Electronics &
Music Maker
MARCH 1982 75p

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LAUS SCHULZE

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LLING CB INTERFERENCE

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ROBERT SCHRÖDER

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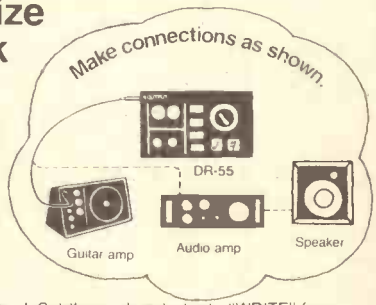
Foot switch FS-1 (optional)

A compact-type rhythm machine that can memorize rhythms which you compose, and play them back automatically.

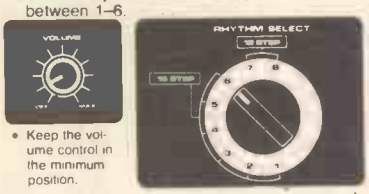


★OPERATION & PROGRAMMING★

Even if you can't play the drums, you can make your own rhythm.

START FROM HERE.

1.
★ Turn the volume control to the right to turn on the machine.
★ Set the rhythm selector to any position between 1–6.

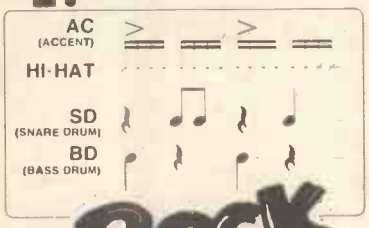


• Keep the volume control in the minimum position.

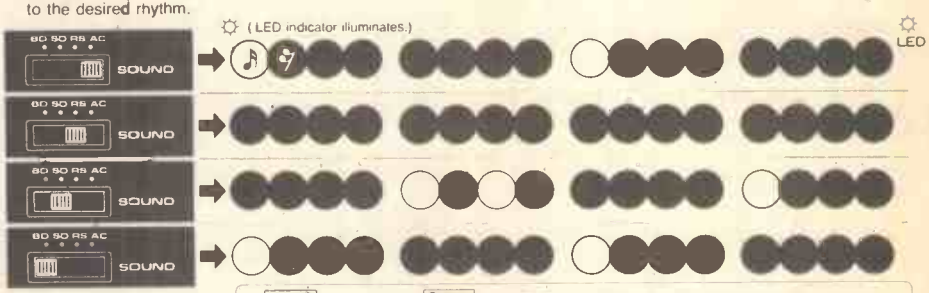
2.
Set the variation selector to position "A".

3.
★ Set the mode selector to "WRITE" for programming.
★ The LED indicator will illuminate.

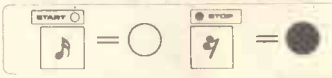
4.
Now start programming.
The example shown is a Rock'n' Roll rhythm.



★ Set the sound selector as illustrated. Then press the START button and the STOP button repeatedly according to the desired rhythm.



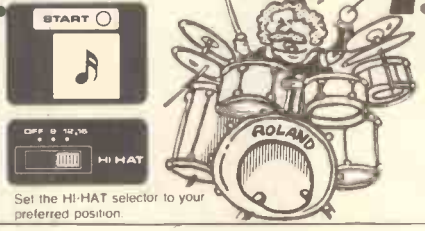
Note:
The LED indicator illuminates after the programming of the rhythm pattern is completed.



Press the START and STOP buttons, indicated as ○ and ● in the illustration above, according to their order.

5.
After completing the programming, set the mode selector to the "PLAY" position.

6.
Press the START button to play back the rhythm you programmed.

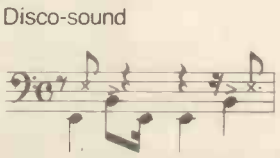


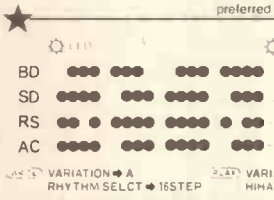
Set the HI-HAT selector to your preferred position.

7.
To stop the rhythm, press the STOP button.

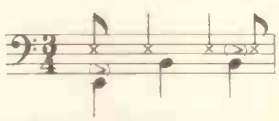
★SAMPLE RHYTHM★

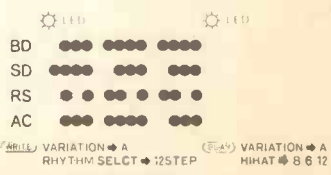
Disco-sound





Waltz





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Electronics & Music Maker

VOLUME 2 NUMBER 1
MARCH 1982

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E&MM FOR GERMANY!

At the time of the Frankfurt Musik Messe, E&MM focuses on German electronic music, with two main features on Klaus Schulze and Robert Schröder plus record reviews and Kraftwerk music (currently in the top of the U.K. record charts).

Electronic music is now part of music making in many countries, including Germany, Spain, America, Canada, Japan, France, Italy, Scandinavia, Australia, Africa, Poland, Iceland, and of course, the U.K. Within the space of a few years it has been commercialised and domesticated to become an accepted direction for music of the future.

Germany has always had a particularly active electronic music scene and recently it has been my privilege to talk to the great Karlheinz Stockhausen himself, who in the sixties paved the way for the New Music. E&MM also meets many of the German public at the Frankfurt Musik Messe in February, and we will continue promoting the exchange of electro-musical ideas between Germany and the U.K.

Soon after this important international event, another potentially promising one is taking place in London — the International Music Show. We will be giving plenty of coverage to both these music industry shows, as well as the U.S. NAMM Winter Market at Anaheim.

Finally, we have a special request to all our readers this month. We would like you to complete our questionnaire on pages 15 and 16 so that we can continue to improve E&MM and make it the essential magazine for the practical musician. Being the top selling music monthly gives us an obligation to present the editorial areas you would like us to cover. So please take the trouble to fill in the form — it's a vital survey for E&MM in its second year.

Mike Beecher

Readers Letters

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

Curtis & Chips

Dear Sir,

I read with interest your article in the December issue of E&MM in the "Electromusic-Music Engineer" column on "Applications of the CEM 3310 — a Voltage Controlled Envelope Shaper IC". Although the article, and particularly the IC mentioned, was very intriguing, I found no mention of distributors who sell this IC at fairly competitive prices. This would for most ICs have been unnecessary but an advertisement by a retailer of the CEM 3310 has resisted persistent attempts by myself to be found. So could you please either send me, or better still, publish, a list of distributors (preferably mail order companies) who sell CEM 3310. I am sure this would be useful information, not only for myself, but also for other "electromusic engineers".

Edward Commander
Twyford, Hampshire

The Curtis CEM chips are solely distributed in the U.K. by Digisound Ltd, Dept 2/82, 13 The Brooklands, Wrea Green, Preston, Lancs PR4 2NQ. Tel: 0772 683138.

Humming chorus

Dear Sir,

Please could you help? I'm a busily gigging musician and have changed my amp from Marshall to Peavey. When using my Boss Stereo Mains Chorus with the amp I find that as soon as I plug both pieces of gear into the mains and switch on my Peavey Reknown amp that mains hum (loud) appears on attaching the connecting audio lead. This seems to be an earth loop since the hum goes when mains earth at the chorus is disconnected. I don't wish to use the gear like this as I feel it is unsafe. Apart from using a live bridging transformer between chorus and amp which is expensive and one more box to have lying around, is there any solution which is cheaper and as safe? I feel that gear of this quality should not have this problem — why does it occur?

Steve Rhenius
Chelmsford, Essex

You are correct in your assumption that you have an earth loop. Our suggestion is that you use the earth from the amp, connected through the earth in the Boss Chorus mains plug. Roland recommend this method provided all connections are made before mains switch-on. Of course, the signal jack lead from your instrument should remain intact and will also then be earthed via the amp.

Telharmonium

Dear Sir,

I would like to thank Alan Douglas for drawing my attention to a serious omission from part 1 of my "History of Electronic Music".

Thomas Cahill, designed and had built the "Telharmonium" - a gigantic device weighing some 200 tons, and truly the first synthesiser. It was used to produce "MUSAK" in restaurants, hotel lobbies etc. via the telephone system, as well as being played on Broadway. Its first demonstration in New York attracted well over 1,000 people. It was, however, scrapped due to its causing interference in the telephone system. As well as creating this monster, Cahill believed that the best way to reproduce music was from source and his idea of transmitting music via the telephone system has of course been widely used since.

Once again, my thanks to Alan Douglas, who incidentally qualified as a member of the Institute of Organ Builders 20 years before I was born.

D. Pierce
Bath, Avon

Human League fan

Dear E&MM,

I must congratulate you on producing an excellent magazine, right from issue No. 1, to the present January issue.

Please can you feature an article on The Human League (I'm a big fan), and also a feature on studio recording techniques (even though too expensive for most of us) would be very interesting. Keep up the good work.

John Heap
Blacko, Lancs.

Human League producer Martin Rushent tells all next month — including the studio recording side, and so should cover both your interests.

Learning Electronics

Dear Sirs,

I am a working musician and I find myself doing more and more sessions and gigs on Synth; Andy Williams tour and Grace Kennedy series to name a couple of recent jobs.

Although I have a fair working knowledge of most popular synths (Prophet, Oberheim) etc, I have absolutely no knowledge of electronics at all. I would like to learn from the beginning and wonder whether you could recommend any books that would explain the basics about components and their functions thus enabling me to understand more of your excellent publication.

Peter Wharton
Greenford, Middlesex

Four books immediately come to mind: Essential Theory for the Electronics Hobbyist by G. T. Rubaroe published by Babani, price £1.25; Elements of Electronics, a series of five books at £2.25 each by F. A. Wilson also published by Babani; Electronics, a new questions and answers book by Ian Hickman at £1.95 published by Newnes Technical Books; Beginners Guide to Electronics by Owen Bishop also published by Newnes at £3.60.

Using Synclock with Syntom

Dear Sir,

After reading about the excellent project, the Synclock, I would be appreciative if you could supply details of the conversion of the Syntom so that a trigger input can be used. If you have already detailed such a change in a previous issue of E&MM could you please let me know which one, because I couldn't find it!

P. Cogdell
Basingstoke, Hants

The trigger input for the Syntom was given in the Circuit Maker of the July 1981 issue of E&MM.

