit become more significant and crucial data which isn't readily available such as SOA (safe operating area) and HFE curves must be taken into consideration. However, Table 3 lists some general purpose audio power devices having ample ratings for run-of-the-mill applications.

One area to be discussed concerns components which are chassis mounted. Of course, the power transistors are tested in the same manner as the PCB mounted devices, and here again, complete removal is the only way to be sure you're measuring a faulty transistor and not a hidden, parallel resistor or a short circuit across the mica insulating washer.

Before replacing power devices, clean down both mounting bases and apply fresh heatsink compound. Then inspect the mica washer for cracks and replace it if it appears at all weary. Check also the nylon insulating bushes for abrasion or crushing. Then, once the devices are repositioned and tightened up, use an ohmmeter to check for short circuits between the heatsink (assuming a mica washer is used) and the transistor's collectors.

If a Zobel network is fitted across the output socket, check the series resistor for continuity. Finally, the power rail voltages should be checked, making sure that the bare ends of those wires which lead to the PCB are insulated or at least unable to touch each other. If the power supply won't work, and you're certain that blown fuses aren't responsible, look for broken transformer terminations or a faulty mains switch. Alternatively, persistent fuse blowing at the instant the mains is applied suggests a short circuit that's most likely to be traced to the bridge rectifier. However, also check the transformer primary, as it's not unknown for tappings to be changed to 110 volts "to get more power" — a famous quotation usually attributed to fervent guitarists!

## The Meticulous Reinstatement

At this point, we have a chassis bearing serviceable power devices and a working power supply. And next to it, a PCB with all damaged and suspect components replaced. Of course the natural temptation is to dive in, replacing the PCB and switching on, rashly expecting the return of loud music. But aside from a nerve-shattering 'bang', music is unlikely to return if you approach the reconstruction phase with

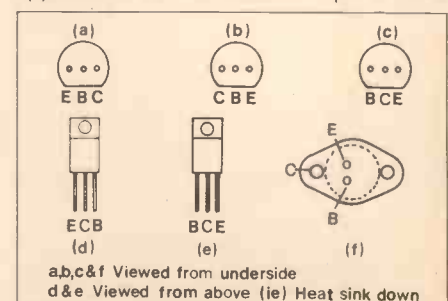


Table 4. Transistor leadouts.

sary to pull one leg from the PCB.

The next stage is to obtain spare transistors, and if you can't obtain exact replacements through normal distribution channels, it's worthwhile phoning the amplifier manufacturer or importer for a quotation. Failing this, check semiconductor manufacturer's data books or a general purpose equivalents book such as 'Tower's International Semiconductor Selector' to arrive at nominal equivalents. For small signal devices, the salient parameters are V<sub>CE0</sub> (normally 10 to 30% higher than the total supply volts), I<sub>c</sub>, P<sub>tot</sub> (aim for similar order of values here), and the current gain HFE, which need only be within 50%, but must be quoted at the same order of bias current. For instance, if the original device had an HFE of 250 @ 3mA, then an equivalent with an HFE of 350 @ 2mA would be a sensible choice, whilst another with an HFE of 250 @ 500mA would probably be unsuitable.

Two other parameters to consider are V<sub>CE0</sub> (look for a device where V<sub>CE0</sub> is similar to the original or higher), and f<sub>t</sub>, which indicates the transistor's frequency response. This figure ought to be of the same order as the original, but a lower f<sub>t</sub> will probably only be of audible significance if the amplifier is expected to reproduce



impatience. Unless you're possessed with inner calm and great confidence, the best way to ensure your labours aren't wasted is to take a break from the amplifier session for an hour or two, or at least make a cup of tea. When you return, check over your work with a refreshed and, above all, critical eye. Bear in mind that 'everything depends on everything else' in direct coupled power amplifiers; one error, however minor or stupid, can readily precipitate the chain destruction of your beloved amplifier once again. When you're satisfied, replace the PCB, double checking the connections noted earlier and also ensure that water used to wash the board isn't lurking in droplets under large components.

Next, wire 470 ohm 7 watt wirewound resistors in series with the positive and negative supply leads (or use a 1k resistor if the amplifier has a single supply rail relative to 0V), and reconnect the input and output leads. Connect a meter across the positive

and negative terminals on the PCB side of the resistors as in Figure 1, and after making final checks, turn on. If the resistors heat up and the voltage across the rails at the PCB falls to a value well below the nominal, e.g., only 20 volts across  $\pm 45$  volt rails, then a fault is in evidence and further checks are called for. However, if there's a preset potentiometer on the board, this is probably intended to set the quiescent current, so watch for confirmation when its adjustment to one extreme causes the voltage across the PCB to rise to a near normal value.

Assuming satisfactory results, switch off and discharge the PSU reservoir capacitors. Then insert smaller value resistors (say 100R, 7 watt — the exact value isn't critical) and place a milliammeter in the positive supply lead. Switch on again and if there's a quiescent current preset, adjust the current after a few minutes of warm up time to circa 30mA (again, this is not critical). If no preset is present, assume that quiescent current

lying somewhere between 10mA and 60mA spells a healthy amplifier. Switch off again, discharge the PSU reservoir capacitors and place the meter across the output to read volts. Then, after shorting the input, turn the gain control to minimum and checking the positive supply lead is reconnected minus the meter, switch on and examine the residual DC voltage at the output. If this lies below 1V, it's unlikely anything is seriously amiss, though under 100mV is a more satisfactory indication. If the DC offset exceeds 1V, a fault is likely, but note that some amplifiers boast a preset pot enabling any residual DC to be trimmed to zero. If so, forestall this adjustment until the 100 ohm current limiting resistors have been removed. If the amplifier survives, at this crucial point, it will probably live. But before pressing it back into service, apply a music signal peaking at half power (-3dB) and soak test it for a few hours into a suitable speaker — or, less taxingly (especially if you're restricted to BBC Radio 2 as a continuous soak testing source!) into a load resistor.

Finally, listen to the sound quality and remember that any freshly developed harshness or distortion probably indicates high frequency instability, or more subtle faults. These call for investigation with more elaborate test gear, and using only a test meter, this is about as far as we can go. Nevertheless, this technique will enable some 75% of direct-coupled bi-polar transistor amplifier catastrophes to be rectified at a fraction of the usual cost. In subsequent articles, we'll look at MOSFET and valve amplifier repairs, possibly also with a detailed examination of sophisticated test and tuning procedures for musicians' amplification.

E&MM

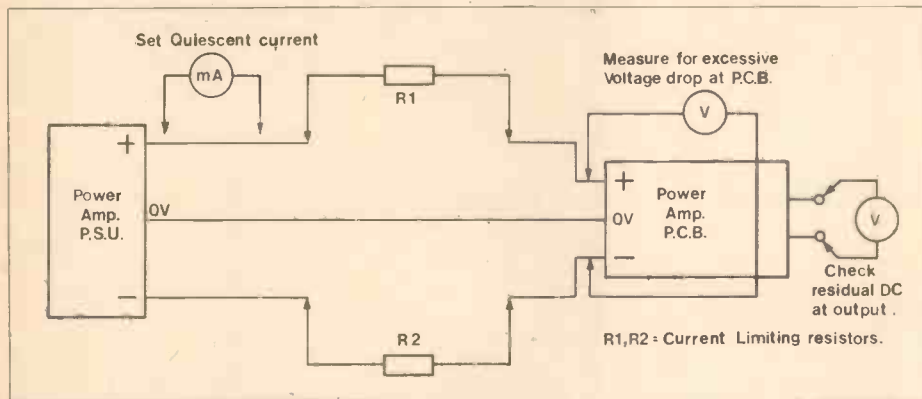


Figure 1. Power amplifier test connections.

## BACK ISSUES - EVERY ONE VITAL FOR THE ELECTRO-MUSICIAN! Copies can be obtained from E&MM at £1.10 each (Incl. p&p)

### 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  
& 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

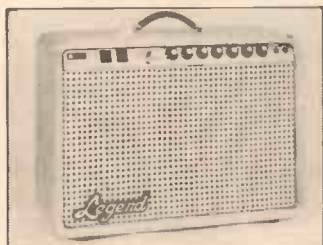
**MARCH** Klaus Schulze ★ Robert  
Schröder ★ Kraftwerk Music to play  
★ Killing CB Interference ★  
Reviews: Firstman SQ-01,  
SC1 Pro-One, JHS  
Pro Rhythm Mini Synth, Tascam  
124AV, Wersi Comet, Hamer  
Prototype, Shure 517SA & B ★  
Synth Buyers Guide ★ Projects:  
Power 200 Speakers, 1.6 sec Digital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

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

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

# MUSIC MAKER EQUIPMENT SCENE

## Rock 'n' Roll Legend



Legend amplifiers, made in New York state, still have no distributor in the UK, but continue to make a big noise the other side of the water, attracting players as diverse as Craig Chaquico of Jefferson Starship, Nile Rodgers of Chic, Walter Becker of Steely Dan, and Billy Gibbons of ZZ Top to their high-quality, professional looks and sounds.

The latest Legend products are the Series II Rock 'n' Roll 50 and 100 units, and the MS-570 professional miking system. The 50W and 100W versions of the Rock 'n' Roll amps feature hand-crafted solid-oak cabinet work, cane grilles, valve pre-amps, transistor power amps, 4-band EQ (described by Legend as 'English'), something called a Dual Mode footswitch, pre-amp out and power amp in jacks and a separate control for pre-amp out level, and another

'English' touch, Celestion drivers in the loudspeaker cabs. Shure's MS-570 miking system places a shock-mounted low-impedance Shure SM57 mic into the actual speaker cone, giving what is claimed to be optimum miking under any conditions, both in the studio and on stage. The rear panel of Legend MS-570-equipped cabinets feature an XLR connector and on/off switch.

More info on Legend amplification from Legend Musical Instruments Inc, 6399 Easy Molloy Road, East Syracuse, NY 13057, USA. Tel: (315) 437-3413.

## Altec



Altec professional sound equipment has a new distributor in the UK and the Republic of Ireland: Rank Strand Sound, whose MD, Ben Hogan, described Altec equipment as fitting perfectly into Rank's existing activities in the pro-audio and cinema fields. "We are looking forward to their providing first-class sales and service to back up the world's finest professional loudspeakers," he said.

More information on sales and service facilities from Rank Strand Sound, Great West Road, Brentford, Middlesex. Tel: 01-568 9222.

## Alembic in London



Musimex of north London are now sales agents for Alembic guitars in Europe and Scandinavia, and they recently told us of the top-class American company's latest super-axe, the Distillate 8-string bass. It features a five-piece maple and amaranth laminated neck-thru-body, the Explorer-shaped body itself having a mahogany core on to which are laminated various exotic hardwoods. The 24-fret fingerboard is of ebony,

and fretless options are available. The hardware includes a brass nut and backplate, Schaller machines (eight, of course!) and the Alembic 'quick-change' tailpiece. Electronically, the Alembic is pretty wide-ranging, as is their wont. It has two wide-band, low-distortion, specially wound Alembic pickups feeding an active pre-amp and tone filter control system with a two-position Q switch, frequency control, and bass and treble cut/boost switches. A rotary pickup selector and a status LED complete the control functions.

More info: Musimex, 33 Church Crescent, London N20 0JR. Tel: 01-368 2716.

## New Combos from Vox



Vox recently introduced two new amplifiers to their range, the Escort 50 Lead Combo, and the V125 Combo.

The Escort 50 Lead Combo features a newly-developed Vox loudspeaker which is claimed to give 'exceptional clarity and performance'. The combo's pre-amp boasts master and pre-amp level rotaries for complete control over overload sounds, along with three-band EQ, feeding the integral 50W power amp. Suggested retail price of the Escort 50 Lead Combo is £160.

The V125 Combo is a 125W valve unit featuring five-band active EQ, which Vox reckon is unique among valve amps. Overload sounds are induced thanks to the master and pre-amp rotaries along with something labelled a 'volume compensatory distortion circuit'. The V125, too, has new Vox drivers, and retails for a suggested £

Vox Ltd, 32-34 Gordon House Road, London NW5 1NE. Tel: 01-267 5151.

## Belli Bares New Wares

Remo have unveiled a new series of pre-tuned 'membranic' percussion instruments and drum heads which require no tuning adjustments or tensioning after manufacture, using a plastic film mounted and tensioned under controlled conditions. Remo Inc., of North Hollywood, California, have patent applications pending for various techniques involved in the production of the new heads and drums. President of the company is Remo Belli, shown above with one of his new drum heads, who first developed the plastic drum head in the late 1950s. Belli said that the technology involved in his new pre-tuned heads, which had taken over a year to develop, would herald, "The next major advance in the evolution of drum making"; and expected deliveries of the heads and other percussion instruments to begin in early summer 1982. Apparently, various other percussion manufacturers have already expressed interest in the 'membranic' head. Initially, Remo will offer the pre-tuned drum heads in the Ambassador Coated style, with a choice of bright, mellow, and dark tonal variations, in 12in, 13in, 14in,



and 16in batter heads, a 14in snare head, and a 22in bass drum head, with other sizes and types becoming available in due course.

Remo Inc, 12804 Raymer Street, North Hollywood, CA 91605, USA.