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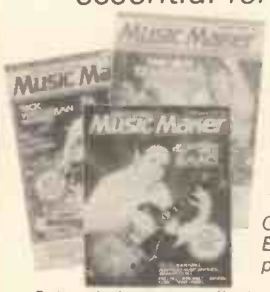

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APRIL Syntom Drum Synthesiser ★ Workshop Power Supply ★ Direct Inject Box ★ Ultravox ★ Paia 8700 review ★ Matinee ★ Spectrum

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

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

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

AUGUST PA Signal Processor ★ Powercomp ★ Hexadrum ★ Matinee ★ 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

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

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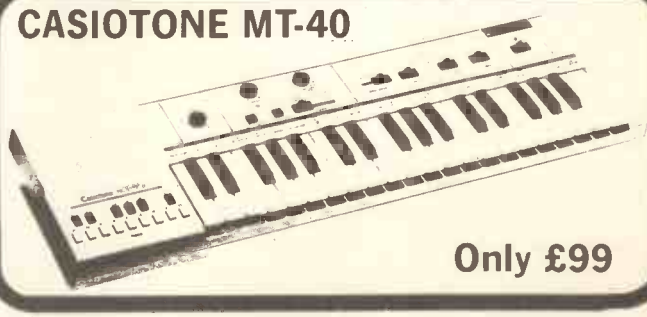

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KLAUS SCHULZE

Klaus Schulze was born in Berlin in 1947 and coming from a non-musical background, his first associations with music were through four years of formal training on classical guitar. During this time he became bored with Bach etc and turned to electric guitar, much to his tutor's annoyance. Together with Alex Conte and Joachim Schumann he formed his first band, Psy Free in 1967; ". . . just improvising on stage for two hours or so . . ." says Klaus.

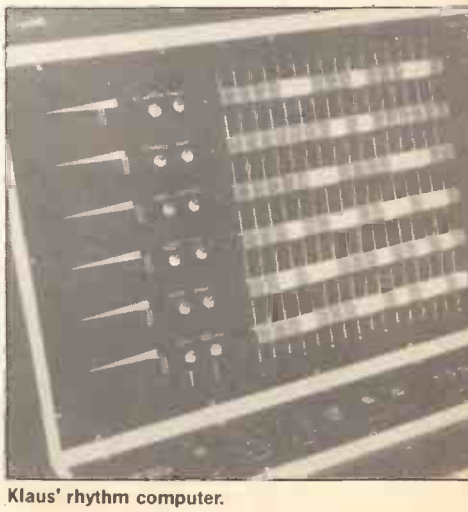
Berlin, at this time very much a political island, had large cultural grants available and this attracted many experimental composers and musicians. Agitation Free, Guru Guru, and of course Tangerine Dream are some of the bands formed in this environment, the latter being formed by Edgar Froese in 1967. Two years later Edgar met Klaus Schulze and, together with Konrad Schnitzler, they rented a factory floor and produced a tape of experimental music using a 2-track Revox. Klaus at this time was playing drums, Edgar played guitar and organ, and Konrad, cello, violin and flute; other "instruments" used were a cash register fitted with a contact mike and glasses that were smashed during the session! OHR Musik of Berlin listened to the tape and agreed to take the band on and in May 1970 they released "Electronic Meditation"; Tangerine Dream's first album, highly rated as one of the worst records ever to emerge from Germany. Klaus had been experimenting with placing microphones in drums and using tapes and electronic effects, his ideas were not received too well and he was asked to leave Tangerine Dream, which he did shortly before the album's release. He went on to work with Manuel Göttsching and Hartmut Enke in the band "Ashra Tempel", still playing drums. One album was released, called "Ash Ra Tempel".

In 1971 Klaus decided to embark on a solo career and also abandoned drums in favour of keyboards. The fact that he had no training on any keyboard instrument was, to him, an advantage; ". . . the day I felt the need to make some different sounds, I told myself the best way to build up my confidence was to play an instrument which I did not know — and above all, to let no-one teach me how. I began to play like an idiot who puts on a pair of glasses for the first time and can see. . .". Nevertheless, three weeks after putting himself at the keyboards Klaus had completed his first album, "Irrlicht".

In early '73, in France, at a concert arranged to bring together all the new German bands, Klaus Schulze gave his first live solo performance, using an electric organ he had bought only the day before. Since then he has toured annually and is still one of the few solo synthesists giving live concerts. He comments: "In the beginning it was for me quite easy to play live, because I made my records like I would play on stage. I had no multitrack, nothing. Just one Revox 2-track. So I had to play anyway, everything at the same time to make records." Klaus still does a lot of improvisation and when he goes on stage he has no "score" as such, just an outline of what he intends to do and then judges by the audience reactions, it is for that reason that he does his own mixing on stage. He explains: "It's like you start something and it goes really nice, so I stay one hour on it or you start something really nice and the audience doesn't like it, so I change it . . . immediately, but you can't tell a mixing engineer "stop it, stop it, they don't like it . . .' — he's sitting 20 metres away!" Five albums were made using the Revox, although for one side of the fifth album, "Timewind", he obtained a cheap 8-track, and it was with this album that his career took an upturn, particularly in France where the "Academie Charles Gros" awarded "Timewind" the "Grand Prix International du Disque" in 1976.

At the time of the release of "Timewind", Klaus was also producing a Japanese group called "Far East Family Band" at the Manor studio in England. Here he received a telephone call from Stomu Y'amashta who was organising the staging of a series of concerts involving all the top names in their own fields, called simply "Go". Klaus was asked to participate on synthesisers and three concerts were given, one in New York, one in Paris and the other in London. Three albums were released featuring the "Go" line-up: two studio albums, one in New York and one in London and a live album of the Paris concert.

Looking back on it Klaus is very dissatisfied, implying that it was a case of ". . . too many cooks spoiling the broth". But it was while he was involved in "Go" that he met ex-Santana drum-



Klaus' rhythm computer.

The AMEK 3000 36 channel, computerised mixing desk.

mer Michael Schrieve, who has since become a close personal friend and changed Klaus's ideas about the use of percussion. On many of his solo albums, Klaus used drummer Harald Grosskopf, ". . . with Harald there was one thing; the drums supported the sequencers to make it even more rhythmical; but while working with Mike Schrieve and others, I saw that it is more rhythmical if the percussion works against my instruments. That makes music more alive and that for me today is much more interesting".

Thirteen solo albums have been released to date but he has been involved with many other projects, not least "Richard Wahnfried", a pseudonym used by him when working with other artists. Richard Wahnfried is, in fact, the name of Klaus's two-year-old son, a picture of whom was sent to the press when they requested a photograph of the "new band". On the last album released under that name: "Tonwelle", "Richard Wahnfried" consisted of Klaus, Manuel Göttsching, Michael Schrieve, Michael Garvens (from the band "Lorry") and a mystery guitarist who appears under the name Karl Wahnfried, not his real name, which cannot be given for contractual reasons.

Steel Symphony

In 1980 Klaus met the head of organisations for the International Bruckner Festival being held in Linz, Austria. He was invited to perform the opening concert for ARS Electronica and in September Klaus staged one of the most adventurous concerts ever performed. He had for a long time wanted to use the sounds of heavy machinery in his music and this provided him with the perfect opportunity. Microphones were placed in strategic positions within the nearby Voest-Alpine steel works and the sounds were transmitted by radio link to the Brucknerhaus where the concert was taking place. The sounds were sent to speakers mounted in life-size puppets of steel-workers and also to Klaus's mixing desk from where they were used as another sound source, either to be modified or used to trigger the synthesisers.

TV pictures were transmitted live from the steel works to the Austrian TV studios where they were mixed by Klaus' own video technician, Klaus Cordes with prepared graphics, some of which had been made by Cordes himself. The pictures were then transmitted to the Brucknerhaus where they were shown on a huge screen using the eidophor system, and also on a monitor so that Klaus could play according to the images. A percussionist was used at this concert, Tommy Betzler from the band P'Cock, who, unlike Klaus who was on the stage, was situated in the balcony, the audience being totally unaware of his presence until he struck one of the 20 specially prepared gongs. The whole concert was broadcast live on radio and on the Eurovision TV network two weeks later. Unfortunately it was not shown in this country.

Instruments

Klaus's battery of synthesisers and effects has built up over the years. With him on stage at Linz were his old EMS Synthi A, ARP 2600, two Minimoogs, Korg Polysynth, Yamaha CS80 and a PolyMoog. Klaus particularly likes the Yamaha for its rich sound and the PolyMoog for its versatility on stage and its good solo voice. Last, but by no means least, he had with him what he affectionately calls his "Big Moog". Bought from Florian Fricke of Popol Vuh fame, it has since had much work done on it by Robert Moog, who has become a good friend of Klaus. What is claimed to be the world's largest live performance synthesiser, Klaus's "Big Moog" may not be seen on stage again. Now, rarely used, it takes pride of place in his private home studio. He refers to it as a relic from the 70's, but he uses it on the new Richard Wahnfried album; and on his new solo album ". . . because I like the high sound, you know . . ." he says and then proceeds to demonstrate by gritting his teeth and hissing!

Other equipment on stage included an AKG BX20 reverb unit, two Dynachord DRS 78 echo units, two Dynachord TAM 19's for flanging and a Korg Vocoder with the microphone mounted inside the PA, Klaus used the feedback produced to sound like voices. All audio mixing was done on stage using a 32 into eight Dynachord mixer.

Also on stage, making its first public appearance, was Klaus's "new toy" - the GDS computer. The terminal with its associated keyboard was a studio model, although he soon hopes to have a stage model which, he says, will look like a MiniMoog. The GDS has two floppy disc drives which he uses to store the various parameters and voices he requires, ". . . I spend hours looking for an organ sound as beautiful as in a church . . . Now that it is in memory, I can find it no matter when."

Klaus is very aware that some people will believe that the computer is producing the music and goes to great lengths to explain that he still must play everything. One big advantage of the GDS is that he will need fewer instruments on stage. He has said in the past that he would like to play in smaller halls, but the cost of transportation for his equipment is too high to make this

The real Richard Wahnfried takes over, while father and the author look on.

possible and so the GDS may well solve this problem.

Innovative Communication

The ideals of I.C. were to produce and promote new artists, whose records were not necessarily million sellers, but who had something fresh and new to offer. This has been a dream of Klaus for many years, and, after two false starts, one of which actually saw some albums released on the Delta Acoustic label, he offered I.C. as a concept, complete with five new, unreleased albums by various artists to the big distributors. WEA took up the offer, but because of the money involved, they formed a partnership with I.C. Klaus was to provide and produce the acts, and WEA were to market and distribute the records. This arrangement proved to be unsatisfactory, with disagreements over the choice of acts and an overly complicated contract which acted against Klaus' interests, so I.C. went independent.