## New Pieces from Peavey

Peavey have been expanding their guitar range and, in addition to the T20 bass mentioned in the NAMM report in April's E&MM, have announced the new T15 and T30 electric six-strings.

The T15 is a two single-bar pickup solid with a compact 23½in, 20-fret scale maple neck, single volume and tone controls, a neck adjustment similar to Fender's micro-tilt, and a pickup selector switch down on the lower horn. There's a satin sunburst finish, and the suggested retail price is a reasonable £166.75 (inc VAT and case).

The T30 is similar to the T15 in overall dimensions and the shortish scale, although it features three single-bar pickups in typical Strat-like configuration, plus a five-way selector switch. The body of the T30 is of ash, and confirms that Peavey have well and truly dumped their earlier plastics experiments in favour of now-cheaper conventional woods. The T30 has a suggested retail price of £217.35 (inc VAT and case).

Both of these guitars can be obtained with Peavey's new 'electric case' which has a built-in 10W amp with gain and EQ plus speaker: with the T15 £217.35 (inc VAT), and with the T30 £256.45 (inc VAT).

Peavey Electronics (UK) Ltd, Unit 8, New Road, Ridgeway, Uckfield, Sussex TN22 5SX. Tel: 0825 5566.

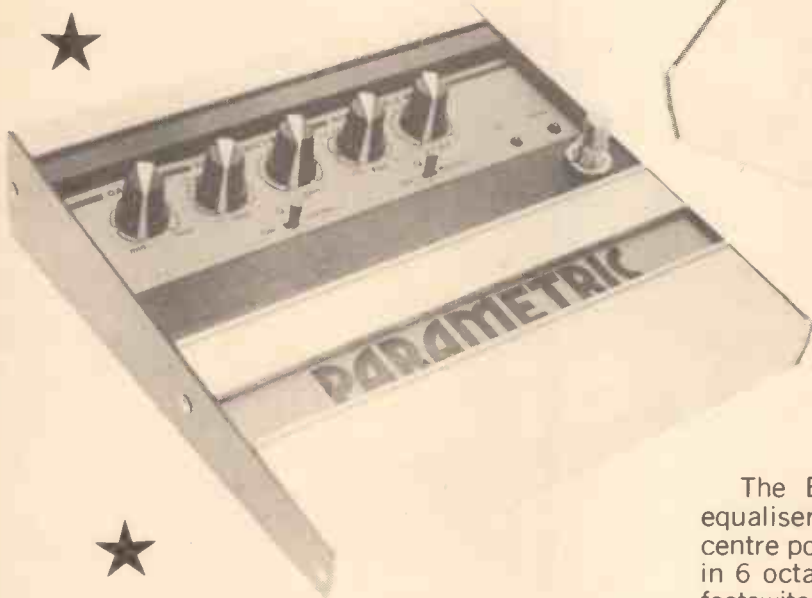
# SPECIAL OFFER

## TWO EFFECTS UNITS FROM CARLSBRO

This month, E&MM is able to make this exclusive offer to its readers — the **CARLSBRO PARAMETRIC** and **EQ 6** Effects Units.

**ONLY  
LIMITED NUMBER  
AVAILABLE**

**CARLSBRO PARAMETRIC:**  
Retail Price £82.00  
**SPECIAL OFFER PRICE £45.00**  
(inc. VAT & P&P)



**CARLSBRO EQ 6:**  
Retail Price £48.13  
**SPECIAL OFFER PRICE £29.00**  
(inc VAT & P&P)

The PARAMETRIC is mains operated and can be used with any electronic musical instrument. It contains two parametric equaliser sections each of which have three controls: Frequency — this allows you to select the operating frequency. On Parametric 1 the range is from 30Hz-3kHz. On Parametric 2 the range is from 200Hz-10kHz. The gain controls allow up to +25dB of cut or boost on the selected frequency range. The 'Q' switch selects the width of frequencies to be affected and can be used to reduce feedback by removing problem frequencies.

These EQ Units have a myriad of uses in the studio and on stage and can be used in almost any instrument application.

Take advantage of this limited offer with this big saving on the recommended retail price.

The EQ 6 is a battery-operated 6-band graphic equaliser having unity gain with all slider controls in the centre position. The range covered is from 125Hz-4kHz in 6 octaves and can be switched in and out with the footswitch.

### Offer must close March 31st 1982

Please complete order form below. Offer open to readers in the UK, Republic of Eire and Europe only. (European customers please add £5 for surface mail postage.) Overseas payments including Republic of Eire should be covered by a bankers draft in pounds sterling. Please allow 28 days for delivery.

Send this coupon and cheque/P.O. to:  
ELECTRONICS & MUSIC MAKER (Special Offers)  
282 London Road, Westcliff-on-Sea, Essex SS0 7JG.

Please send me:

Quantity	Item	Item Price £	Total £
	<b>Parametric Pedal</b>	<b>£45.00</b>	
	<b>EQ 6 Pedal</b>	<b>£29.00</b>	

I enclose a cheque/P.O. payable to:

Electronics & Music Maker for: £.....

PLEASE PRINT

Name: Mr/Mrs/Miss .....

Address .....

E&MM/6/82

All prices shown include VAT, postage and packing

# PANOLO

Design by Mike Beecher

Project development by Robert Penfold

- ★ A new effects unit combining pan and tremolo
- ★ Stereo and mono operation
- ★ Remote switching option for stage use

'Panolo' is a term we have invented to describe this easy to build and operate project for the electro-musician looking for a new effect. Despite its low cost, the Panolo gives high quality results and can be used in series with any keyboard (organ, synthesiser, etc.) and guitar prior to your amp or mixer.

The Panolo unit is in essence a split phase tremolo unit which also provides additional panning effects as well as conventional tremolo.

The normal tremolo effect simply consists of varying the volume of the processed signal (normally automatically) at a frequency of between about 0.1Hz and 10Hz.

A split phase tremolo is basically just two ordinary tremolo units, but as the gain of one signal is boosted, the gain of the other is reduced. This enables the following interesting effects to be obtained:

1. Conventional tremolo by using only one channel (in and out) of the unit.
2. Conventional split phase tremolo, where the single input signal is applied to both inputs, and is continuously panned from left to right and vice versa at the stereo outputs.
3. Used to process a stereo signal, first one channel and then the other becomes dominant.
4. With separate signals applied to the inputs, but with the outputs mixed together, a mono output is available having each input signal alternating between high and low levels — giving the impression of two sound sources swapping with each other.

This variety of options gives plenty of scope for experiment in the movement of sound sources and will produce exciting effects on stage with a stereo PA feed, exploited on Kraftwerk's 'Computer World' LP and Jean-Michel Jarre's 'Magnetic Fields' (using a special sequencer — see this month's feature).

## Block Diagram

The block diagram of the Panolo is shown in Figure 1; two voltage controlled amplifiers (VCAs) are at the heart of the unit. By means of a low frequency oscillator the gain of each VCA can be varied at the appropriate rate with the output of the oscillator connected to the control input of each VCA.

The only slight complication is that the two control signals have the same frequency, but must be opposite in phase. In other words, as one signal is positive going the other must be negative going, and vice versa. This is achieved here by obtaining one

**PARTS COST  
GUIDE £16**  
including case

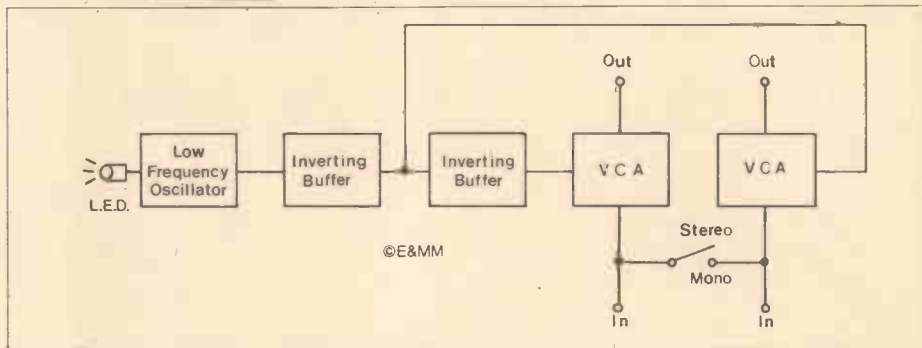


Figure 1. Block diagram of the Panolo.

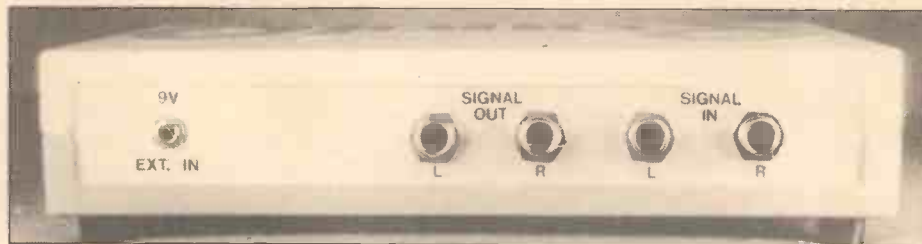
control signal from the oscillator via an inverting buffer amplifier so that a control signal of opposite phase to the oscillator's output is obtained. The oscillator is also used to operate an LED indicator which flashes at the Panolo 'rate' setting. A switch enables the two inputs to be connected together when a conventional split phase tremolo effect is required.

## The Circuit

Figure 2 shows the complete circuit diagram of the Panolo, and the two VCA's (IC3), which are based on an LM13600N dual operational transconductance amplifier (OTA). An OTA is different to an ordinary operational amplifier in a number of respects. The two main differences are that a transconductance amplifier gives an output

current that is governed by the differential input voltage, whereas an ordinary operational amplifier has an output voltage that is governed by the differential input voltage. A transconductance amplifier has a third input terminal (the amplifier bias input), and the conductance (gain) of the amplifier is controlled by the bias current fed to this input. In order to use a transconductance amplifier as a voltage controlled amplifier it is necessary to connect a resistor between the output terminal and the 0V rail so that the output current develops a voltage across this load resistor, and the circuit then acts as a voltage amplifier. A resistor is connected in series with the input to the amplifier bias input so that the bias current is proportional to the applied voltage.

In this circuit R11 and R19 are the output resistors, and R8 plus R18 are the series



Rear panel view.



Front panel view.

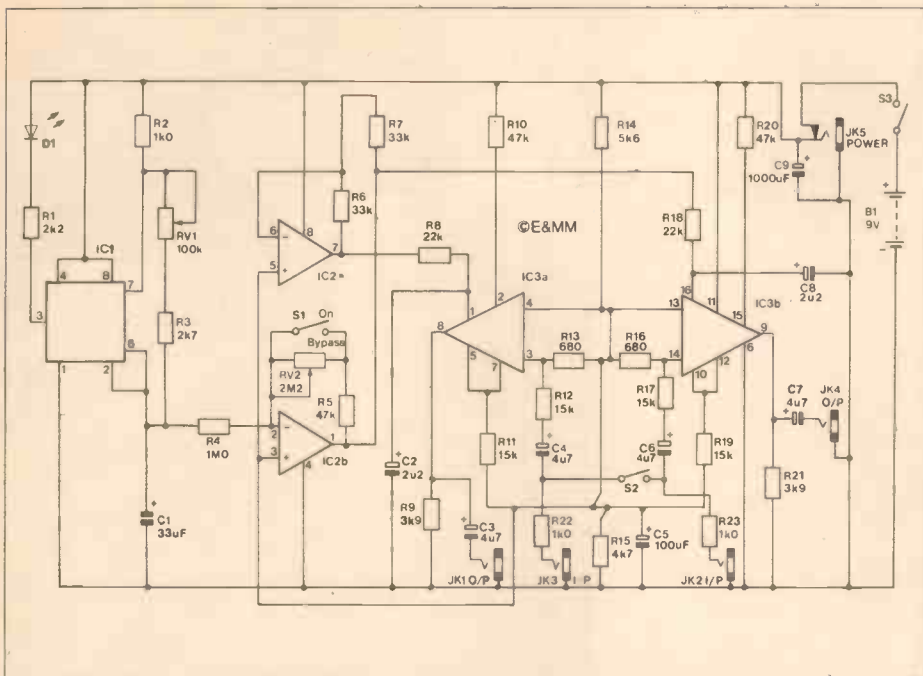


Figure 2. Circuit diagram of the Panolo.

resistors at the amplifier bias inputs. The output impedance of a transconductance amplifier is rather high, and a buffer amplifier is therefore used at the output of each VCA. These amplifiers have internal Darlington Pair emitter followers but require discrete load resistors, viz: R9 and R21.

The circuit is powered by a single 9 volt battery, and the central 0V rail is therefore formed by a potential divider across the supply rails (R14 and R15). R13 and R16 bias the non-inverting inputs of the transconductance amplifiers to the 0V rail, and the inverting inputs are connected directly to this. The input signals are coupled to the non-inverting inputs by coupling capacitors C4 and C6, and series resistors R22, R12, R23 and R17. The resistors boost the input impedance of the circuit to an acceptable level of a little over 16k, and the losses they introduce prevent the VCAs from having excessive voltage gain. It is not possible to reduce the gain of the circuit and produce increased input impedance by using negative feedback over the amplifiers as the feedback would try to maintain the voltage gain of the amplifiers at a certain level, and the desired VCA action would not be obtained.

Although the transconductance amplifiers are used open loop they still give low levels of noise and distortion provided the circuit is not overdriven or used with a very low input signal level. The LM13600N has linearising diodes at the input of each amplifier, and by applying a small bias current to these the overload margin of the amplifiers can be boosted. The bias currents are provided by R10 and R20 in this circuit.

S2 is the 'mono'/stereo' switch, and simply connects the two input sockets in parallel when in the 'mono' mode: R22 and R23 prevent possible damage to external equipment should the 'mono' switch position be accidentally selected whilst both inputs are in use.

The low frequency oscillator uses an ICM7555 device, which is the CMOS version of the popular 555 timer IC. The CMOS version is used in this circuit as it gives a lower current drain on the battery, and it does not introduce noise spikes on to the supply lines. The main output of IC1 (pin 3) cannot be used to provide the modulation signal as the waveform here is rectangular, and this would result in the VCAs being switched between two levels of gain, rather than being smoothly varied between the gain

limits. However, the output at pin 3 of IC1 is used to operate LED indicator D1 which gives a visual indication of the tremolo rate.

The waveform produced across C1 is roughly triangular, and this is a suitable modulation waveform. IC2b is used as a buffer amplifier between C1 and the control input of IC3b, and the voltage gain of IC2b is controlled by RV2 which is the modulation depth control. Maximum resistance gives maximum modulation depth. S1 can be used to short circuit RV2 and thus switch off the tremolo effect. The tremolo frequency is controlled using RV1, and can be varied from about 7Hz at minimum resistance, to approximately one cycle every seven seconds at maximum resistance. IC2a is used as the basis of the second buffer amplifier, and this is a straightforward unity gain inverting amplifier which is interposed between the output of IC2b and the control input of IC3a, to provide a low driving impedance.

S3 is the on/off switch, and SK5 enables the unit to be used with an external 9 volt power supply (such as the E&M Synpac, featured in September 1981), whilst at the same time disconnecting the battery.

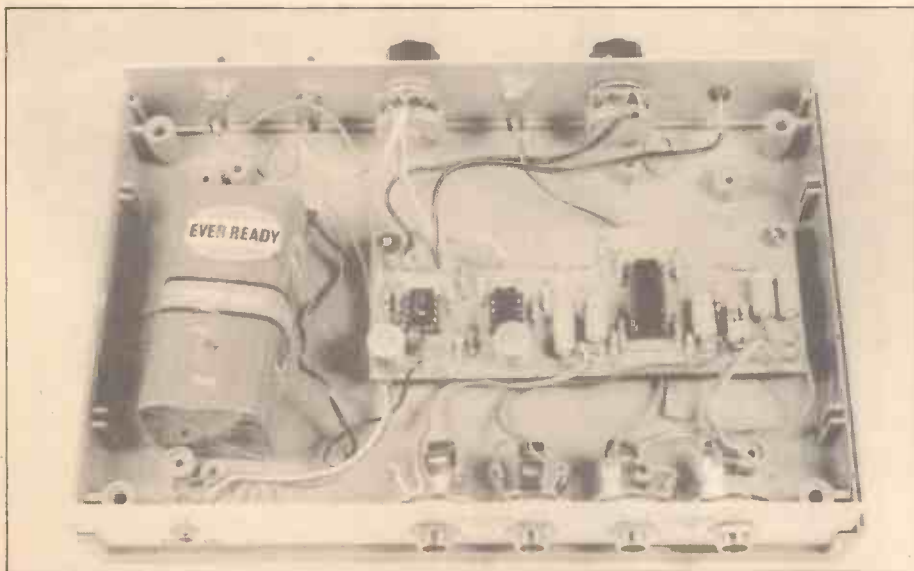
## Construction

The recommended case for the unit is a Verobox having approximate outside dimensions of 205 x 140 x 40mm, but any case of around this size should be suitable. The general layout of the unit can be seen from the accompanying photographs, but the layout is not critical and using a different arrangement should present no difficulties.

Figure 3 and 4 shows the component layout and other details of the printed circuit board. Although IC1 is a CMOS device it has built-in protection circuitry that renders special handling precautions unnecessary. IC2 has a PMOS input stage, and does require the normal MOS handling precautions. Use a socket for this device, and do not plug it into circuit until the unit is complete in other respects. Leave IC2 in its protective packaging until it is to be inserted in its socket, and handle it as little as possible. Although IC1 and IC3 are not prone to damage from static charges, they are not the cheapest of devices and it is probably worthwhile fitting these in sockets as well. Note that IC1 has the opposite orientation to the other two integrated circuits.

Use Veropins at points on the board where connections to off-board components will be made. The finished board is mounted on the base panel of the case using 12.7mm 6BA screws, 6.35mm spacers, and fixing nuts. The spacers are needed to prevent excessive stress and possible damage to the board when the fixing nuts are tightened. Figure 3 shows all the point to point wiring of the project, and it is not essential to use screened leads for this (ribbon cable was found suitable when wiring up the prototypes).

A piece of foam material can be glued to the lid of the case so that the PP6 size battery is trapped firmly in place when the lid is fixed in place. The current consumption of the



Internal view.

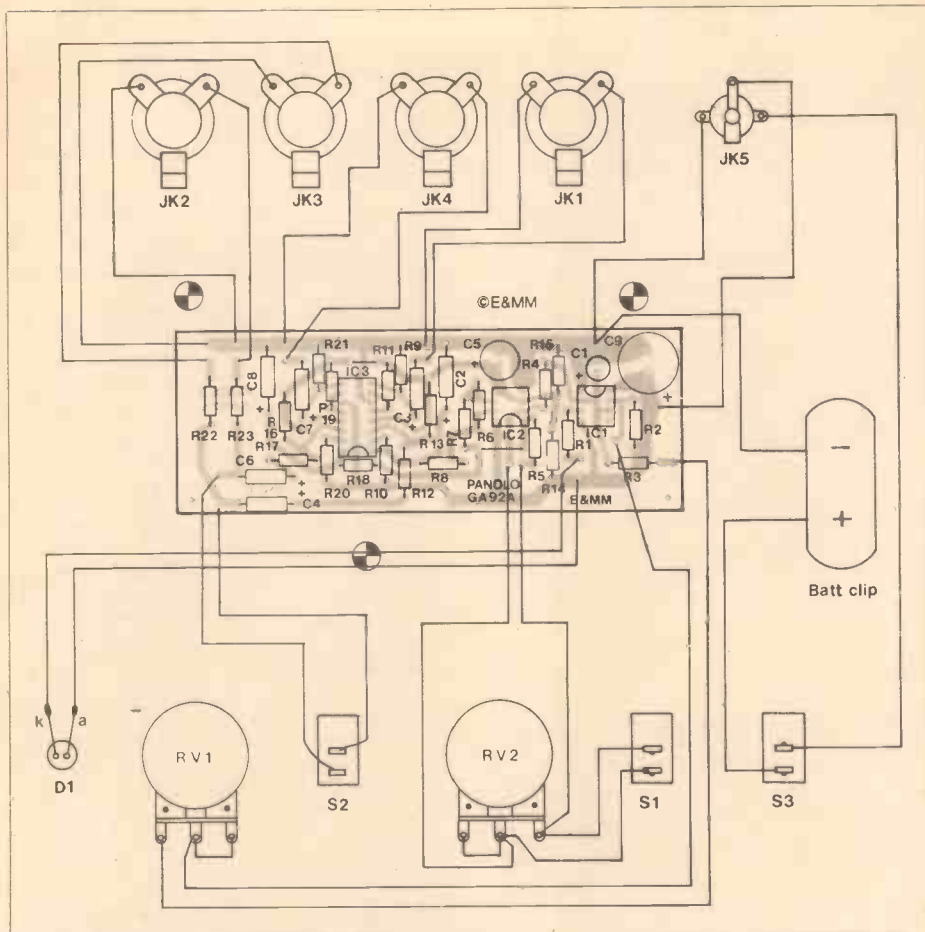


Figure 3. PCB component overlay and wiring of the Panolo.

completed unit should be in the region of 12mA. Power is connected to SK5 using a lead terminated in a 3.5mm jack plug, and the tip of the plug carries the positive supply with the barrel carrying the negative supply.

When used to give a split phase tremolo effect, S2 must be set to the 'mono' (closed) position and the input signal can be applied to SK2 or SK3. In this mode the unit can also be used to give a simple tremolo effect with the input applied to SK2 or SK3, and the output taken from SK1 or SK4. S2 is set to the 'stereo' (open) position for other modes of operation. If a wider tremolo frequency range is required C1 can be made larger in value to expand the low frequency range, and R3 can be made lower in value to increase the upper frequency limit. However, this will make it a little more difficult to set the desired tremolo rate, especially at the high frequency end of the range.

If a foot operated bypass switch is required S1 can be replaced with a 3.5mm or ¼" jack socket, and an external foot operated switch can be connected to this. If one channel of the unit has substantially more gain than the other the value of R12 or R17 can be reduced somewhat to increase the gain of the weaker channel to a suitable level.

For stage use, BNC, DIN, XLR or other latching connectors are recommended for reliable connection of the external power; it is important to note that if the unit is powered from an external source via connectors other than the specified jack, S3 must be switched to the off position. Also S1, 2 and 3 will be less prone to damage if rotary or push-button types are adopted. **E&MM**

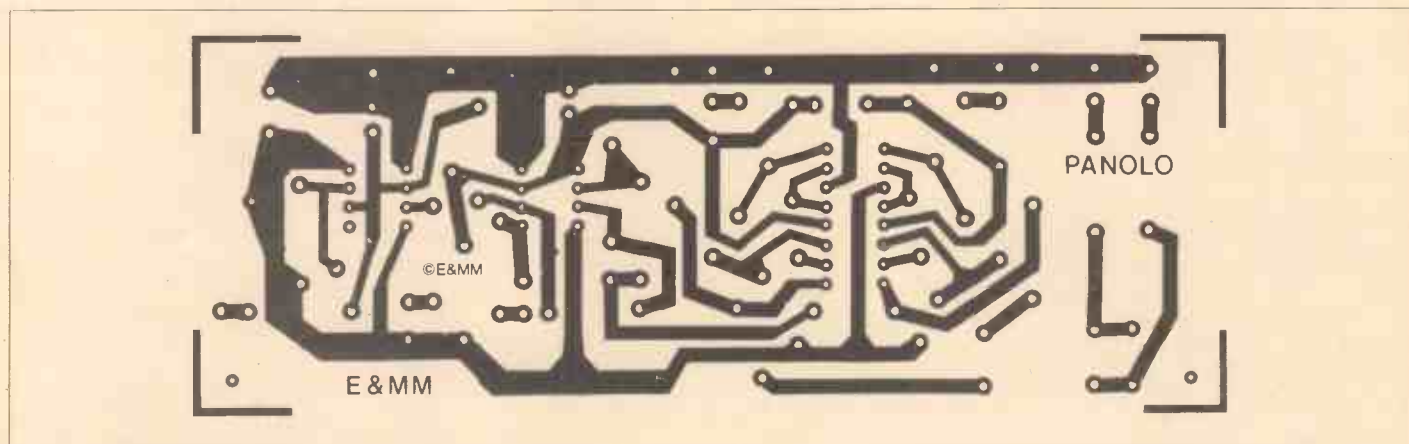


Figure 4. PCB track layout (full size).

**PANOLO PARTS LIST**

Resistors — all 5% ¼W carbon unless specified		Maplin Code	Semiconductors	
R1	2k2	(M2K2)	IC1	ICM7555 (YH63T)
R2,22,23	1k	3 off (M1K)	IC2	CA3240E (WQ21X)
R3	2k7	(M2K7)	IC3	LM13600N (YH64U)
R4	1M	(M1M2)	D1	3mm orange LED (WL34M)
R5,10,20	47k	3 off (M47K)	Miscellaneous	
R6,7	33k	2 off (M33K)	S1,2,3	SPST min toggle 3 off (FH97F)
R8,18	22k	2 off (M22K)	SK1,2,3,4	Standard mono jack sockets 4 off (HF91Y)
R9,21	3k9	2 off (M3K9)	SK5	3.5mm jack socket (HF82D)
R11,12,17,19	15k	4 off (M15K)	PP6 size battery	
R13,16	680R	2 off (M680R)	Battery clip (PP3 style)	(HF28F)
R14	5k6	(M5K6)	PCB	(GA92A)
R15	4k7	(M4K7)	Case	(LL05F)
RV1	100k lin pot	(FW08J)	Control knobs	2 off (YX01B)
RV2	2M2 lin pot	(FW09K)	3mm LED clip	(YY39N)
Capacitors			Veropins	(FL23A)
C1	33uF 10V tantalum	(WW74R)	8-pin DIL IC sockets	2 off (BL17T)
C2,8	2u2 63V electrolytic	2 off (FB15R)	16-pin DIL IC socket	(BL19V)
C3,4,6,7	4u7 63V electrolytic	4 off (FB18U)	12.7mm 6BA screws	(BF12N)
C5	100uF 10V PC electrolytic	(FF10L)	6BA nuts	(BF18U)
C9	1000uF 16V PC electrolytic	(FF17T)	6.35mm 6BA spacers	(FW34M)
			Wire, solder, etc.	