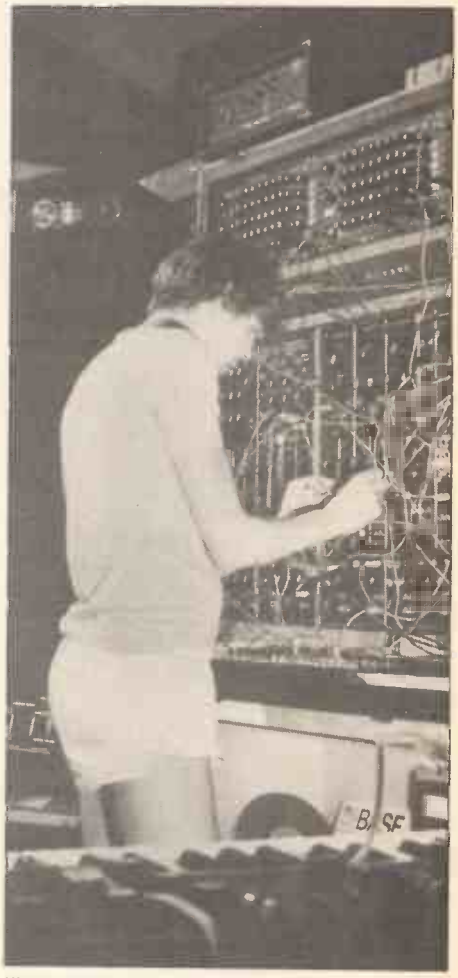
Whilst looking for a factory to cut his last album at half-speed, Klaus was told by experts that "half-speed cut" was just a fashion without better sound, but if he would cut his album for 45 rpm there would be a great improvement. So, with I.C. now independent, Klaus decided this was the way to go. All releases on I.C. are 12 inch LP's but must be played at 45 rpm, the only disadvantage being that the playing time is restricted to a maximum of 18 minutes per side.

The video camera.

2" 24 track Telefunken Magnetophone 50.

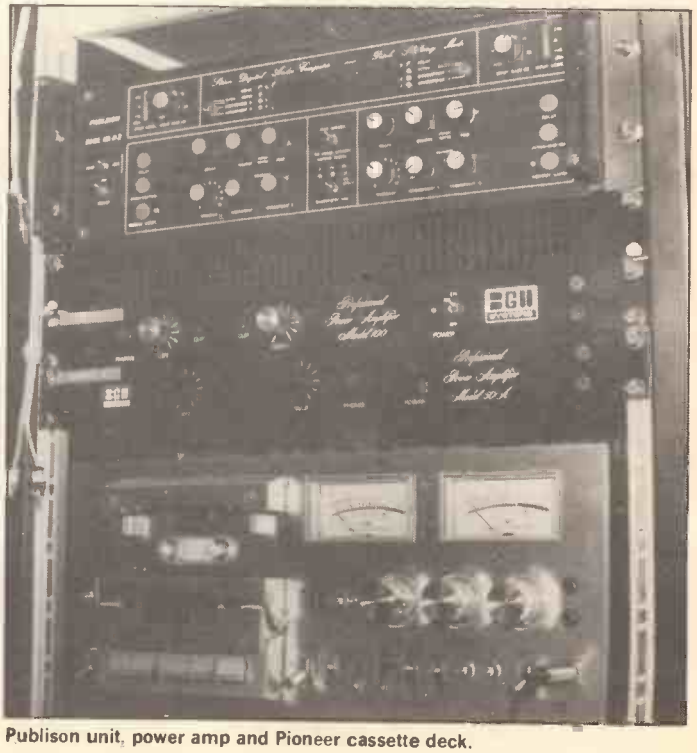
IC's reputation has grown quickly with demo tapes arriving at an alarming rate, all of which are first listened to by Klaus' manager and the best are then passed on for Klaus to judge for himself. Not all requests to appear on the I.C. label come from "young hopefuls", Richard Pinhas and Michael Garrison both offered their new albums to I.C. ("Iceland" & "Regions of Sun Return" respectively).

The first I.C. studio was in Hamburhren, but Klaus wanted somewhere



Klaus makes some adjustments to the "Big Moog".

Dynachord digital reverb units and flangers.



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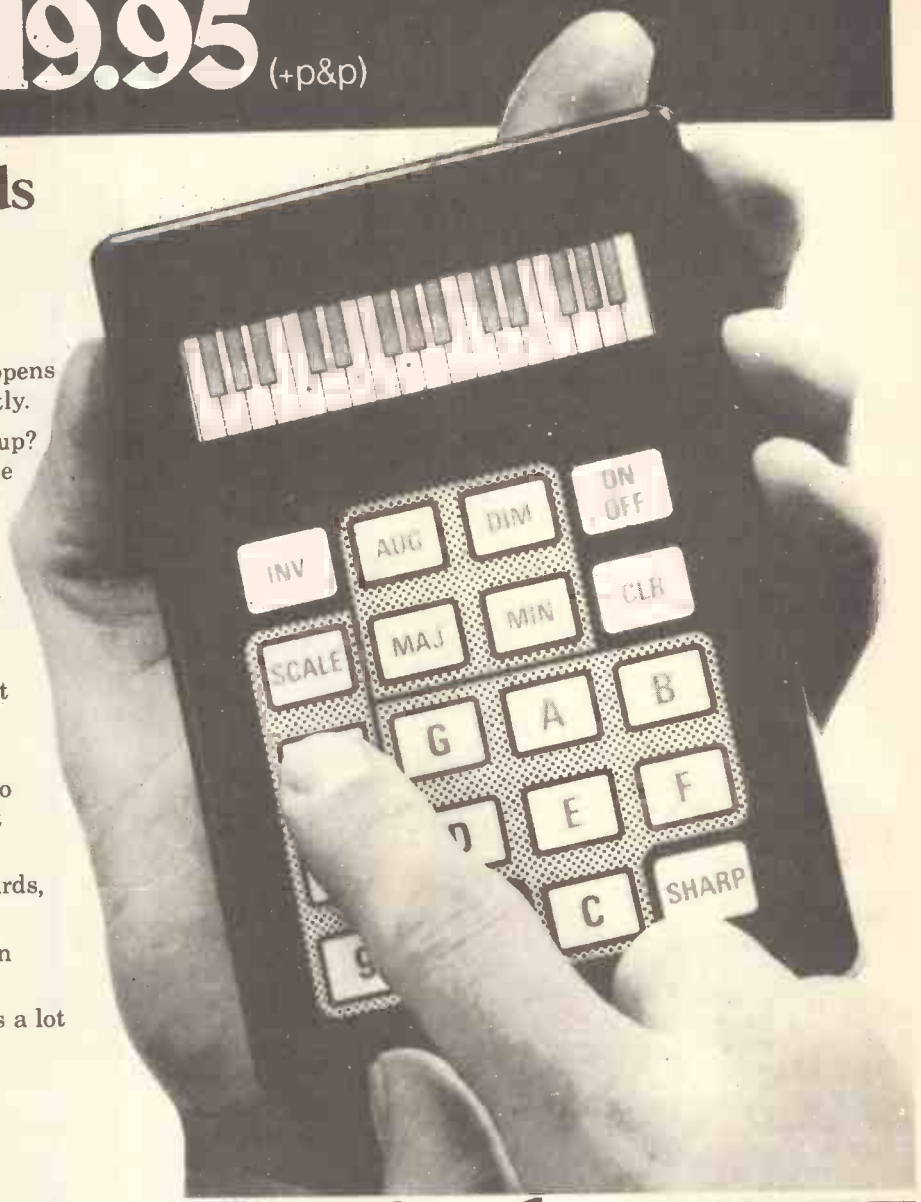

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bigger so they moved to their present location in Winsen/Aller, a small town just north of Hannover. The new studio has many advantages, not least of which is the fact that it is situated above a bar! The first floor was originally a hall, with the studio and control room situated on what was the stage. The seating area is now the video studio where promotional video tapes are produced, although the video side seems destined for greater things than just this. The surrounding rooms and

Klaus at the main mixing desk.

KLAUS SCHULZE IN CONCERT

Forest National Theatre
20th November 1981

I first saw Klaus Schulze at his London Planetarium concert in April 1977. I had gone out of curiosity, not knowing what to expect and I was more than pleasantly surprised (perhaps overawed would be a more fitting description). This white-clad figure perched on a white rug surrounded by a multitude of wildly interesting machines, not least the magnificent Moog which he had bought the previous year from Florian Fricke and had been adapted to suit Schulze's needs by Robert Moog himself (who was now a good friend). With the Planetarium's Zeiss projector adding even more effect, I couldn't help but be hooked.

I left that concert in the belief that such an atmosphere could never be equalled, but after two years of missing his European tours (mainly through the lack of information in the British music press . . . we didn't have E&MM at that time!), I was determined not to miss his one European concert (apart from the specially prepared and performed Linz Stahlsymphonie) in November 1980 in Brussels, a special concert arranged and dedicated by Schulze to the promoter who had been a long standing friend and was now moving on to other things. 1980 also saw his first move away from solo performances when he was accompanied by percussionist Tommy Betzler and had arranged a surprise appearance by Manuel Gottsching of Ashra fame, who previously had been working with Schulze on the Richard Wahnfried album "Tonwelle". The 1980 concert also saw the disappearance of the "Big Moog" and the arrival of the GDS computer.

A year later, on 20th November 1981, he was once again at Brussels Forest National Theatre . . . and so was I! This time his tour had included most of the major cities in Europe, from Switzerland through Germany, France and Belgium to Holland. Actually, one city lost out — the Paris concert was cancelled due to Palace Theatre organisers double-booking the venue, a great shame as Schulze's popularity is perhaps greatest in France, although there was still the Lyon concert.

This year, after having already dismissed the Moog, the GDS came into its own by successfully replacing the percussionist with great success. Once again Manuel Gottsching was there (his presence being advertised this time), also bringing with him his own impressive array of sequencers and processors which enabled him to tailor his guitar to any sounds he required, this being so effective that it became difficult at times to figure out exactly who was playing what. The concert opened with discordant, randomised sounds including a peel of electronically produced tubular bells and an unmistakable Schulzian haunting sound which led us into a definite pattern of rhythmic bursts, greatly appreciated by the audience. This rhythm lasted for most of the piece with masterful themes weaving in and out, until the final five minutes when (as Schulze likes to let his audience down gently) a simple melody took over to ease us to the end of a very powerful first half.