# POWER PACKED — by POWERTRAN

THE FIRST WORDS AND THE LAST WORD IN ELECTRONIC KITS

Powertran's black boxes are packed with punch. Not only are they superb kits to buy and build they really do the job! Imaginative and ingenious design goes hand in hand with top quality materials and outstanding performance capability. With their smart black styling the kits harmonise visually as well as musically.

You can build each unit independently for its set task and then gradually increase your array until you have a complete bank of formidable controllable power.



Complete Kit — £49.90 + VAT

MPA 200 — is a low price, high power 100W amplifier. Its smart styling, professional appearance and performance, make it one of our most popular designs. Adaptable inputs mixer accepts a variety of sources yet straightforward construction makes it ideal for the first-time builder.



Complete Kit — £49.50 + VAT

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



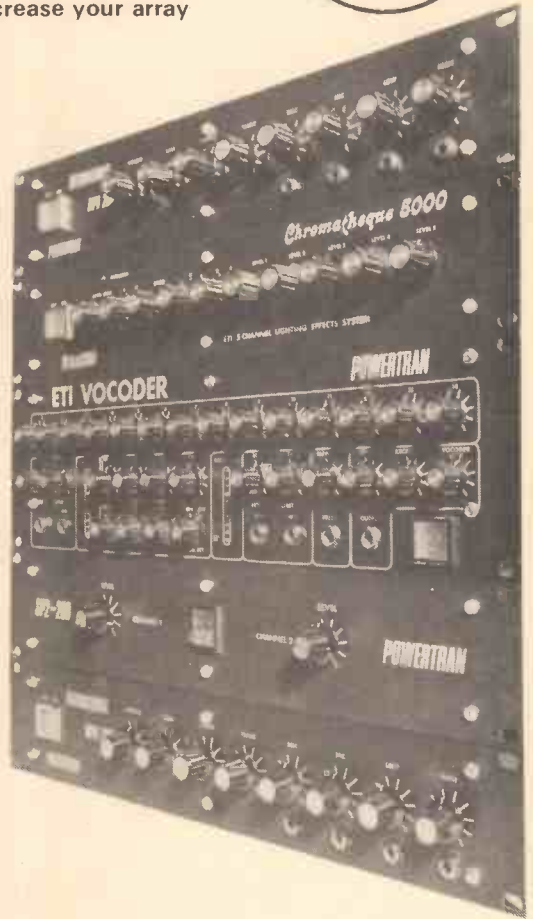
Complete Kit — £175.00 + VAT

ETI Vocoder — 14 channels, each with independent level control, for maximum versatility and intelligibility; two input amplifiers — speech/external — each with level and tone control. The Vocoder is a powerful yet flexible machine that is interesting to build and, thanks to our easy to follow construction manual, is within the capability of most enthusiasts.



Complete Kit — £64.90 + VAT

SP2 2000 — twice the power with two of the reliable, durable and economic amps from the MPA 200; fed by separate power supplies from a common toroidal transformer. Superb finish and quality components throughout — up to (even over!) the standard of high priced factory-built units.



## STOP PRESS: NEW FROM POWERTRAN DIGITAL DELAY LINE AS FEATURED IN FEB/MARCH 1982 E&MM

THROW AWAY ALL THOSE EFFECT PEDALS — THIS ONE'S GOT THE LOT

Ranging from phasing right through to distinct echoes with up to 1.6s max delay, all at the push of a button. Just select delay required for chosen effect.

FEATURES INCLUDE:—

EFFECTS — REVERB (all types) — CHORUS — PHASING — FLANGING — ADT — ECHO & MANY MORE  
Delay from 0.31ms to 1.6 sec expandable in 400ms stages.

Sweep modulation. Variable speed and depth. Repeat and freeze of delayed signal with no degradation in quality of recycled information. Great for building up unique backing accompaniments. Also allows pitch to be varied up and down.

High and low input sockets.

28.5K and 1.5K respectively.

Level control with overload LED.

Mix control of dry and delayed signal.

This unit is an absolute must for both the professional studio user and amateur electro-musician. Just compare the specification with units costing upwards of £1,000. Unbelievable value!

Kits start at £130 + VAT with 400ms delay. 400ms add on delays £9.50 + VAT. Up to a maximum of 1.6 sec.



.... Quite simply the best way to make music



### WORLD LEADERS IN ELECTRONIC KITS

- Money Back Guarantee — If you are not completely satisfied with your Powertran Kit return it in original condition within 10 days for full refund.
- Free Soldering Practice Kit — To assist the beginner we will supply, on request with your first kit order, a free soldering practice kit with useful tips and illustrations.
- Component Packs — Most kits are available as separate packs (e.g. PCB component sets, hardware sets etc). Prices in our FREE catalogue.
- Ordering — Full ordering details, delivery service, and sales counter opening — inside front cover of this issue.

PORTWAY INDUSTRIAL ESTATE, ANDOVER, HANTS SP10 3WW. (0264) 64455.

ORDER BY PHONE  
(0264) 64455  
Simply telephone us with your order and quote  
your Access or Barclaycard number.  
40 PAGE CATALOGUE FREE — CONTAINS  
FULL DETAILS OF ALL OUR KITS

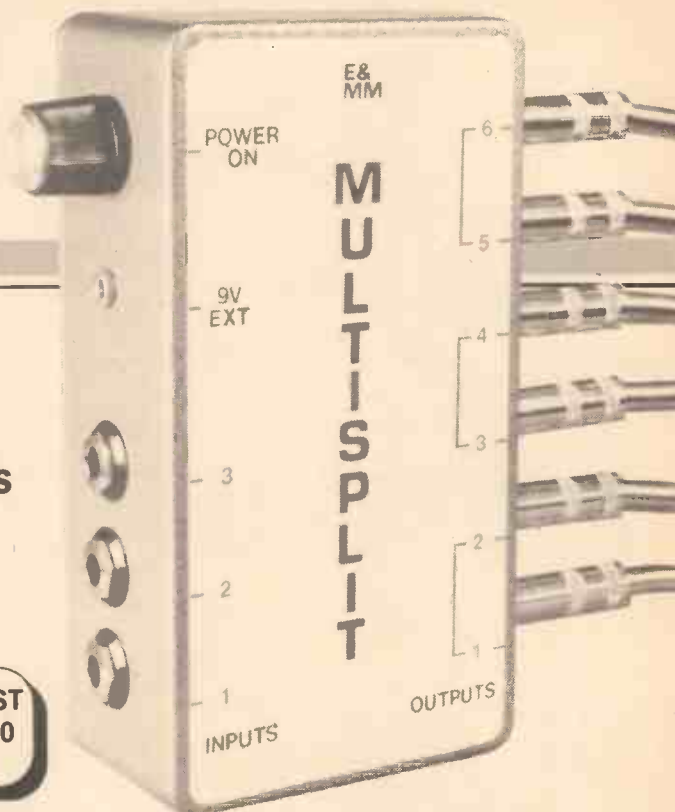
# MULTISPLIT

Design by Mike Beecher

Project development by Robert Penfold

- ★ Overcomes equipment matching problems
- ★ Accepts 1 to 3 inputs and distributes these to 2-6 outputs
- ★ Drives long cables and low impedance loads
- ★ Use with internal battery or E&MM Synpac

PARTS COST  
GUIDE £10  
inc. case



Probably most electro-musicians are equipped with a mixer of some kind that enables several inputs to be mixed down into a single signal, but a piece of equipment that enables one signal to feed several inputs is far less common, although in its way just as useful. In some cases, where a signal source having a fairly low output impedance is driving several inputs having high or medium input impedances, simply connecting all the inputs in parallel and feeding them with the input signal should give satisfactory results. However, problems can arise when a high or medium source impedance is used to drive several inputs. Due to loading effects the source signal can be attenuated to such a degree that there is an inadequate signal level.

The Multisplit has been designed to overcome problems of this type, and the unit has three inputs each of which gives a pair of outputs. The input impedance at each input is 100k, and the output impedance of the unit is low. The unit is not restricted to having three inputs with each one giving a pair of outputs, and if only one input is used an output signal is available at all six output sockets. If two of the inputs are used, one input signal is available at two output sockets, and the other is available at the other four outputs.

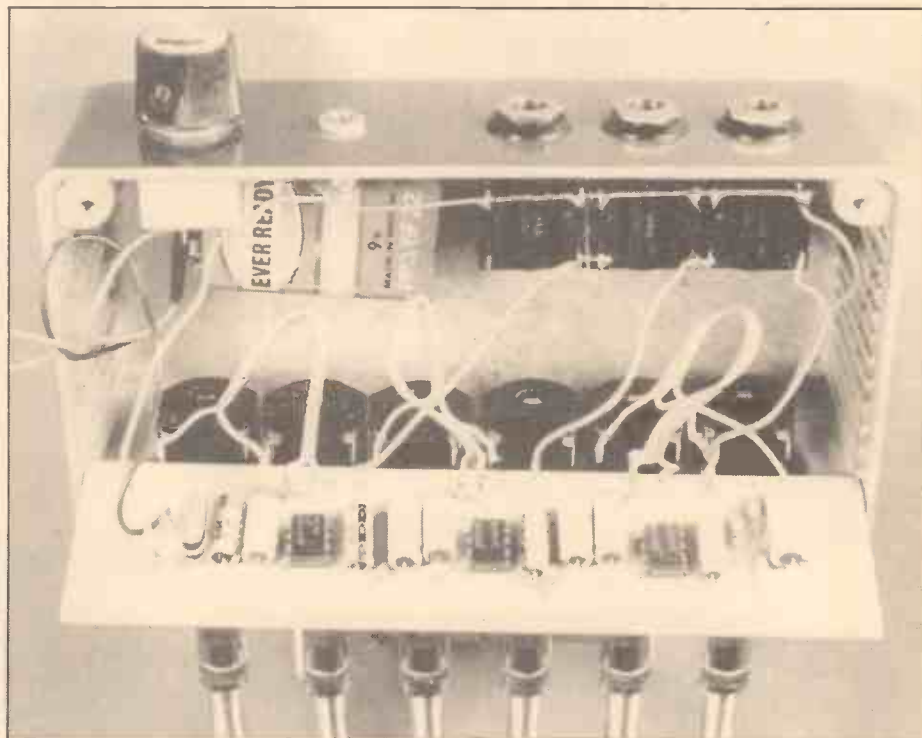
The noise and distortion levels of the unit are negligible provided the input level is kept below the clipping level of about 6 volts peak to peak, and a very low (say less than about 30mV RMS) signal level is not used with the unit. There is unity voltage gain through the circuit. Apart from use as a splitter, the unit can also be used as a buffer amplifier where it is necessary to match a high source impedance to a low input impedance.

## The Circuit

The unit consists basically of three buffer amplifiers, and the full circuit diagram is provided in Figure 1. Each amplifier uses an operational amplifier with 100% negative feedback from the output to the inverting input so that unity voltage gain is obtained. R1 and R2 form a centre tap on the supply lines, and the non-inverting input of each



PCB board.



Interior view of the Multisplit.

operational amplifier is biased from this via a separate resistor (R3 to R5). It is these resistors that determine the input impedance of the unit, and the input impedance can therefore be easily altered if desired. C2 is a decoupling capacitor which prevents stray coupling between the inputs through the bias circuit.

Each input socket is connected to its respective operational amplifier via a DC blocking capacitor, and break contacts on JK4 and JK7 connect all three input sockets together. Thus an input signal applied to JK1 appears at all three inputs, but if an input signal is also applied to JK4 this signal is applied to IC2 and IC3, and the break





# Multisplit

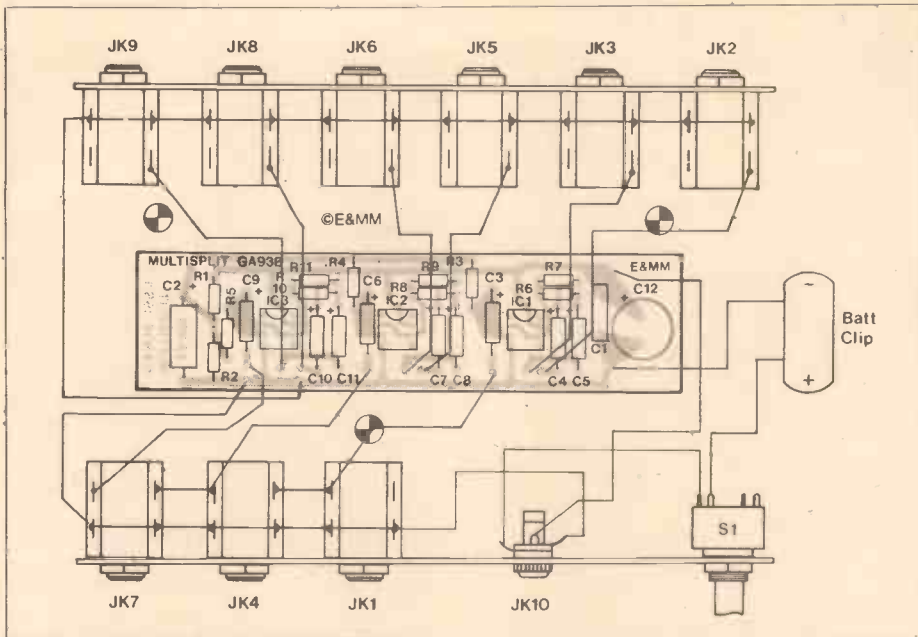


Figure 2. PCB component layout and wiring of the Multisplit.

at the same time disconnecting the internal battery. The tip of the jack plug must carry the positive supply and the barrel carries the negative supply. Alternatively, a latching connector (e.g. BNC or DIN) can be used for extra robustness on stage. If the unit is then also fitted with an internal battery it is essential that on/off switch S1 is set to the 'off' position when an external power source is used with connectors other than the specified jack socket. S1 becomes inoperative when an external power supply is used, and the unit is turned on and off using the on/off switch of the power supply.

If you wish to use the unit with one input and six outputs the input signal must be applied to SK1. With inputs connected to JK1 and JK4 the signal applied to JK1 is available from JK2 and JK3, and the input applied to JK4 is available from JK5, JK6, JK8 and JK9. An input signal applied to JK7 will only be available from JK8 and JK9, and will not give a six-way, or even a four-way split. Of course, with all three inputs used each input is coupled through to its respective pair of outputs (JK1 to JK2-3, JK4 to JK5-6, and JK7 to JK8-9).

E&MM

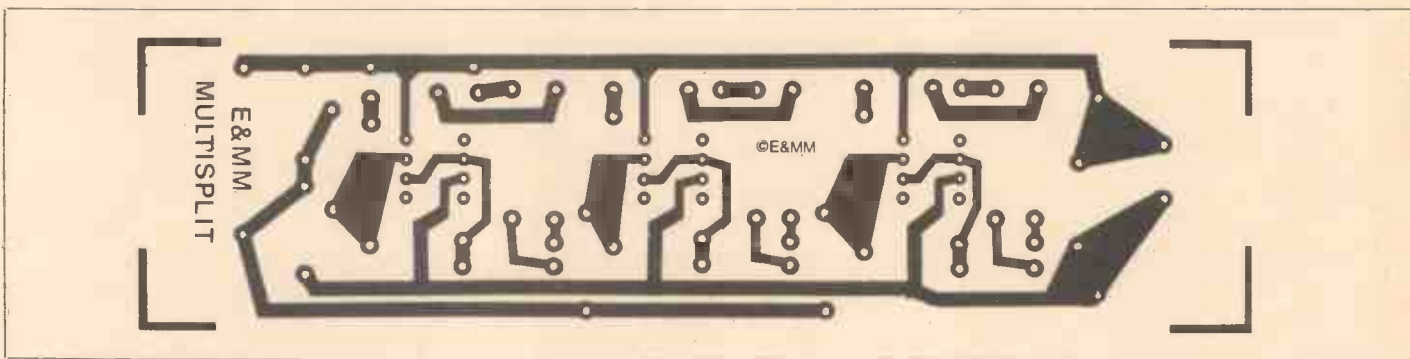


Figure 3. PCB track layout (full size).

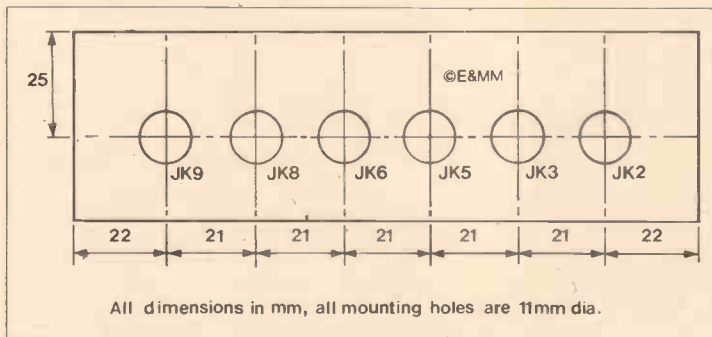
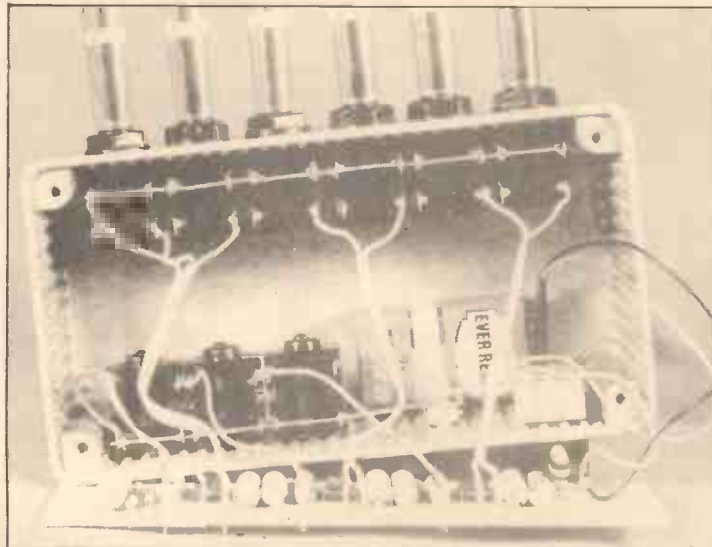


Figure 4. Drilling details of the Multisplit.



Interior view.

## MULTISPLIT PARTS LIST

Resistors — all 5% 1/8W carbon unless specified		Maplin code
R1,2	4k7	2 off (M4K7)
R3,4,5	100k	3 off (M100K)
R6,7,8,9,10,11	100R	6 off (M100R)
Capacitors		
C1	100nF polyester	1 off (BX76H)
C2	100uF 10V electrolytic	2 off (FB48C)
C3,6,9	1uF 63V electrolytic	3 off (FB12N)
C4,5,7,8,10,11	10uF 25V electrolytic	6 off (FB22Y)
C12	1000uF 16V electrolytic	1 off (FF17T)
Semiconductors		
IC1,2,3	LF351	3 off (WQ30H)
Miscellaneous		
S1	Rotary on/off switch	1 off (FH57M)
B1	PP3 size 9 volt battery	1 off
JK1-9	Standard jack socket with 2 break contacts	9 off (HF90X) (HF82D)
JK10	3.5mm jack socket	
	150 x 80 x 50mm diecast aluminium box	1 off (LH73Q)
	Veropins	(FL23A)
	Control knob	(RW88V)
	PCB	(GA93B)
	PP3 connector	(HF28F)
	Wire	(XR06G)



### Tragic Loss For Rose-Morris

Roy Forder, Sales Director of Rose-Morris and Company Limited, died tragically and unexpectedly on 3rd April. Roy joined Rose-Morris in 1975 and immediately established himself as a strong and popular Sales Manager not only within the Company but within the U.K. music industry as a whole. He will be greatly missed.

### SYCO Electronic Music Award

The S.E.M.A. award is open to anyone who has completed the first year of music study in any British college or university and is not a professional musician.

The award allows the winner the use of a Fairlight CMI for one year in their musical studies and development (150 hours). The winner will also receive £200-worth of ancillary recording equipment.

The award is intended to encourage the serious use of electronic musical equipment and to broaden awareness of its latest developments among young musicians.

Contestants reaching part II of the application process are required to submit a piece of their own composi-

tion for electronic musical instruments and finalists will attend a performance or playing of this piece before the judging panel.

Applications and details are available only by writing to: The Secretary, Trinity College of Music, Mandeville Place, London W1M 6AQ.

### Designs on Excellence

Following the recent 1982 Design Council Awards made by HRH The Duke of Edinburgh, submissions for its five Award categories are invited — Engineering Products and Components, British Motor Industry, Medical Equipment and Consumer or Contract Goods.

The Council is looking for products which may be simple or sophisticated, technical or beautiful but are an amalgam of outstanding design.

Details from: Tony Key, Awards Manager, The Design Council, 28 Haymarket, London SW1Y 4SU. Tel: 01-839 8000.

### Discline In The Spotlight

Spotlight, a subsidiary of the Morgan Grampian Group have taken over the production of recordings for British Telecom's Discline (Dial-a-Disc) service. The service will present a total of 30 records from the charts each week and record companies will be able to promote their new releases in advertising slots.

## 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.

May 14th-18th THE 1982 BRITISH MUSIC FAIR will be held at the National Exhibition Centre, Birmingham. 20,000 square feet of space has already been reserved by exhibitors and reservations are still being taken. Those expected to attend are Carlsbro, Custom Sound, H&H Electronics, Laney Amplifiers, Tannoy and Roland. For more details Tel. 01-834 1347.

June 3rd-5th THE THIRD INTERNATIONAL COMMODORE COMPUTER SHOW. The Cunard Hotel, Hammersmith, London. Over 100 exhibitors of microcomputer systems demonstrating products for specialist business applications, educational uses and communications. Also seminars throughout the show introducing people to the world of microcomputers. For details ring Slough 79292.

June 18th-20th GLASTONBURY CND FESTIVAL. 1980's-style successor of the famous 'Glastonbury Fayre', this gathering E&MM JUNE 1982

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 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. Working 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.

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.



# MUSICAL DISCOUNT WAREHOUSE

- ★ Casio MT 31's ..... }
- ★ Casio MT 40's ..... }
- ★ Casio 101's ..... }
- ★ Casio 202's ..... }
- ★ Casio 403's ..... }
- ★ Casio 601's ..... }
- ★ Casio 701's ..... }
- ★ Roland EP II ..... }
- ..... our price £275
- ★ Moog Rogue Synth's ..... }
- ..... our price £199
- ★ Teac Portastudios ..... }
- ★ Teac A3440's ..... }
- ★ Teac Model 2A Mixers .... }
- ★ Teac MB20 Meter Bridges ..... }

Phone for quote

Phone for quote

Access — Barclaycard — Mail Order — Closed Wednesdays —



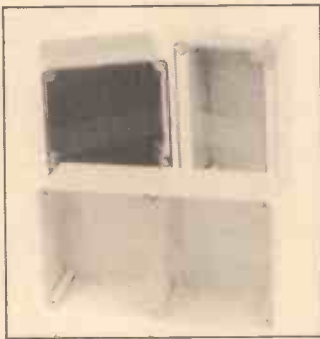
MARY STREET  
LANCASTER  
LA1 1UW  
0524 60740

# NEW PRODUCTS

## NEW MULTI-SHAPED LEDs

Zaerix Electronics Ltd have recently introduced a completely new family of multi-shaped LEDs suitable for a multitude of diverse indicator applications. Including not only 3mm and 5mm standard devices but also rectangular, square, domed, dot and arrow shapes, almost any design of bar graph and arrowed 'null indicators' can be produced. Comprising 30 lens shapes, 3 lead frame designs and 7 basic diffused or transparent colours these GaAsP/GaP devices have typical power dissipation figures of 105mw, will operate over a temperature range of -40°C to +80°C and have luminous intensity capabilities of up to 20mcd @ 20mA.

For further details contact Granary Enterprises, Greatness Lane, Sevenoaks, Kent TN14 5BQ. Tel: (0732) 460424.



## ANOTHER DEEP PROFILE, CLEAR LID, BIMBOX

Augmenting their existing BIM 2000 range of Bimboxes, BOSS Industrial Mouldings Ltd have now added another deep profile clear lid for use in a variety of timer/control type applications where viewing of, but not necessarily access to, internal components is required.

Designed to fit on to the BIM 2006 size Bimbox this new clear lidded version is designated BIM 2006/26 and measures overall 190 x 110 x 90mm high. With the clear lids manufactured in SAN and the bases in black, grey, orange, white or blue ABS, 5.08mm (0.2") spaced slots are incorporated on all sides for supporting 1.5mm (0.062") PCBs. Both the coloured and transparent versions of the lid are secured by four screws running into the base corner bosses and, with the lids incorporating small flanges all round, which sit recessed into the base, these boxes exhibit excellent water repellent properties.

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

## H/H AMP AND MIXER

Unveiled at the British Music Fair for the first time will be the new H/H Mixer Amps — the MA80 (80 watt, 4-channel), MA150 (150 watt, 5-channel) and the S150 (150 watt slave amp). Also being unveiled will be a new 6-channel mixer with a full range of features.



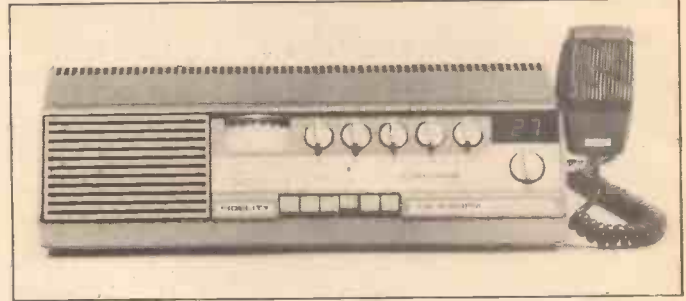
## SLIMLINE DE-SOLDER GUNS

The latest addition to Tele-Production Tools range for the electronics enthusiast are two new de-solder guns. These high quality precision made tools are available in two sizes: the first for most standard work being 19mm dia x 220mm long (0.75" x 8.5"), and for fine joints the miniature de-solder gun is ideal being only 14mm in dia x 165mm long (0.55" x 6.5"). Both de-solder guns have plunger guards and are easy to

operate in one hand. (Each gun has powerful suction and a low re-coil to leave joints clean and tidy.) The solidified solder is automatically ejected when the gun is re-set for the next operation.