The end of a short interval brought Schulze and Gottsching back with even more interesting ideas on how to instill enthusiasm into the fans. After about ten minutes of soft, simple but rapid sequence and melody, the music built to a strong climax with a mass of synth melodies mixed with guitar sounds, and the GDS giving the whole thing a light-hearted air with speedy variations on "Death of an Analogue" from the "Dig It" album. This was followed by a "rock" session of sequencers, synths and guitar melodies over a heavy rhythm, only to soften once again to the most beautiful piece of the evening, with Schulze giving gentle long themes that formed a basis for Gottsching's guitar playing. Then a return to deep heavy chords and rhythm with the guitar adding a jazz-like theme.

The whole concert, as usual, was completely unrehearsed. Schulze dares not rehearse . . . "Once I start to play, it is difficult to stop. I could go on for hours!"

This urge to continue playing was apparent after the first encore when Schulze was more than a little "put out". Whilst waiting backstage, looking forward to his usual second encore, the organisers had put up the hall lights, causing faint-hearted fans to begin vacating the premises. Schulze was adamant that he should go on again regardless of how many were left. After a short hassle with the organisers and a promise that it would be kept short, the lights were once again dimmed and music recommenced. A tip, therefore, for all Schulze fans attending one of his concerts; don't give up on encores, this man loves to play, especially to a live audience. Energy and organisers permitting, he could go on all night. Another move away from traditional Schulze was the raising of his barrage of equipment, and himself, from floor level; replacing his usual white rug with an ordinary swivel chair. One thing that had not changed was the presence of the 32 into eight mixing desk alongside his other equipment on stage. If you are performing "ad lib", you can't expect someone else to do the mixing for you.

With the usual lack of numbered seating at the Forest (the procedure is usually "first in gets the best seats"), and with seats for 6,000, but a less than full auditorium, the multitude were neatly placed in a group directly opposite the stage in order to get the most from Schulze's Dynachord PA. A large number had also positioned themselves directly in front of the stage causing a few problems with their tendency to stand rather than sit bringing cries of "Assis! Assis!" from the rear of the hall at the beginning of each session. Even the powerful bass (which at times tended to resonate through one's ribs) did not encourage any movement away. The only thing to calm the situation was a plea from Schulze himself (I think maybe the shock of his actually speaking did more to settle the audience than anything). For the encores, a motion from Schulze for calm was all that was needed.

The GDS's ability to replace other large instruments has no doubt had a great effect on the transportation of equipment. We only have to look at the size of the tour to realise that. A tour stretching across five countries and taking one month to complete, it covered 21 venues and gave Schulze only six days off (most of which were spent travelling).

Whether this new portability will tempt him to once again cross the Channel I doubt though, as his dealings with British organisers and promoters has been scarred in the past. But if you are in any way a fan of his music, his concerts are well worth the trip. Unlike with many other artists, a Klaus Schulze concert is not a repetition of old pieces nor a preview of a new album but is totally unique.

Jeanette Emsley

Klaus & Michael Schrieve lend a critical ear to their first efforts for the new "Wahnfried" album.

second floor contain the offices and work-rooms for the small compliment of staff employed by I.C. and apartments for visiting artists.

Studio manager and recording engineer, Barney Roth-Profenius, showed me around the control room. Situated centrally is the AMEK 3000 computerised 36-channel mixing desk. The computer is, in fact, only being used for setting volume levels on mix-down. Only 24 channels are normally used, but as the desk is of modular design, any of the spare channels can be unplugged and used to replace any of the main group should a fault occur.

Signals are fed from here to a control panel on Barney's right as he sits at the desk. This panel houses 24 LED VU meters which he uses in preference to the slower analogue meters mounted on the main desk. Beneath these are the track selection buttons, vari-speed control and auto-locator for the two-inch tape machine, a 24-track Telefunken Magnetophone 50.

Behind Barney's chair is a rack containing the VGW monitor amplifier, Klark Technik graphic equaliser, four Dynachord units, (consisting of two DRS 78 digital reverb units and two flangers, a TAM 19 and a TAM 21).

Above these are the Pioneer CT-F1000 cassette deck, headphone amp and the Publison, a French-made effects unit based on the Eventide Harmoniser. Studio monitoring is through GBA Electro-Voice speakers. In the far corner are the two master tape machines, a Telefunken M10 and a T9, both very old, but Barney swears by them. Proudly displayed on the back wall is a photo history of the rebuilding of the studio.

The I.C. concept originally included a synthesiser school, but this unfortunately closed because of a combination of lack of time on the part of Klaus and lack of interest on the part of the media, although Klaus told me that he would like to do it again in the future, time permitting. Meanwhile, he refers prospective pupils to one of the many schools that have sprung up in Germany, many named after the titles of his albums.

The Future

After speaking to Barney at I.C., I went to visit Klaus at his home studio, where he was working with Michael Schrieve on the new "Richard Wahnfried" album, while the group's two-year-old namesake was busily adding echo to every track!

In the future Klaus sees himself moving away from the rock/pop type of music and developing a more classical style, the popular side being catered for by "Wahnfried", which will have as its base Klaus & Michael with the other members constantly changing. Also in the pipeline is an album by Klaus and Michael and a new solo album later this year. This will be Klaus' first on I.C. as an independent label.

His last release "Dig It", made whilst still under the control of WEA, was a digital recording, but he doesn't see this method being used for I.C. artists in the near future due to the expense of digital editing equipment which is necessary for conventional albums with short tracks. His own albums, however, which normally consist of one track per side can be recorded in this way as they do not need editing.

Klaus also appears on a new album by Din a Testbild, a new wave band recording on I.C., which has been whittled down from its original five members to one, the vocalist, with Klaus adding the electronics. A European tour is planned for the end of this year but unfortunately this will not include the U.K. in spite of offers from a promoter.

Dennis Emsley
Photos by Nessie

KLAUS SCHULZE DISCOGRAPHY

(No title yet)	1981 -I.C.-	KS 80.014	(Autumn '81)
DIG IT	1980 Brain	60 353	
. . LIVE . .	1980 Brain	80.048	(Do-LP)
DUNE	1979 Brain	60.225	
"X"	1978 Brain	80.023	(Do-LP)
BODY LOVE Vol. 2	1977 Brain	60.097	
MIRAGE	1977 Brain	60.040	
BODY LOVE	1976 Brain	60.047	
MOONDAWN	1976 Brain	1.088	
TIMEWIND	1975 Brain	1.075	
BLACKDANCE	1974 Brain	1.051	
PICTURE MUSIC	1973 Brain	40.146	
CYBORG	1972 Brain	21.078	(Do-LP)
IRRLICHT	1971 Brain	1.077	

"ROCK ON BRAIN — KLAUS SCHULZE" Brain 80.046 (Sampler Album)

I.C. DISCOGRAPHY

KS 80.001 ROBERT SCHRODER	'Floating Music'	Nov. 1980	(Electronic)
KS 80.002 DIN A TESTBILD	'Programm 1'	Nov. 1980	(New Wave)
KS 80.003 LORRY	'Be Careful, Too'	Nov. 1980	(West Coast American Sound)
KS 80.004 IDEAL	'Ideal'	Nov. 1980	(New Wave/Rock)
KS 80.005 P'COCK	'In 'cognito'	March 1981	(Jazz-Rock/Classical-Rock)
KS 80.006 RICHARD WAHNFRIED	'Tonwelle'	March 1981	(Electronic Rock)
KS 80.007 POPOL VUH	'Sei still'	March 1981	
KS 80.008 BAFFO BANFI	'Hearth'	March 1981	(Electronic)
KS 80.009 CLARA MONDSHINE	'Luna Africana'	Sept. 1981	
KS 80.010 LORRY	(2nd)	Autumn 1981	
KS 80.011 DIN A TESTBILD	(2nd)	Autumn 1981	
KS 80.012 IDEAL	(2nd)	Autumn 1981	
KS 80.013 KLAUS KRUEGER	'One is One'	Sept. 1981	(Electronic)
KS 80.014 KLAUS SCHULZE		Autumn 1981	(Electronic)
KS 80.015 AVIS DAVIS		Sept. 1981	
KS 80.016 ROBERT SCHRODER	(2nd)	Autumn 1981	(Electronic)

Firstman SQ-01 Sequence Synthesizer

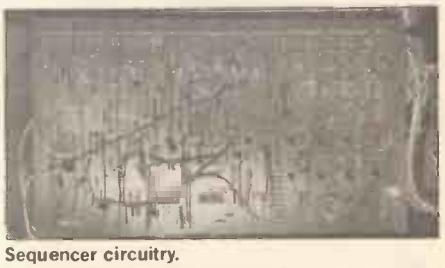
As sequencers become increasingly accepted by musicians for freeing the hands for more gratifying activities (don't giggle, Jones Minor in the back row) than playing endlessly repetitive riffs and so on, so digital technology comes up with cheaper and better ways of improving this interface between man and his more or less artistic pursuits.

The SQ-01 is a neatly-packaged combination of a multi-channel monophonic sequencer and basic features synthesiser which Firstman describe as a "mini music lab being to music what the calculator is to math (sic)". Be that as it may or, more likely, may not, its design philosophy seems to put it fairly and squarely between the beginner's sequencer facilities of the Casio VL-1 (no criticism intended) and the rather more advanced real-time recording operation of the Roland CSQ-100. Despite certain limitations, the SQ-01's facilities should make it quite applicable to the pro side of the market.

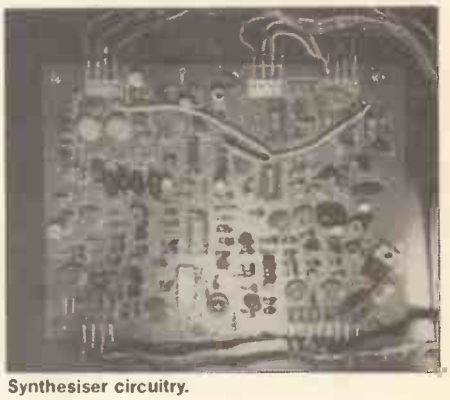
Sequencer

The sequencer is constructed wholly from CMOS chips with a couple of CMOS 1024 x 4-bit RAMs for note storage. Unlike various real-time programming counterparts, where any duration of note is 'recorded' as it's played, the SQ-01 is loaded using the principle of pulse time, with a total capacity of 1,024 'events' of equal duration. This capacity is organised as four master channels (A, B, C and D), each holding 256 events, and subdivided into four numerical channels (1, 2, 3 and 4) of 64 events each. Thus, with a sixteenth note (𝅘𝅥𝅯) as an event, the 64 events that could be programmed into sub-division 1 of master channel A would be four bars of 4/4 time. 6/8 time can also be selected for loading notes, in which case each subdivision will hold 48 sixteenth holes. The eight touch pad SEQUENCE controls on the right side of the unit enable all the sixteen available sequencer subdivisions to be programmed from the various combinations and LEDs light up to register your choice. REC engages the recording mode of the SQ-01 for the loading of one sub-division or 64 sixteenth notes at a time. Unusually for this type of sequencer, it's also necessary to prescribe one's choice of envelope before the commencement of recording a sequence. Pitch specification is limited to 25 notes, one octave in the LOW transposition setting and the other in the HIGH setting, and transpositions have to be selected before the entry of any pitch. After each pitch has been selected, the required event duration is entered by pressing 𝅘𝅥𝅯 or 𝅘𝅥𝅰 to give multiples of sixteenth notes, the former giving an untied note and the latter slurred notes. Rests are similarly entered with 𝄾. If you're entering long duration notes like semibreves, for instance, it's only too easy to make boobs with one's mental arithmetic (or, as Firstman might put it, one's mental math). Fortunately, this isn't fatal as mistakes can be corrected by pressing REC and STEPping to the error to put right one's miscalculation. There are three other sequencer controls to consider: TEMPO, which does what you'd expect, the actual range of playback speeds being dependent on your initial implementation of pulse time when recording; RELEASE, which varies the duration of a note after its initial attack during playback; and BAR, which selects playback of 2, 4, 8, 12 or 16 bars from the start of each sequence. A tempo LED also flashes to indicate the tempo and metre, with a flash every third pulse or event in 6/8 time, and every fourth pulse or event in 4/4 time.

That completes the nitty-gritty of programming the SQ-01; pressing the generously large PLAY/STOP pad starts the whole playback ball rolling, and, wonders of wonders, one finds that once one numerical sub-division of a master channel has done its 64-note or 4-bar thing, then so the channel LED clicks (well, not literally) over to the second, third and fourth sequences in turn, dependent on what the BAR knob is pointing to. End result: 4 channels of 256-note pulse-time sequences. The main limitation of this sequencer is that what you get out is no more than what you put in, unless you do some jiggery-pokery with CVs via the sockets à derriere. It would be nice to be able to use the keyboard to transpose the sequence on playback, but then maybe that's asking just a little too much from a unit costing the same as the Spider (£199), but with much greater storage capacity and the extra bits and pieces of the synthesiser added on top.



Sequencer circuitry.



Synthesiser circuitry.

Synthesiser

As the photo shows, the synthesiser part of the SQ-01 occupies five knobs at the top of the unit: CUTOFF FREQ, RESONANCE, FINE, FREQUENCY and SUSTAIN. There are also, of course, the two envelope pads that we've already alluded to in the previous section. As you'll imagine, this is what could be described as a 'basic synthesiser', and the manual is deluding itself if it thinks that "the seven octave range oscillator, pulse and sawtooth waveform generator, 24dB low-pass filter and envelope controls interact for the infinite sound creation we have come to expect from the finest and most sophisticated synthesizers". That criticism doesn't mean that the sound the SQ-01 produces is bad; on the contrary, it's often very pleasant, but it's the predictable pleasantness of a cheap, one oscillator synthesiser lacking the dynamic envelope shaping and filtering that today's synthesists really *do* expect. The saving grace is undoubtably the filter which gives some nice resonant effects, but as

Rear view of the SQ-01.

there's no provision for any sort of filter sweep it's all a bit static. The SQ-01 also limits one to two basic sound types: a sawtooth waveform with a short attack and long decay (selected with the envelope touch pad); and a pulse waveform with a short attack and short decay (the touch pad). Not surprisingly, there's a difference between these two sounds, but I for one don't like my waveforms pre-packaged in somebody else's idea of an envelope. Put a stamp on it and send it back to Japan! To be fair, there is a RELEASE function for varying the release time of the envelope and the SUSTAIN control, but the all-important attack profiles of notes are fixed to the two choices already outlined.

Extras

One thing we haven't mentioned so far is what the SQ-01 likes to be fed on in terms of power. Well, situated at the bottom of the unit is a metal plate marked 'battery box'. This is detached from the main body of the SQ-01 with two knurled screws — these then promptly vanish from sight as there's no washer to keep them in reasonably intimate contact with the battery box plate. The newly-opened cavity reveals a couple of drifting battery holders, of the sort that have a habit of cutting the life support, courtesy of flimsy wires that spontaneously detach themselves from the holders. That wouldn't be so bad if it wasn't for the fact that two of the 1.5V batteries thus jettisoned are (were) for memory back-up . . . Embarrassment prevails. The SQ-01 consumes 1.5W of power in full swing, which works out at around 150mA — rather reminiscent of the insatiable appetite of the Spider, isn't it? A 12V AC adaptor obviously makes everything much more secure, and, as I found out, it's also rather essential if you're after a fairly consistent performance from the synthesiser as far as tuning is concerned. So, if you elect to use batteries (you dangerous fool, you!), be sure to plug in your ¼-tone perceptual apparatus. I must admit, I really don't understand why an AC power supply isn't built in — a striking case of false economy.

On the plus side, there is plenty of interfacing capabilities at the back of the SQ-01: CVs in and out, GATEs in and out, CLOCKs in and out, a foot switch for remote stop/start, the obvious audio out, and a SYNCHRO jack for synchronising the stop/start of one SQ-01 with another, should you choose to use them *en masse*. Firstman also make the BS-01 Bass Pedal Controller which plugs into the CV and GATE inputs and enables recorded sequences to be transposed and restarted at the beginning of a sequence by depressing an appropriate pedal. Sounds like a splendid idea, but so far it hasn't appeared in the U.K. and there's no clue as to how much it will cost.

In sum, then, the SQ-01 is pretty versatile, especially in terms of interfacing, and it offers excellent value for money. The black spots, on the other hand, stick out like the proverbial sore thumb. The design game *is* a curious thing, isn't it?

David Ellis

The Firstman Sequencer is distributed in the U.K. by London Synthesiser Centre, 22 Chalton Street, London NW1 1JH.

LISTEN TO THE SOUNDS IN E&MM!

ELECTRONICS & MUSIC MAKER DEMONSTRATION CASSETTES

Electronics & Music Maker is the first monthly publication to produce its own cassettes that will provide a unique aural complement to the magazine. Produced in our own recording studio, these C60 cassettes will allow you to hear the sound of instruments and electro-musical effects in our features and reviews.

Demo Cassette No. 1 (March/April issues) contains:
1. Matinee Organ. 2. Yamaha SK20 Synthesiser. 3. Guide to Electronic Music Techniques. 4. Sharp MZ-80K music/sound effects. 5. Warren Cann plays Syntom Drum Synthesiser project. 6. Paia 8700 Computer music. 7. Frankfurt Music Fair.

Demo Cassette No. 2 (May/June issues) contains:
1. Tim Souster. 2. Adrian Wagner plays Wasp & Spider. 3. Lowrey MX-1 Organ. 4. Apple Music System. 5. E&MM Word Synthesiser. 6. Fairlight Computer Musical Instrument. 7. Sharp Composer program. 8. Yamaha PS20 keyboard. 9. Vero musical projects. 10. David Vorhaus LP "White Noise" excerpt.

Demo Cassette No. 3 (July/August issues) contains:
1. PPG Wave 2 Synthesiser. 2. Synwave project. 3. Wersi Pianostar played by Hady Wolff. 4. Alphadac 16 music. 5. Atari 400/800 music. 6. Duncan Mackay. 7. Hexadrum project. 8. MTU music. 9. Casio VL-Tone. 10. Irmin Schmidt's Toy Planet LP extracts.

Demo Cassette No. 4 (Sept./Oct./Nov. issues) contains:
1. Linn Drum Computer. 2. E&MM Harmony Generator project. 3. City University music. 4. Casio MT-30. 5. Roland instruments: Jupiter 8, TR808, MC-4, & GR300. 6. Steve Howell piece. 7. 'Ecstasy' LP by Georg Deuter excerpt.

Demo Cassette No. 5 (Dec./Jan. issues) contains:
1. Teisco SX-400 Synth. 2. Poly ZX81 music. 3. Study Music 1: Synth backing for you to play solo of Dec. '1984' Rick Wakeman music. 4. Casiotone 701. 5. Yamaha CS70M. 6. Roland CR8000. 7. E&MM Synclock project. 8. Study Music 2: 'Exit' music from Jan. issue minus theme for you to solo with. 9. Alpha Syntauri Computer pieces. 10. Elka X-50 Organ. 11. Soundchaser. 12. Ian Boddy music. 13. Richard Mitchell's electronic music for film.

Demo Cassette No. 6 (February/March 1982 issues) contains:
1. Yamaha GS1 played by Dave Bristow. 2. Korg Trident Polysynth. 3. Roland Drumatix sounds. 4. Study Music 3: Ike Isaacs performs his 'After Hours' music in Feb. issue. 5. Firstman Sequencer. 6. Wersi Comet played by Mark Shakespeare. 7. Sequential Circuits Pro-One Synth. 8. Study Music 4: Kraftwerk's 'Computer World' sample backing music to play solo with. 9. Home Electro-Musicians: Johnny Demestos, Gerry Taylor. 10. Digital Delay Line Effects Project. 11. Percussion Sound Generator Project. 12. E&MM Spectrum Synth sounds.

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JHS DX-5 Pro-Rhythm Mini Synth

Fans of the E&MM Syntom and Synwave (and there are many) may find the idea behind this unit a little familiar! The JHS DX-5 is a percussion synthesiser which can be triggered either by hitting the case with a drum stick or finger (there is an internal transducer) or by being mounted on a drum. A bracket is provided which clamps on to a drum rim, and when the drum is hit, the synthesiser is triggered.

The unit is very compact, being mounted in a matt black diecast case measuring 120 x 60 x 35mm. There are eight knobs, two switches and two jack sockets mounted on this, and the synth is powered by an internal PP3 battery; so there can't be much room left inside for the circuitry!

The main sound source is an oscillator which produces sine waves, with a pitch range from 50Hz to 3.5kHz. The amplitude of the sound is controlled by an envelope shaper with variable decay and fixed attack. In other words, the sound starts immediately the unit is triggered, and then takes between 0.4 and 12 seconds to die away. Here we have the essential elements for synthesising most non-metallic percussion instruments, drums and woodblocks for instance. Anything from bass drum to claves may be imitated, and many other percussive sounds can be generated using just these two controls.