Replacement Teflon tips are available for both guns at £0.70 each and the guns cost £5.95 each or £10 for the pair. All prices include VAT and carriage.

For further details contact: Lionel Crockett, Stiron House, Electric Avenue, Westcliff-on-Sea, Essex SSO 9NW. Tel: (0702) 352719.



## CITIZENS BAND RADIO HOME BASE STATION

We don't normally get involved with CB, but Fidelity Radio have developed their CB3000 which includes a headphone socket and an external speaker. There are also PA

speaker and tape recording sockets.

An enterprising micro enthusiast could now possibly hold 'conversations' with fellow micro users by broadcasting from micro output ports. Let us hear if anyone gets a system going.

For more details of the CB contact Fidelity Radio Ltd, Victoria Road, London NW10 6ND. Tel: 01-965 8771.



## NEW BOOKSHELF LOUDSPEAKERS FROM REVOX

## TUTTIFRUTI

The DrumDrops albums (Tutti-Fruti as they are sometimes known) are now available from Mustang Records and Tapes.

The albums, 1-5, are selections of contemporary drum styles and tempos arranged in 8-bar phrases for verses and choruses. All styles are included — from disco and rock'n'roll to country and jazz. Each selection is overdubbed with appropriate percussion instruments such as cowbell, congas, tambourine, cabasa and timbales etc. The albums are £5.99 each including post and packing.

Available from: Mustang Records & Tapes, P.O. Box 139, High Wycombe, Bucks HP13 5LH. Tel: (0494) 443508.

Revox have added a bookshelf unit to their range of loudspeakers. Designated the Revox Piccolo, the new loudspeakers are extremely compact, measuring 220mm x 140mm (front panel dimensions), finished in black and containing a 122mm bass/mid-range driver and an 18mm dome tweeter. The Piccolos will handle 35W, with a frequency response of 80Hz to 22kHz (+3dB), and retail at a price of £90.00 plus VAT, per pair.

Further information on all Revox Hi-Fi equipment is available from F.W.O. Bauch Limited, 49 Theobald Street, Boreham Wood, Hertfordshire WD6 4RZ. Tel: 01-840 2671.

## NOISE CONTROL

AIMS Limited will be launching a new version of their noise controller MINIM. Designed primarily for use in clubs etc., the MINIM has presettable noise level settings which allow the volume of live and recorded music to be regulated.

The new version, MINIM II is claimed to have improved electronics, easy to view controls, be more compact, lighter and easier to install. A three level warning light indicates when the preset noise level is reached.

The system meets with local authority regulations, has a two year warranty and is available for £333 including delivery (excluding VAT).

For further information contact: Ken Parkinson, AIMS, 25, Potters Lane, Kiln Farm, Milton Keynes, MK11 3HG. Tel: (0908) 562953.



## ZX81 KEYBOARDS

Kempston Electronics have developed a 'full-size' keyboard for the ZX81. It is inserted in the recess made by peeling off the existing touch-sensitive keyboard and a ribbon cable connects to the ZX81 itself. The keyboard is sold in kit form at a price of £22.50.

Details of this and other ZX81 attachments from Kempston Electronics, 60, Adamson Court, Hillgrounds Road, Kempston, Bedford MK42 8QZ.

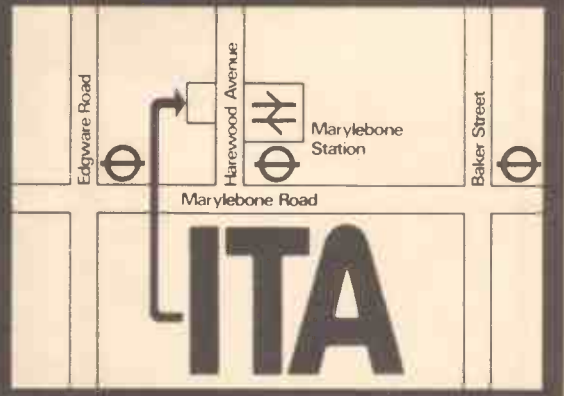
# WHERE DO YOU GO FOR THE BIGGEST CHOICE IN STUDIO EQUIPMENT?

Equipment from 42 manufacturers is on display at London's biggest pro audio dealer! Park outside — and come and hear all about it!

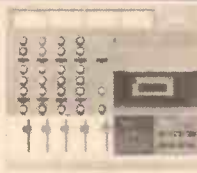
## PLUS THE BEST ADVICE.

Impartial technical help to ensure you get the system you really need. Our engineers are here to help you with installation and after-sales assistance. ASK ABOUT OUR FAMOUS PENNY PINCHING PACKAGES.

Finance, H.P. or Leasing.



**Fostex**



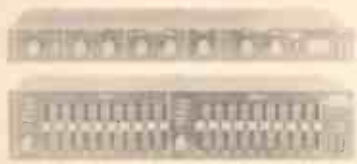
250  
Multi  
tracker



A-8



350



Signal  
Processing

**OTARI**



2 track



4 track

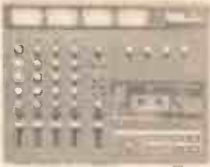


the  
ultimate  
8 track



Cassette  
copier

**TEAC**



Porta  
studio



22-4



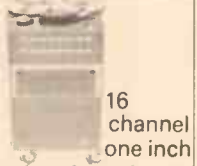
3440



Model 3  
Model 2A

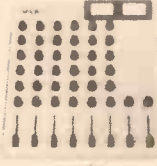


**itom**

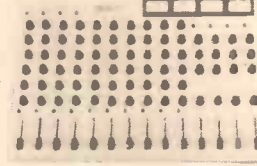


16  
channel  
one inch

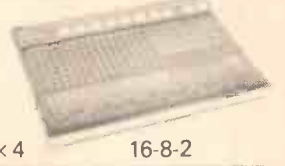
**SECK**



6x2



10x4



16-8-2

**REVOX**



The  
LOCATION  
MIXER



London  
**TANNOY**  
Distributors



**AKG**



**Nakamichi**



**TEAC**



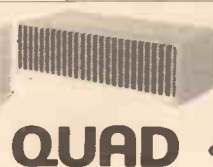
**REVOX**



**Rebis**



**DR**



**QUAD**



**AURATONE**



**H||H**



**Roland**



**bel**

**AMPEX**

Audio  
&  
Video Tapes

**MXR**



**ITA  
PRICE  
GUARANTEE**  
We will match  
any genuine  
advertised  
price.

**Agfa**

**ITA, 1-7 Harewood Avenue, Marylebone Road,  
London NW1. Tel: 01-724 2497. Telex: 21879**

# British MUSIC FAIR 1982 THE AMI SHOW

## OPENING TIMES

TRADE ONLY: 14-16 MAY 10.00am-2.00pm  
17 MAY NOON-2.00pm  
18 MAY 10.00am-3.00pm  
TRADE & PUBLIC: 14-17 MAY 2.00pm-7.00pm

**T**his year, the British Music Fair moves its venue from London to the National Exhibition Centre in Birmingham. There will be well over 50 exhibitors displaying something for everyone: from musical instruments to recording equipment, lighting, sheet music, educational features, competitions, workshops and concerts. For E&MM readers, exhibitors will be showing the very latest in electronic synthesisers and equipment. There will be over 100 different brand-named products covering all aspects of music making and electro-music. E&MM has a stand, too, of course. We'll see you there.

### Atlantex Music Ltd. 0462 31511.

Atlantex will be showing the famous MXR range of effects.

### Barratts of Manchester Ltd. 061-872 0713.

Barratts will be exhibiting their range of guitars by Hofner including 3 new models called the Chopper.

### Belwin-Mills Music Ltd. 01-681 0855.

These publish music with a leaning towards educational scores including band, organ and orchestral music. They will also have a music boutique selling novelty musical gifts.

### Boosey & Hawkes (Musical Instruments) Ltd. 01-952 7711.

Their famous range of musical instruments will be on display.

### Carlsbro (Sales) Ltd. 0623 753902.

New products will include effects and amplification.

### Casio Electronics Co. Ltd. 01-377 9087.

Casio, of course, will be showing the range of their revolutionary new products including the CT701.

### Chandler Guitars 01-940 5874.

Schecter Custom Guitars and the new ESP range of vintage-type replacement pickups will be on display.

### Chappell Music Ltd. 01-478 6922.

Famous publishers, Chappell Music, will have their range of sheet music on show.

### Coventry Music Centre 0203 58571.

These will be displaying equipment by Roland (U.K.) Ltd., Yamaha and their other main agency lines and a spotlight feature will be a running video show.

### Craftmaster (UK) Ltd. 01-803 8941.

Craftmaster, distributors of the Omnichord, will be showing this interesting instrument reviewed in E&MM last month.

### Cymbals & Percussion (UK) Ltd. 0533 601001.

An interesting display of things to hit.

### DEG Music Products (UK) Ltd. 0706 354956.

DEG will be showing their range of wind, brass and reed instruments including the Classic Saxophone range.

### Ecclehall Guitars 01-992 4741.

This guitar company make guitars to special orders, several examples of which will be on display including their new solid electric which features a 3-band graphic equaliser.

### E&MM 0702 338878.

There will be several publishers with magazines on display including E&MM of course! We will be there to talk about the magazine and its projects and to provide a two-way communication between ourselves and you, our readers.

### EMI Music Publishing Ltd. 01-836 6699.

Another famous music publisher with their catalogue.

### Fletcher, Coppock & 0732 366421.

Their range of guitars will be on display including the Westone Bass.

### Galaxy 7 Policies 0682 386022.

Of interest to all performing musicians is this company who specialise in insurance policies for musicians and their instruments.

### Keith Hand Musical Supplies 061-764 1792.

A wide range of instruments and equipment will be on display from Keith Hand including the new Hartley-Thompson 50W amplifiers.

### H/H Electronics 0954 81140.

H/H will be showing their range of amplifiers, speakers and keyboards.

### Hiscox Guitars 0543 491331.

Hiscox specialise in hand-built guitars. The latest model is a round-back, all-wood acoustic model.

### James How Industries Ltd. 01-304 4711.

These will be showing the Rotosound guitar-string range which includes a new phosphor-bronze string.

### Superwound Ltd.

This company, a division of James How, produce an exclusive set of strings for the Steinberger bass (to be reviewed soon in E&MM).

### Jones & Crossland Ltd. 021-643 4655.

A full range of guitars, amplification, keyboards and orchestral instruments will be on view.

### Kemble/Yamaha Ltd. 0908 71771.

This company needs no introduction and can be relied upon to provide a large display of their latest instruments.

### Music Sales Ltd. 01-636 9033.

Their catalogue of mail-order music will be there, of especial interest to organist and home musicians.

### OHM Amplification Ltd. 0565 54641.

OHM Amplification will have on display their popular MX8008 stereo, powered mixer and also their recent MX6006 which is a smaller version. Their new range of PA/Keyboard speaker cabinets will be there too.

### Dean Markley (UK) Ltd. 0202 522613.

Dean Markley will be showing their full range of electric, acoustic, bass and classical strings; also strings for mandolin and banjo and pickups for acoustic guitars.

### Martello Sound Ltd. 0424 713220.

On display will be the Reslo range of radio microphones.

### Micro Musical Ltd. 0203 616760.

Micro Musical will be demonstrating the Casio and Yamaha portables and will be giving away a Prelude Chord Computer with each purchase of a Casio CT and Yamaha PS model. Also on show will be the new Micro Musical Keyboard Chorus Unit for use with these keyboards.

### Pearl Music Ltd. 01-961 5055.

Lots of new equipment on show from Pearl Music including a new range of professional, phantom powered mics, new guitar effects pedals, accessories, plugs, sockets and tuners. Also on display will be drum kits, old and new.

### Peavey Electronics (UK) Ltd. 0825 5566.

Peavey's well-known range of amps and associated equipment will be on display with the opportunity to see how it fits together for the performing musicians in the audience.

### Percussion Services Ltd. 01-407 4952/1056.

As well as their wide range of percussion accessories, Percussion Services will be showing a new range of imported drum kits.

### Premier Drum Company Ltd. 0533 773121.

Premier will be exhibiting their enormously popular range.

### Recording Studio Design Ltd. 0582 570621.

Their well respected range of mixing consoles and products will be on show including the RSD Studio 4 with built-in 4-track cassette.

### Roland (UK) Ltd. 01-568 4578.

Roland will be exhibiting their range of products which are always of great interest to electro-music makers. On show will be their TB-303 'Bassline', the new Piano Plus range and their brand new Juno-6, 6-voice polyphonic synth. The rest of their well-established range will be on display, too.

### Rose-Morris & Co. Ltd. 01-836 4011.

On show will be their diverse range of products from Vox amplifications to the newly released Korg Polysix and Mono Poly. They hope even more new Korg products will arrive in time for the show.

### John Hornby Skewes & Co. Ltd. 0532 865381.

Many new lines will be launched including about 12 new guitars in the Hondo range, and the new range of Teisco keyboards including the EX300 string, brass and human voice ensemble, the T77 piano and a smaller version of their popular S100P pre-set synth.

### Strings And Things Ltd. 0273 420704.

Strings And Things will be revealing their string range and batches of electro-accessories.

### C. Summerfield Ltd. 0632 770431.

Are Distributors of Tama, Guild and Ibanez guitars, C. Summerfield will be showing models from the ranges.

### Yardley's (Birmingham) Ltd. 021-236 7441.

Yardley's have a range of brass, woodwind, percussion and educational instruments and on show will be a new Meyer Saxophone from the U.S.A.

### LATE ADDITIONS: Badger Music Ltd.

0532 441474.

Everbimes.

0623 652651.

Manson Guitars.

08926 4266.

C F Martin Organisation.

02556 2249.

MTR Ltd.

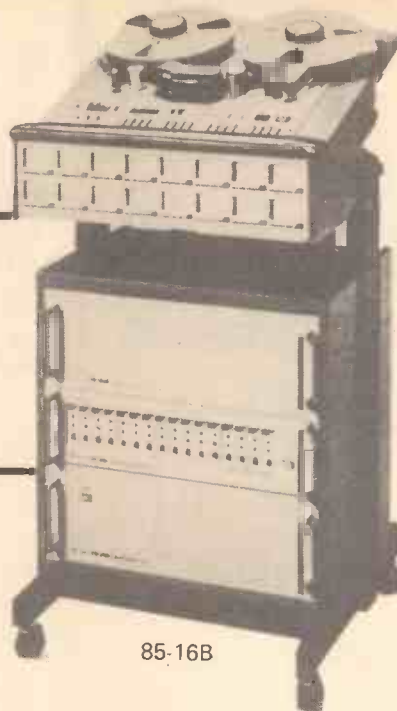
Theme Musical.



**16 TRACK PACKAGE from £ 9919 + VAT**

**Movement Audio Visual**

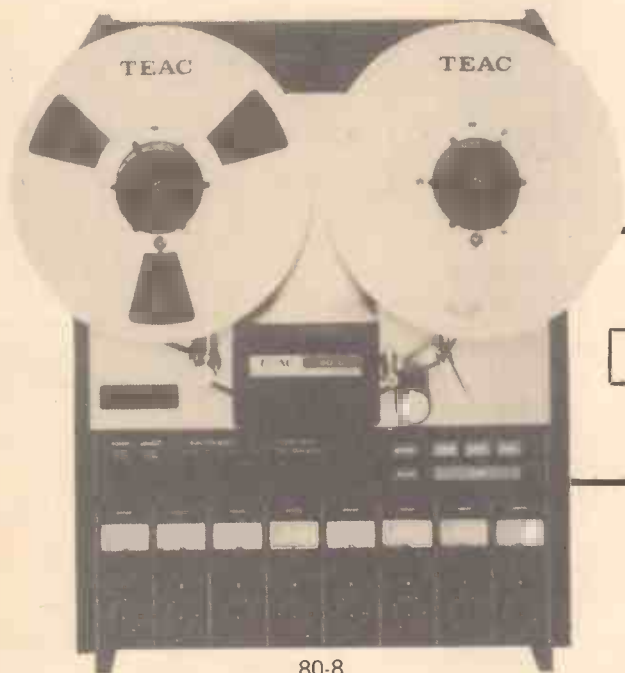
61 Taunton Road,  
Bridgwater,  
Somerset,  
TA6 3LP.  
Tel: 0278 424560



85-16B



**8 TRACK PACKAGE from £ 2898 + VAT**



80-8

**Movement Audio Visual**

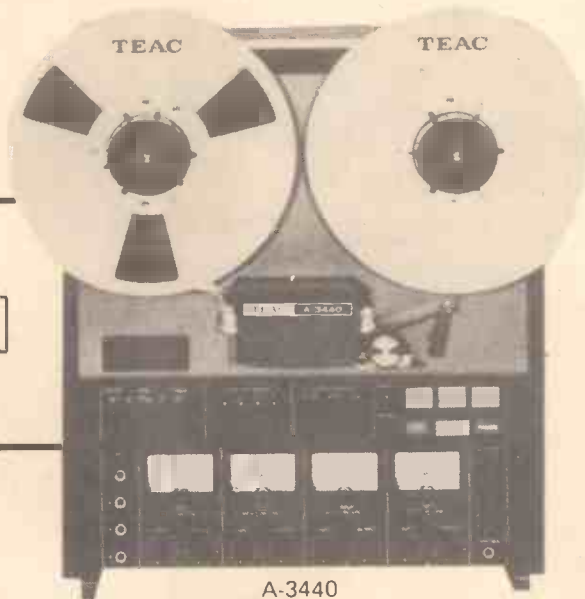
61 Taunton Road,  
Bridgwater,  
Somerset,  
TA6 3LP.  
Tel: 0278 424560



**4 TRACK PACKAGE from £ 906 + VAT**

**Movement Audio Visual**

61 Taunton Road,  
Bridgwater,  
Somerset,  
TA6 3LP.  
Tel: 0278 424560



A-3440

# CLASSIFIED

New rates for 1982: Lineage 34p per word (min. 12 words); Box No. 80p extra. Semi-Display: £1.00 extra. Display: £10.00 per single cm. column.

All advertisements must be pre-paid. Closing date: 20th of month preceding publication.

Advertisements are accepted subject to the terms and conditions printed on the advertisement rate card (available on request).

Telephone: (0702) 338878/338015. "Classified", E&MM, 282 London Rd, Westcliff-on-Sea, Essex SS0 7JG.

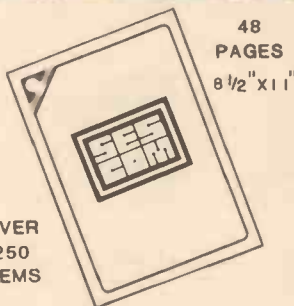
## ACCESSORIES

**NOW!**

FROM **SESCOM**

ORDER YOUR FAVORITE  
AUDIO ACCESSORIES  
BY MAIL

SEND FOR YOUR FREE COPY  
OF OUR 1982 CATALOG



OVER  
250  
ITEMS

WITH TECHNICAL DATA  
& USE DIAGRAMS

INCLUDING DIRECT BOXES, MIC-SPLITTERS,  
SIGNAL PROCESSING, AUDIO MODULES,  
TRANSFORMERS  
& MANY OTHER ACCESSORIES

USE YOUR VISA OR MASTER CARD

Most Shipments From Stock

We Ship the fastest & most convenient  
way for you!



SESCOM, INC.  
RETAIL SALES DIVISION  
1111 Las Vegas Blvd. North  
Las Vegas, NV 89101-1197 U.S.A.  
(702)384-0993 (600)634-3457  
TWX (910)397-6996

## Loudspeaker Cabinet Fittings

From Adam Hall Supplies:  
Coverings & frets • flight case parts  
• Celestion power speakers •  
Rean jacks & fittings • P&N stands  
Send 30p PO/cheque for Illustrated  
catalogue

**ADAM HALL  
SUPPLIES LTD**  
Unit M,  
Carlton Court,  
Grainger Road,  
Southend-on-Sea  
Essex

**Celestion**  
Cabinet Handbook  
Available NOW  
Extra **£1**

## FOR HIRE



### FOR HIRE AT BUDGET RATES

LEXICON 224 Digital reverb and Prime Time  
EVENTIDE HARMONIZERS ROLAND ECHOS  
DBX COMP/LIMITERS and ANALYSER/  
EQUALIZER

Plus a whole range of studio gadgets

Phone Andy or Louise 01-708 0483

or write for further details:

10 Steedman Street, London SE17 3AF

## PERSONAL

### FIND-A-FRIEND

through FIND-A-FRIEND's new postal  
concept. Countrywide friends/mates/  
partners. A confidential, inexpensive ser-  
vice. SAE. Telephone: FIND-A-FRIEND  
(EMM), Temple House, 43-48 New Street,  
Birmingham B2 4LH 021-429 6346

## BOOKS & CATALOGUES

PARAPHYSICS JOURNAL (Russian translations): Psy-  
chotronic Generators, Kirlianography, gravity lasers, tele-  
kinesis. Details: s.a.e. 4X9: Paralab, Downton, Wilts.

## HOME ORGANISTS

Teach yourself to play with  
**THE ORGAN MASTER**

by *Brenda Hayward (Making Notes)*

Two Music Books - Two Theory Books -  
Two Chord Charts in a Boxed Pack

£10 + £1 p&p.

Cheque/P.O./B'Card/Access accepted.

**ORGAN MASTER PUBLICATIONS**  
Metfield - Harleston - Norfolk - IP20 0LH.  
Fressingfield (037986) 370

## RECORDING

How many times have you thought about  
controlling your unit from tape?

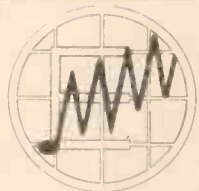
**NOW YOU CAN!!**

### THE MF 100 SYNC UNIT

The MF 100 will sync rhythm units,  
sequencers, and most units that require a  
clock or stop/start control

Three Units available: £40-£250

**MAC FISON ELECTRONIC ENGINEERS**  
13 Northfalls Road, Canvey Island, Essex  
Telephone: (0268) 685748



## Electronics & Music Maker

### ASSISTANT EDITOR (ELECTRONICS)

We require immediately an Assistant Editor having  
practical experience of electronic design and  
construction, with the responsibility for preparation  
of submitted projects and technical articles for  
publication.

This is a special opportunity for an energetic  
electronics engineer with a strong involvement in  
music technology (including microcomputers).

### ASSISTANT EDITOR (MUSIC)

We require immediately an Assistant Editor having  
sufficient practical and theoretical music ex-  
perience and qualifications with responsibility for  
preparation of music reviews, interviews, features  
and workshops for publication.

This is an exciting and challenging position for an  
energetic, experienced musician with a wide in-  
terest in the techniques of music making, as well as  
the ability to interview people in the music business  
and review the latest music instruments.

**The successful applicants will help to develop  
E&MM's important role in the future of Electro-  
Music.**

**Salary will be negotiable at the time of the interview.**

Please write stating relevant experience, with C.V. to:  
The Editor, 282 London Road, Westcliff-on-Sea, Essex SS0 7JG.



### STUDIO HIRE

8 track studio including synthesisers, free tea and a handy musician engineer, £30 per 6-hour session. Ideal for composers, synth players, etc. For full details catch:

Dave on WATFORD 39347



SERIES 4 MIXERS

- PA or Recording Masters ● Fully Modular
- PPM/VU Monitoring ● Any Frame size ● 5 Band EQ ● 4 Aux sends.

Master + Frame £199.00

Input/Output Modules £60.00 each

For Brochure or Dem telephone:

HORNCHURCH 55836

### QU'APPELLE STUDIOS LIMITED

8 track sound recording, colour video recording with edit suite, titling facilities, variable acoustics. Session musicians by arrangement. Audio visual recording £100 per day including tape, audio recording by arrangement.

Tel. Newport, Gwent (0633) 412415

### REPAIRS

### ROGER GIFFIN THE LEGEND LIVES ON

SIMPLY THE BEST FOR ALL REPAIRS AND CUSTOM BUILT GUITARS

Phone: (01) 948 5891

### HIGH QUALITY SPEAKER REPAIRS

NOT SO MUCH A REPAIR EVERY ONE A MADE-TO-MEASURE

### CUSTOM BUILT JOB

JOHNSON & JONES

66 Dalston Lane, London E8 3AH

Phone: 01-254 9331

### Peter Cook Guitars

69 Station Rd, Hanwell W.7. Tel. 01-840 1244

NOT ONLY the ultimate customising and repair service —

BUT ALSO a selection of the most playable instruments in the U.K.

OPEN WED to FRI 12 noon-7 p.m.

SAT 11 a.m.-6 p.m.

BARCLAYCARD — ACCESS — HP — PX MAIL ORDER

### FOR SALE

CLEF BANDBOX with new programmable bass. £300 or part exchange string ensemble. 670 8420.

MAPLIN ORGAN MES51 and 52 built in tough combo style cabinet: £150. Brighton 554715.

TRANSCENDENT 2000 program sheets. £1.50 (p&p inc.) for 50. Lawson Print, 73 Northwood End, Haynes, Bedford.

ORGAN — ELKA ARTIST 707. Top of the range including drawbars, pianos, strings, brass and built-in synthesiser. Home use only. Immaculate condition. Just over two years old. Cost over £3,000. Must sell. £2,100 o.n.o. Tel: Newcastle (0632) 696433 evenings.

PART BUILT UK101, and MICROTAN 65, circuit diagrams, sound, colour boards, programs etc., £230. SHARP PC1211 and C/1 £65. Mail order only, send cheques to S. Gray, 18 Ellendine Road, Hounslow, Middlesex.

4-TRACK STUDIO. Teac A3340S, Revox A77 plus Vari-speed & R. cont., MM 12/2 mixer, 4 companders, sw box, 10 reels, Ampex 456. Unused. Parkstone 743640.