One other factor in drum synthesis is this: when a drum skin is hit, the initial impact of the stick or beater stretches it, and the tone tends to start high and then settle down to a lower pitch as the sound decays. The "sweep" control allows the DX-5 to do this, and the effect can be greatly exaggerated to produce that "pinging" sound which has been done to death on so many disco records.

Another sound source is provided in the form of a noise generator, which can be switched to give white or pink (filtered) noise. The "balance" control mixes the noise and oscillator outputs in any proportion. A little noise may be used to roughen up the sound slightly — drum skins never produce a pure tone — or a bit more gives a snare drum effect. Alternatively, using the noise source by itself, a reasonable attempt may be made at producing cymbal and clap sounds.

For more electronic sounding effects, vibrato may be introduced. A low frequency oscillator with variable rate and depth modulates the main oscillator frequency for a wide range of weird outer space sounds. (Actually, sound doesn't travel in outer space because it's a vacuum, but you know what I mean.)

The only controls left to cover are a volume control, which works as volume controls do the world over (maximum output is 500mV p-p); a footswitch socket for turning the whole thing off when you don't want it, if it's mounted on a drum for instance; and the "intensity" control. This adjusts the unit's sensitivity — it is touch sensitive — and ensures that it isn't set off by external sounds, such as the bass player's 300W stack two feet from your right elbow.

The number of controls on the box means that finding somewhere safe to hit it is a bit of a problem, and I would think there's a good chance of breaking something with a misplaced drumstick, hastily lashed out in the middle of a percussive cacophony (drummers are such beasts); also, it's a pity there's no external trigger for operating the unit automatically, from a Synclock for example.

Apart from that, the DX-5 is simple to set up and operate, it produces a vast range of sounds, and it's *fun*: there's no law against that, contrary to popular rumour, and at £45 including VAT it's a lot cheaper than some other sources of fun I could mention (but won't).

Peter Maydew **E&MM**

JHS products are sold by John Hornby Skewes & Co Ltd, Salem House, Garforth, Leeds LS25 1PX. Tel: (0532) 865381.

EVENTS

COMPUTER OPEN DAY EXHIBITIONS; covering the field of personal computers, home computing, small business systems

Wembley, London. This is the exhibition to be at in '82! Famous celebrities will be appearing, music and record companies. musical publications (yes, E&MM will be there!) national publications, recording studios, radio stations and many more Something for everyone! Apart from Sunday, when the show opens from 10.30 a.m. to 11.00 p.m. the week day hours are 10.30 a.m. to 12.00 noon (trade only) and from 12.00 noon to 11.00 p.m. for the public. For more information contact IMS, 26 Kingsland Road, London E2 8DA or tel. 01-729 2666.

April 20th-22nd THE ELECTRONICS/ ECIF SHOW. The Barbican Exhibition Centre, London. This will be the largest and most comprehensive display of the electronics industry the capital has seen for many years. So far there are approximately 300 exhibitors to occupy the four halls of the Barbican Centre. Times of opening are 10.00 a.m. to 6.00 p.m. except Thursday when it will close at 5.00 p.m.

For more information contact: Miss Samantha Clarke, The All Electronics/ ECIF Show, 34-36 High Street, Saffron Walden, Essex, CB10 1EP. Tel. (0799) 22612. Telex: 81653.

April 23rd-25th THE COMPUTER FAIR. The Computer Fair will be designed to be of interest to all those involved in personal computers from home computer enthusiasts to businessmen. The aim of the exhibition is to assist in the government campaign to promote computing.
For further information about this Fair, tel. 01-643 8040.

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, Tandy and Roland. For more details tel. 01-834 1347.

Electronics & MUSIC MAKER Reader Survey

FREE SUBSCRIPTIONS GUIDE TO MICROPHONES

HERE'S A CHANCE TO WIN YOURSELF A FREE SUBSCRIPTION IN E&MM'S FIRST READER SURVEY!

We'll be giving away 25 annual subscriptions to the first names drawn out of the hat at the end of March. We'd simply like you to fill in the questionnaire on this page and the next, then post it to our office. Your replies will, of course, be kept entirely confidential.

We'll also send every respondent a **FREE 'GUIDE TO MICROPHONES'** booklet prepared by a major microphone manufacturer, Audio-Technica, which gives valuable information for all electro-musicians.

By completing our questions, you are helping to point future issues of E&MM in the directions most beneficial to you. We have obviously met readers and received letters from you throughout our first year, but by analysing a survey we are much better able to reflect your real needs and interests.

Please use BLOCK CAPITALS throughout and/or tick appropriate boxes

1. Name: Jason Fitzpatrick
2. Address: 2 rough Hill cott, The Tye, East Hanningfield chelmsford Essex
3. Sex: M☒1 F☐2
4. Age group: under 16☒3 16-21☐4 22-35☐5 36-50☐6 51-65☐7 over 65☐8
5. Occupation: school boy
6. Would you class yourself as MUSICIAN☐1 CONSTRUCTOR☐2 SOUND ENGINEER☐3 COMPOSER☐4 or MUSIC LISTENER?☒5
7. Do you play an instrument? YES☐1 NO☒2 If yes, which? KEYBOARDS☐1 ORGAN☐2 GUITAR☐3 BASS☐4 DRUMS☐5 WOODWIND☐6 BRASS☐7 STRINGS☐8
8. What make/model instrument(s) do you play? None
9. Where do you normally purchase your instruments from? Nowhere
10. Name one instrument you would like to own: Sequential circuits Pro-One
11. How much would you be prepared to spend when purchasing an instrument? £20..00
12. Have you made any changes to your instrument(s) in any way? YES☐1 NO☒2 If yes, please give details:
13. What make/model of mixer do you use? None
14. What make/model of reel to reel tape recorder do you use? Any
15. What cassette? Any Noise reduction?
16. What effects/signal processors do you use? Echo:
    Reverb: Effects:
17. Where do you usually buy your recording equipment from? Musical Instrument Dealer☐1 Hi-Fi Shop☒2 Mail Order☐3
18. What make/model of amplifier do you use? Any
19. What speaker cabs? Maplins
20. Do you prefer a mono, stereo or quad performing system? Stereo
21. Have you hired any instrument, PA or lighting equipment? Yes☐1 No☒2
    If yes, please specify hire firm
22. What types of music do you play?
    Rock☐1 Pop☒2 Classical☐3 Experimental☒4 New Wave☒5 Jazz☐6 Funk☐7 Soul☐8 Other ☐9
23. What percussion do you usually work with? Electronic☐1 Acoustic☐2 Both☐3
24. Are you an amateur☒1 semi-professional☐2 or professional musician?☐3
25. Do you do most of your performing in your home studio☒1 on gigs☐2 in a recording studio?☐3
26. If you do gigs, where? Pubs☐1 Local Halls☐2 Theatres☐3

continued ▶

Please cut along this line

Reader Survey

27. If you use a recording studio, which one(s)? _____ How many tracks? _____

28. Do you class your musical skills as BEGINNER☒1 AVERAGE☐2 or ADVANCED?☐3

29. Have you made a demo recording? YES☐1 NO☒2 If yes, where? _____

30. Have you had a release on cassette or LP? YES☐1 NO☒2

If yes, please give details: _____

31. How often, if at all, do you read each of the following magazines/papers?

	Regularly	Occasionally	Never		Regularly	Occasionally	Never
E&MM	☒3	☐2	☐1	Melody Maker	☐3	☐2	☐1
Studio Sound	☐3	☐2	☐1	Home Organist	☐3	☐2	☐1
Keyboard (American)	☐3	☐2	☐1	Keyboards & Music Player	☐3	☐2	☐1
Sounds	☐3	☐2	☐1	Music UK	☐3	☐2	☐1
New Musical Express	☐3	☐2	☐1	International Musician	☐3	☐2	☐1

32. Do you read any electronics magazines? YES☒1 NO☐2 If so, which? Everyday Electronics

33. Do you read any computing magazines? YES☒1 NO☐2 If so, which? Your computer

34. Please indicate your interest in the following sections of E&MM:

	A lot	Some	Little	None		A lot	Some	Little	None
Musician/group interviews	☐4	☒3	☐2	☐1	Organ Talk	☐4	☐3	☐2	☒1
Music to play	☒4	☐3	☐2	☐1	Micro Music	☐4	☐3	☒2	☐1
Fact File	☐4	☐3	☐2	☒1	Using Micros	☐4	☒3	☐2	☐1
Home Electro-Musician	☐4	☐3	☒2	☐1	Basically BASIC	☐4	☒3	☐2	☐1
Exhibition reports	☐4	☐3	☐2	☒1	Circuit Maker	☐4	☐3	☐2	☒1
Sound on Stage	☐4	☐3	☐2	☒1	Education	☒4	☐3	☐2	☐1
Discotek	☒4	☐3	☐2	☐1	Guitar Workshop	☐4	☐3	☐2	☒1
Hi-Fi	☒4	☐3	☐2	☐1	Understanding Electronics	☒4	☐3	☐2	☒1
Working with Video	☒4	☐3	☐2	☐1	Electro-Music Engineer	☐4	☒3	☐2	☐1
History of Electronic Music	☐4	☐3	☐2	☒1	Making Notes	☐4	☐3	☐2	☒1
Guide to EMT	☐4	☐3	☐2	☒1	Projects to build	☐4	☐3	☒2	☐1
Advanced Music Synthesis	☐4	☐3	☐2	☒1	Buyers Guide	☐4	☐3	☐2	☒1

REVIEWS: Synth/Keyboards☐1 Mics☒2 Organ☐3 Percussion☐4 PA☐5 Guitars☐6 Micros☐7 Effects☐8 Accessories☒9
Tape Recorders☒10 Mixers☐11 Records☒12 Video☒13 Books☐14

35. How often do you buy E&MM demonstration cassettes? Every one☐3 Occasionally for specific items☒2 None so far☐1

36. What other articles would you like to see in E&MM? _____

37. What is your experience of building electronic projects? CONSTRUCTOR☐1 DESIGNER☒2 NEITHER☐3

38. What projects have you constructed (or plan to make) from E&MM? None

39. What other musical projects would you like to see published in E&MM? _____

40. Do you use a micro? YES☒1 NO☐2 If yes, which one? ZX81

41. Do you use it with your music instruments for composing/performance? YES☐1 NO☒2

42. Please state any qualifications in music: None

43. Please state any qualifications in electronics: None

44. Are there any well-known musicians you would like interviewed in E&MM? Landscape

Thank you for taking part in our survey. The draw will take place at the end of March and the subscription winners will be announced in our May edition. Please cut out this page and send it to: John Gillman, Market Research Dept, E&MM, 282 London Road, Westcliff-on-Sea, Essex SS0 7JG.

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TEAC Model 5 8 into 4
TEAC Model 15 24 into 8/16
ALICE 12 into 4/8
ALICE 16 into 4/8
ALICE 22 into 16/16
MM 12 into 2

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JBL 4315 Compact monitors
JBL 4331 Studio monitors
JBL 4333 Studio monitors
JBL 4343 Studio monitors
JBL 4350 Studio monitors
JBL Electronic crossover
TANNOY Super Red SRM 12X
LOCKWOOD MAJORS HPD
WHARFDALE Lazer 80
WHARFDALE E90's

AMPLIFIERS
QUAD 405
CROWN D75
CROWN D150A
CROWN DC300A

EQUALISERS
TEAC GE20 Stereo 10 band graphic
MXR Stereo 15 band graphic
MXR 31 band graphic
AUDIO DESIGN S03 Scamp sweep
AUDIO DESIGN S07 Scamp octave
KLARK TEKNIK DN22

MICROPHONES
ELECTROVOICE RE20
ELECTROVOICE 671
ELECTROVOICE DS35
ELECTROVOICE 635A
ELECTROVOICE DO50
CALREC C Series

EFFECTS
STATIK Stereo Reverb
ROLAND 201 Space Echo
ROLAND 501 Space Echo
AUDIO DESIGN S23 Scamp pan module
AUDIO DESIGN S24 Scamp ADT flanger
EMT 140 Stereo echo plate
AUDICON Stereo echo plate
EVENTIDE Instant flanger
EVENTIDE Digital delay
KLARK TEKNIK DN36 Time delay
CLAP TRAP

COMPRESSORS/ LIMITERS/GATES
AUDIO DESIGN F300 Scamp expander gate
AUDIO DESIGN S100 Scamp dual gate
AUDIO DESIGN S01 Scamp compressor/limiter
AUDIO DESIGN S02 Scamp mic preamp
AUDIO DESIGN S05 Scamp Dynamic filter HI
AUDIO DESIGN S06 Scamp Dynamic filter LOW
AUDIO DESIGN S14 Scamp LED 4 column display

NOISE REDUCTION
TEAC DX2A DBX for 32/2B
TEAC RX9 DBX for 3440
TEAC DX8 DBX for 80/8
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DOLBY 361

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TEAC M133 3 channel A/V
TEAC M144 Portastudio 4T

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YAMAHA CP80 Piano
LESLEY 145 cabinet
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Tascam 124AV

Audio Visual Cassette Deck

The compact cassette format was originally introduced for use in dictating machines, and it never fails to amaze me just how far this basically unpromising system has advanced in terms of sound quality. I even lowered myself to buy a cassette deck last year, after being a committed reel-to-reel supporter for ages, but that's another story. On the face of it, the machine reviewed here is just another cassette deck, but it has some interesting and unusual features which warrant its inclusion in the pages of this magazine.

The Half Track System

The biggest departure from the conventional format is the use of half track recording. This is nothing to do with pointing microphones at a military vehicle, but a different way of using the tape in the cassette. Normal stereo cassettes split the width of the tape into four equal tracks, two of which are recorded in one direction, and two in the other direction when the cassette is turned over. In a mono machine, the heads are double width, and two tracks are recorded or replayed simultaneously. Since there is only one tape speed, 1⅞ inches per second, a tape recorded on any cassette machine will theoretically play back on any other machine, even if only in mono in some circumstances. This is in direct contrast to reel-to-reel recording, where there are six speeds in general use, and seven different track formats on ¼" tape alone, many of them totally incompatible with each other.

The reason is basically this: higher tape speed gives improved frequency response, a better signal to noise ratio and less drop-outs (where the tape momentarily loses contact with the heads; if you've listened to an indifferent cassette on headphones you'll know about these). Wider tracks on the tape also give less noise and less drop-outs. Manufacturers of hi-fi cassette decks have recently cottoned on to these principles, and there are now a few recorders which go at twice normal speed, such as Teac's C-3X and the famous Portastudio.

The primary function of the 124AV is in audio-visual presentations (slide shows to you), where one of the tracks has pulses recorded on it which tell the projector when to change slides. Obviously, if one of these pulses were missed, the slides would be out of synchronisation with the music or commentary from that point on, and freedom from drop-outs is of primary importance. To help in this area, Tascam have opted for the half track system, where the tape is split into two tracks recorded in one direction only. Since you can no longer turn the cassette over, they have retained the standard slow speed to help avoid the need to change cassettes in the middle of a session.

This does mean that cassettes recorded on the 124 cannot be played back on a normal machine (you would only hear one channel); and conversely, a normal cassette played back on the 124 would give you side 1 in mono on the left channel, and side 2 *backwards* on the right channel, again in mono. Not a lot of use! In view of the things this deck can do for you, I think its appeal would be much wider if it could also be used as a normal cassette deck. It certainly looks like one, and not enough noise is made about the unconventional tape format in the otherwise excellent multi-lingual instruction book. There is nothing at all on the machine itself; the Portastudio comes with a label stuck to its cassette door warning users about incompatibility. This is meant to be professional equipment, I accept, but instruction books have a habit of being either lost or not thoroughly read; a user in a busy audio visual department who was not 'in the know' could get confused quite quickly.

Simul-Sync

The second major feature, and the one most likely to be useful to musicians, is the simul-sync facility. This enables you to play back one channel — the left — and simultaneously record on the right hand channel only, something you can't do on an ordinary stereo deck. For a start, the erase head is usually mono, and so it would rub out both channels even if the record/replay switching were altered.

In audio-visual applications, this allows music and commentary to be recorded on the left hand channel, and synchronisation pulses can be recorded at a later date whilst listening to the soundtrack. The 'cue-select' button allows the 124 to be compatible with virtually all commercial programming equipment, even the newest digital units.

With the cue-select button in position 1, audio signals may be over-dubbed just as easily as programming pulses; for the musician this means that an instrument may be recorded on the left hand channel, followed by another instrument or vocal on the right hand channel. This may be rather unsophisticated compared to a Fostex 8-track for instance, but it's ideal for working out song arrangements and similar work. The deck is very straightforward to use, aided by another useful feature, the 'memory' button. If the tape counter is reset at the beginning of a piece, and this button is engaged, the tape will stop (from rewind only) whenever the counter reads 000. You can easily rewind and start from the beginning as many times as necessary to get something right; I wish my Teac A3340 had one of these!

One departure from normal simul-sync schemes is that you can only overdub on the right hand channel; should you suddenly decide that your original recording was

124AV Specifications

Track format:	½ track stereo
Tape speed:	1⅞ ips, ± 0.015%
Wow & flutter:	0.12% weighted
Fast wind time:	90 seconds (C60)
Size:	410 x 160 x 297mm
Microphone input:	0.25mV or more
Line input:	60mV or more into 50K
Line output:	300mV
Headphone output:	0.6mW into 8R
Equalisation:	DIN 3180uS, 120 or 70uS
Frequency response:	30 to 11kHz ± 3dB (chrome tape)
Signal to noise ratio:	59dB weighted (chrome tape, no Dolby)

Dolby improves the SN ratio by 5dB at 1kHz, 10dB over 5kHz

Manufacturers of compatible programmers include: Arion, Audio Visual Laboratories, Electrosonic, Kodak, Spindler and Sauppe, and Clear Light Productions.

To all those still saving for a Revox.

If you're in the market for a truly professional two track machine, we'd like to offer you something new.

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Quite simply, the 32-2B is a 1/2 track master recorder, specifically designed for professional recording.

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TASCAM
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7½/15ips – 10½"/7" reel capacity – frequency response 30-30,000Hz (± 3dB, 40-20,000Hz, 0 VU) at 15ips

S/N Ratio – 63dB (3% THD Level, weighted) NAB – 65dB (3% THD Level, weighted) IEC – THD 0.8% at O VU, 1,000 Hz, 185 n Wb/m

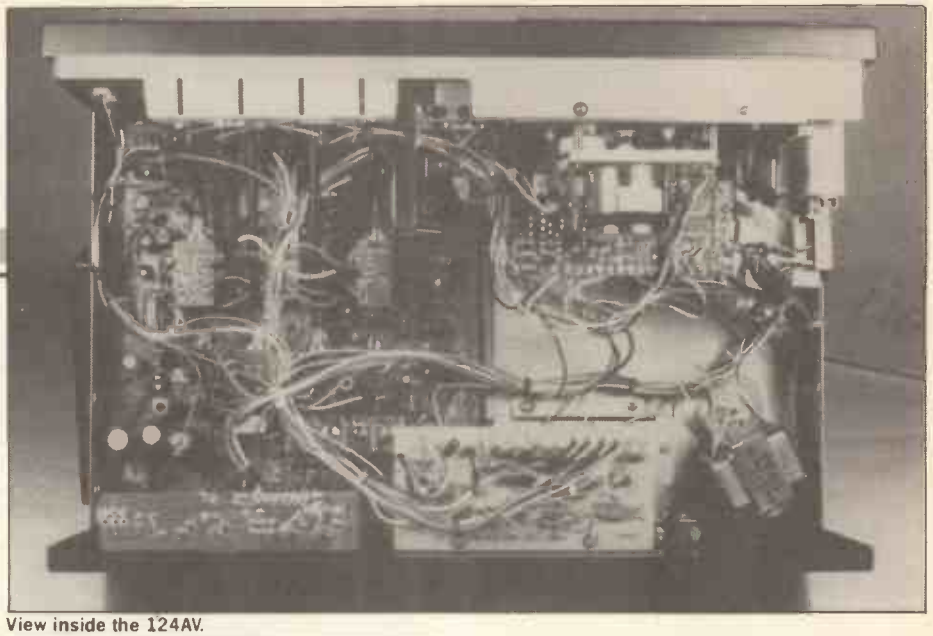
DX-2B. OPTIONAL DBX UNIT – S/N Ratio – 92dB A weighted (NAB).

wrong, you can't redo the left hand channel by itself. Instead, you have to erase everything and start again. This is no hardship for 'roughing out' an arrangement, and after all, you aren't going to record your next LP on the 124AV.

Other Features

Another facility is 'mic blend' which allows you to mix in a single microphone in mono whilst recording stereo music. This facility also works during playback, so you can add live commentary to a pre-recorded soundtrack without needing an extra mixer; or if you've recorded two instruments using simul-sync, you could re-record them on a second deck and add vocals (for instance) at the same time.