### ARP QUADRA

Good condition, home use, £1700 o.n.o. Telephone: (0255) 26672 (Essex).

### DIY ACTIVE CROSSOVERS

Based on Hi-Fi News design. Used in numerous Rock PA's, discotheques, workshops, studios and top notch Hi-Fi systems worldwide. -24dB/octave, 2/3/4 way mono/stereo PCBs, kits or assembled boards/complete units built with PPMs, muting etc.

SAE or 31RC brings details:

B & J SOUND, Kirkby Lane, Tattershall, Lincoln LN4 4PD.

Telephone: (0526) 52950/42869

### DRUZYC-TAYLOR SOLID STATE ANALOG DELAY/ECHO



with delay, repeat controls in/out foot-switch.

Incorporating 2x SAD 1024 analog delay lines

providing delays of up to 300mS. Complete unit as

shown including batteries.

ONLY £55.00 + £1.00 p&p SPECIAL BARGAIN OFFER!

P.C.B. of above unit, fully assembled, tested, complete with I/P O/P jack sockets and controls.

Supplied with operating instructions for an unbeatable £39.00 + £1.00 p&p.

DRUZYC-TAYLOR ELECTRONICS  
148 Coventry Rd, Warwick CU34 5HL  
Tel. (0926) 499300

For quick service and helpful information telephone:

## HOLLY BAKER

Southend (0702)

338878/  
338015

### SERVICES

Cassette 'Real-Time' duplicating from 38p. 'The best value for money' — Sound International July 1981. Pet, Tandy, Sharp, Acorn, ZX81. Simon Stable, 46 West End, Launton OX6 0DG. Mon-Sat 9 a.m.-8 p.m. 08692 2831.

### E.S.S.P.

Electronic — Computer — Synthesiser sound RECORDS — TAPES — BOOKS

Send s.a.e. for catalogue:

The Sound House, PO Box 37b, East Molesey, Surrey KT8 9JB.



MOBILE SOUND MAINTENANCE

- Performance modification rebuilds ●
- Emergency 24 hour fault finding ●
- New and second-hand equipment evaluation reports ●
- Servicing ●
- System checks ●

Contact us for bookings now

Telephone: 01-948 1331 (24 hours)  
13A Jocelyn Road, Richmond, Surrey

### TAPES/RECORDS

### DRUM DROPS

'The Ultimate Drum Track Albums' American produced real drum sound backing tracks

Volumes 1-5 available NOW!

£5.99 per LP inc P&P

MUSTANG RECORDS & TAPES

P.O. Box 139 High Wycombe Bucks HP13 5LH

### LOTUS RECORDS

Neuronium-Digital Dream (the most important synth group since T. Dream. Melodic/Cosmic. Rhythmic Synth Music at its best) ..... £3.49  
Wolfgang Bock-Cycles (produced by Klaus Schulze in similar styles) ..... £4.99  
Peru-Constellations (Dutch synth trio in T. Dream vein) ..... £4.99  
Klaus Schulze—Body Love 2/Time Wind/Black Dance/Moondawn ..... £3.99 each  
Edgar Froese—Aqua/Stuntman/Macula Transfer/Epsilon ..... £4.99 each  
Benoit Hutin—1st (French synth; one dreamy side, one rhythmic side) ..... £4.99  
Tim Blake—Crystal Machine/New Jerusalem (new age synth music) ..... £4.49 each  
Philippe Guerre—Concerto Pour Le Mort D'un Clown (beautiful new synth music of wide-eyed, celestial, melodic quality) ..... £4.99  
P&P (U.K.): 1 LP—50p; 2 LPs—94p; 3 LPs or more—40p per LP.

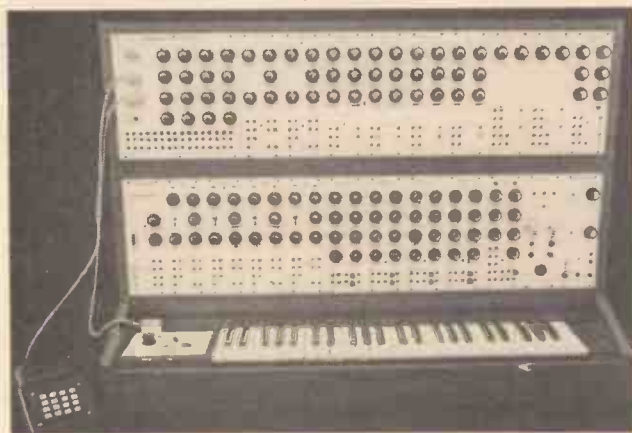
Many of the above items are in the 1982 LOTUS RECORDS Catalogue, containing 26 pages of European Music, Synth and Electronic Music on Records, Cassettes, Fanzines and T-Shirts, much of it only available from LOTUS RECORDS. This listing is free with all orders or available by sending a large S.A.E.

Cheques/P.O.'s payable to:

LOTUS RECORDS  
23 HIGH STREET  
NEWCASTLE-UNDER-LYME  
STAFFS.

# DIGISOUND 80 MODULAR SYNTHESISER

A synthesiser for the professional and amateur keyboard player, for education and for the beginner. The DIGISOUND 80 suits all levels of keyboard skill. If you want to know how, then read on.



**BEGINNERS:** A small synthesiser may be assembled at a price comparable with pre-set types. The DIGISOUND 80 has unique facilities and you can learn about electronic music synthesis with the aid of our User's Manual. When you are ready to go beyond the 'mini-synth' stage then simply add more modules to suit your requirements and your purse.

**EDUCATION:** The modular concept is ideal for teaching both music and the physics of sounds. The microprocessor add-on converts it to a project of even wider application.

**KEYBOARD PLAYERS:** The use of the ALPHADAC 16 microprocessor controller allows up to 16 voices in the polyphonic mode as well as providing many other real time keyboard control routines. NEW recording/composing/sequencing programs provide you with the opportunity to create exciting music — imagine playing back a composition with each voice set to a different instrument!

**KEYBOARD SKILL:** The ALPHADAC programs have facilities for composing and recording in both real time and not real time. The latter allows entry of notes at any speed and subsequent playback at the required tempo. The not real time mode is essential to synthesists of limited skill and a boon to the experienced player.

**THE DIGISOUND 80 - IN ANY CONFIGURATION - OFFERS YOU THE BEST PRICE/PERFORMANCE CHARACTERISTICS**

Kits supplied ex-stock and ready built modules, or complete synthesisers, are available to order.

NEW IC's from Curtis Electromusic Specialties; NEW modules; NEW users manual plus easy to follow construction notes.

*Write or telephone for more information from the ELECTRONIC MUSIC SPECIALISTS:—*



**DIGISOUND LIMITED,**  
Dept 2/82, 13 THE BROOKLANDS,  
WREA GREEN, PRESTON,  
LANCS PR4 2NQ. Tel: 0772 683138

## ADVERTISERS INDEX

Carlsbro Sales .....	15
Casio Electronics .....	9
Chase Music .....	5
Clef Products .....	45
Digisound .....	64
Future Music .....	2
Hobbs Music .....	57
I.T.A. Ltd .....	59
Don Larking Audio Sales .....	64
London Rock Shop .....	IFC
Mail Order Music .....	39
Micro Musical .....	33
Movement Audio Visual .....	61
Phonosonics .....	27
Powertran .....	IBC & 53
Roland U.K. ....	OBC
Rose-Morris .....	1
Silica Shop .....	17
Syco Systems .....	23
Tangerine Computer Systems .....	37
Tempus .....	20 & 21
Wilmslow Audio .....	32



# Fostex Fostex

**FOR THE FULL RANGE  
AND DEMONSTRATIONS  
IT'S GOT TO BE**

# DON LARKING AUDIO SALES

50, Cheapside, LUTON, Beds.  
Tel: 0582 27195 or 26693  
Telex: 825488 DONLAR

New & Used Professional Recording Equipment  
Showroom open:- Mon-Fri 10am - 6pm Sat.  
By appointment

# PRECISION - by POWERTRAN

THE FIRST WORDS AND THE LAST WORD IN ELECTRONIC KITS

For more than eleven years Powertran have been designing and manufacturing the finest quality electronic kits. All of our now considerable range have featured in the electronics press and literally thousands have been bought and built by contractors in the UK and World-wide.

Our philosophy is always the same — we offer ingenuity and originality in the construction phase by using only top class designers. We offer machines with power, versatility and performance — capability fully equal to their factory built rivals. We offer only the highest quality materials and components throughout to ensure years of useful and reliable service, we offer clear comprehensive and easy to follow construction manuals to place our kits within the scope of the careful first time builder as well as the dedicated enthusiast.

Our hallmark of success lies in the number of our clients who have built our whole range — many assembling several units for others to use often on the professional music scene.

We believe in taking every care throughout — months spent checking and testing the design and development. Vigorous checking of every component, constant pre-despatch quality control, careful packaging... even door to door delivery by Securicor!

We are naturally very proud of our Transcendent range of synthesizers designed by Tim Orr and regularly featured in ETI. They represent the best in constructional interest and in musical performance.

**TRANSCENDENT POLYSYNTH** — A four octave polyphonic synthesiser with outstanding design characteristics and versatility and performance to match.  
Complete kit £275.00 plus VAT (single voice).  
Extra voice (up to three more) 42.00 plus VAT.

**TRANSCENDENT 2000** — Although only a 3 octave keyboard the '2000' features the same design ingenuity, careful engineering and quality components of its larger brethren. The kit is well within the scope of the first time builder — buy it, build it... play it! You will know you have made the right choice.  
Complete kit £165.00 plus VAT.

**EXPANDER** — A new matching 4 voice expander to team up with your polysynth for even a greater range and capability.  
Complete kit £249.00 plus VAT.

**1024 COMPOSER** — Come right up to the minute with this new design. It will control your synthesiser with a sequence of up to 1024 notes — or an equal selection of shorter sequences. The Composer is mains powered with automatically charged battery to preserve your programme after switch-off.  
Complete kit £85.00 plus VAT

**TRANSCENDENT DPX** — Offers a five octave keyboard with power to match. Two audio outputs (can be used simultaneously) to give harpsichord and piano/honkytonk or reed with strings/brass and both are fully polyphonic. Other features include switchable touch sensitivity and a chorus ensemble unit with strong/mild effect switching. An advanced design made simple with our clearly laid out instruction manual.  
Complete kit £295.00 plus VAT.

**DEMONSTRATION TAPE** — Demonstration tape now available of all three kits (30 minutes).  
£2.00



**T20 + 20** — Originally designed by Texas Engineers. This is a 20 watt amplifier with true Hi-Fi performance at a minimal cost. New features include true Toroidal transformer, new wiring, single circuit board and improved presentation. An ideal beginners project. Complete kit £29.50 plus VAT. Also T30 + 30 — 30 watt version complete kit £34.50 plus VAT.

**LINSLEY HOOD 75 DE LUXE** — A 75 watt amplifier originally published in Hi-Fi News. Superb performance characteristics with less than 01% distortion. Modular construction with 14 interconnecting boards — virtually no wiring so assembly is easy as is subsequent checking and maintenance. Complete kit £75.00 plus VAT.

... Quite simply the best way to make music



## WORLD LEADERS IN ELECTRONIC KITS.

**PRICE STABILITY:** Order with confidence irrespective of any price changes we will honour all prices in this advertisement until the end of the month following the month of publication of this issue. (Errors and VAT rate changes excluded).  
**EXPORT ORDERS:** No VAT. Postage charged at actual cost plus £1 handling and documentation.  
**U.K. ORDERS:** Subject to 15% surcharge for VAT. No charge is made for carriage, or at current rate if changed. Cheques, Access, Barclaycard accepted.  
**SECURICOR DELIVERY:** For this optional service (U.K. mainland only) add £2.50 (VAT inclusive) per kit. FREE ON ORDERS OVER £100.  
**SALES COUNTER:** If you prefer to collect kit from the factory, call at Sales Counter. Open 9a.m.-12 noon, 1-4.30p.m. Monday-Thursday.

PORTWAY INDUSTRIAL ESTATE, ANDOVER, HANTS SP10 3WW (0264) 64455.

Order by phone (0264) 64455  
 Specify telephone us with your order and quote your Access or Barclaycard number.  
 40 page catalogue free — contains full details of all our kits.

# Roland

## PIANO PLUS RANGE



### **EP11**

Autobass, Autochords  
Autoarpeggio, Autorhythm  
Autoharmony with lower hold  
Keytranspose, 5 tone colours  
Inbuilt amp and speaker.

### **HP60**

Variable touch response. 4 tone colours  
Amp and twin speakers.

### **HP70**

75 Key, Variable touch response, 4 tone colours  
Amp and twin speakers + chorus.  
All with damper pedal for sustain (DP2) supplied.

Also featured: Interfaceable TR606 Drumatrix and CR5000  
Compurhythm together with RH10 headphones and the new  
Keyboard Cube 60 amp.

 **Roland**

Roland (UK) Ltd., Great West Trading Estate, Great West Road, Brentford. Middx.  
Telephone: 01-568 4578 Telex: 934470