The rest of the unit is fairly standard, with switches for bias and equalisation setting (chrome and normal only, no metal position) and Dolby B noise reduction. The VU meters are easy to read, and illuminated; there is also a light behind the cassette window, so you can work the equipment in the dark, the favoured environment for slide presentations.



View inside the 124AV.

Close-up of the heads, showing the wider track width and stereo erase head.

To sum up, everything works smoothly without obvious nasties, and the unit is well built (if a little empty inside). The half track format means the unit is unlikely to sell in vast quantities to domestic customers, but should be useful to audio visual departments, musicians and in education.

Peter Maydew **E&MM**

Tascam products are distributed in the U.K. by Harman (Audio) U.K. Ltd, Mill Street, Slough, Berks SL2 5DD. Recommended retail price of the 124AV is £195, including VAT.

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

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FACT FILE

Tony Bacon

Ken Freeman

"I'm an electronic musician. I'm a composer, very much so now. I used to do a lot of sessions, but I've got about ten jingles on the air at the moment. I'm getting into composing more and more now. I got a CLIO award for a Gordon's gin advert — I used the Synclavier to good effect on the start of that."

Keyboards

Yamaha CS80 (unison/triggering, 8-way phase shift and pitchbend/brass mods); Synclavier II (XPL language, plus Commodore Pet); Freeman String Machine; "use of a Fairlight". "The Synclavier I got because of the conviction that computers are here to stay, and if you don't get involved you get left behind. I've used the Synclavier/Pet set-up for the BBC, for a "Play For Today" in the spring called "Crimes". The String Machine I built years ago, some people still say it's the best string sound around and we tried unsuccessfully to get it marketed in this country. I took it to America and Lowrey had a go at it, then they left about half the oscillators out of it. I was pioneering the thing.

"The more synths with touch sensitivity on the keys, the better. If you compare what a synthesiser does to what a real instrument does, you just *haven't* got the amount of control over the sound — you can only get feeling in with great difficulty. You have to use your whole body to play an instrument properly. One finger on a keyboard isn't enough."

Sequencers

Has used self-built Pet/ARP Odyssey interface; now uses Synclavier.

FX

Roland Space Echo, phaser, flanger.

Percussion/drum machines

Pet/Korg Rhythm 55 interface (Machine Code program available — write to Ken Freeman c/o E&MM for details).

Favourite studio/engineer

Advision/Geoff Young. R. G. Jones/Jerry (surname unknown).

Home recording

Teac 8-track; Studiomaster 12/2 mixer; two ¼in Revoxes. "Very reliable — the Teac's absolutely amazing."

Tony Mansfield *New Musik*

"My basic role is as a producer rather than an instrumentalist or a technician. From a production point of view, synths are really good tools. I'm more of an ideas person than an actual musician — I play most of the things but it takes time. I think I'm quite resourceful — if you gave me a tin whistle and a ukulele I'd find some use for it."

Keyboards

Oberheim OBXa; Prophet-5; Roland Vocoder Plus VP330; piano (whatever's in the studio). "The Oberheim is my main, favourite instrument, the fact that you've got the split keyboard facility is beneficial for live work or composition. If you spend time in the studio, you're going to track those things on anyway. The Prophet I've used for about the last two years. It's a very simple system for someone like myself — very instant. It's a good instrument to develop on. Sequential Circuits opened it up for all the others. The Prophet and the Oberheim are very similar systems, but they do have their own individual characteristics.

"I think everybody's trying to make the ultimate polyphonic synthesiser, but there are always going to be slight differences between makers. Ultimately, someone will bring out a synth that's got everything! With keyboards now, I think they've got to be made accessible to the kids, to the people who are going to grow up and develop them."

Sequencers

Roland CSQ600 (to Prophet).

Amplification

Oberheim DI to desk.

Percussion/drum machines

Simmons SDS-V module. Triggered by pads or Roland CR78.

Favourite studio/engineer

"I enjoyed working at Air recently on Yukihiro Takahashi's solo project (from YMO)." Strawberry South. TMC studio. "I work exclusively with Peter Hammond, he's something of a perfectionist."

Home recording

Two Revox B77s. "I tend to do very 'mock-up' rough demos at home — I don't want to spend hours re-creating it in the studio."

Martyn Ware *Heaven 17*

"I've been using synths for four years, but I'm beginning to go off them. We're starting to realise that acoustic instruments have a much larger dynamic range. We're moving more into the traditional producer's role: less playing, more telling people what to play. It's quite feasible that our next album will be more orchestral-based, we've started working with an orchestral arranger."

Keyboards

Roland JP4; Roland JP8; Synclavier II (hired); Roland Vocoder Plus VP330; Roland System 100M. "We bought a JP4 a few years ago and it's served me well. The basic oscillators aren't brilliant, but Roland equipment's pretty well designed. Their design is more open to experimentation than, say, a lot of the American designs. They're more interfaceable than, up till recently, a lot of the other brands. Interfacing the Vocoder with the JP4 or JP8 is useful. I first hired a Synclavier when we did the Hot Gossip album and it was just amazing, I couldn't believe it. It should be for 10 grand, but i'd recommend hiring one because it's very easy to master.

"I think people would like a different method of manipulating a synthesiser, other than a keyboard. But having said that, I'm no keyboard player — it really is the easiest way to manipulate a synthesiser unless you're into more esoteric fields."

Sequencers

System 100's analogue sequencers linked to Linn drum computer.

Amplification

Everything DI'd on stage (and studio).

FX

"The standard stuff — delays, harmonisers, you name it."

Percussion/drum machines

Linn LM-1 drum computer — synths are synced to this.

Favourite studio/engineer

John Foxx's studio, The Garden. "Totally live - we like it." Engineers - Nick Patrick, Peter Walsh.

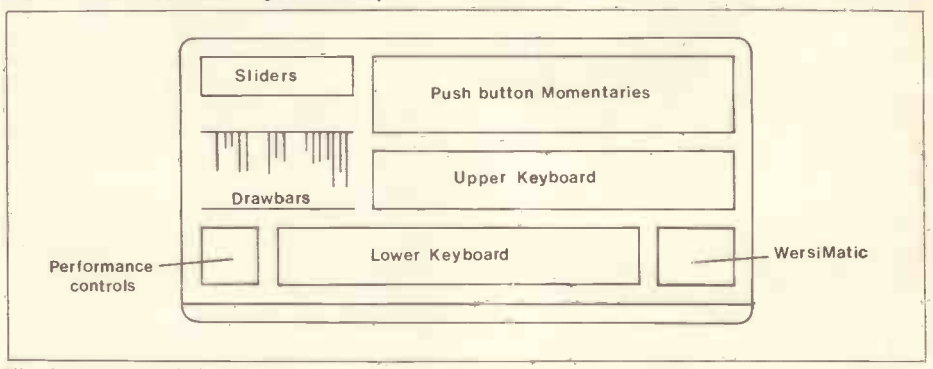
Home Recording

"We had our 8-track in Sheffield till recently — moving to London now, we'll get a small 8-track here."

The Wersi Comet

Wersi Comet Spinet W10S.

Wersi Comet with Satellite Keyboard on top.



Wersi Comet console layout.

Have you ever thought of building an organ from a production line kit? If you haven't, it could be well worth a 'bit of great matter usage', especially as Wersi, THE kit people, have come up with a very attractive new instrument - namely the Comet.

Wersi are a particularly go ahead young German company, based in the small Rhine-side town of Halsenbach. Their *raison d'être* (if you'll pardon the French, in an English article on a German firm) is to provide extremely advanced electronic kits of organs, which even the most non-technical of persons could put together and work for themselves.

The success of the company has been most impressive, almost as much so as the products themselves. Many people who have purchased a Wersi product in the past have enjoyed the construction process so much that they have started afresh on more ambitious models, confident in the knowledge that they are going to both learn a lot about electronics, and in the end, have a quality instrument with which to play.

I guess I'm beginning to sound a bit like an advert for Wersi, but I am impressed with the company, and their unique achievement. I have talked to several "happy customers" who have also given off a fantastic enthusiasm for the enterprise. Wersi are handled in Britain by Aura Sounds Ltd and Electro Voice Sales Ltd. Both companies provide the organs in either kit form or ready made. They don't pretend that you are going to sail through without encountering one or two problems, but they have an excellent team of engineers who will, over the phone, put you straight; or if the worse comes to the worse, come to your home and put you straight - physically.

Anyway, Wersi have just launched the Comet to the world, and for those of you toying with the idea of a kit organ, this one is well worth a very close look. The Comet comes in two different packages - as a Spinet, the W10 S, it will set you back £1,971 in kit form, and £3,620 ready built. The Transportable version, W10 T, arrives in lots of little bits for £1,899, and in one big lump for £3,592. All these prices include VAT at 15%.

For your money you get quite an instrument which is microprocessor based (of course), and offers some rather interesting new ideas, most notably the idea of satellite keyboards; but to build up some suspense I will say no more just yet.

The Comet is a dual keyboard (4 octave C to C) organ with a 13-note pedalboard. The Spinet or console version comes complete with amp and speaker (very good too), and is housed in an attractively styled (rosewood?) cabinet, which would not look out of place in any but the most elaborate of home decor. The Transportable is a rugged piece of hardware, it has all the Spinet's facilities (save amplification) with a sturdy and rather spacey looking chrome steel leg assembly.

The first thing that you notice when looking at the control panels is the predominance of push button momentary LED switches - there are hundreds of them; though initially their functioning is rather daunting, (especially so since the model I saw was labelled in German). However, an intelligent colour code system makes things a lot simpler, and it doesn't take long to 'get into' the Comet. Presumably, if you had built

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Sadly, we have not the room to fully do justice to the Clever Comet. However, noted below are just a few of the reasons why we at Electro-Voice feel very excited about the arrival of this exceptional organ.

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Wersi Comet Portable W10T.

the instrument up from scratch, you would be well familiar with all the controls and facilities. It seems a common thing on Wersi organs to provide a fantastic array of control devices - more so than for almost any other manufacturer - consequently some facilities are not that commonly used. Nevertheless, if the circuitry is there to provide the effect (which it is in most organs) then for the sake of a few extra switches why not utilise said circuitry to the full?

The control panels can be looked at in several distinct sections. This is best seen with reference to Figure 1. Starting in the top left corner we have a series of slider controls, and underneath three sets of drawbars. Eight sliders are used for voicing and constructing the harmonic percussion, with seven footages (16', 8', 5⅓', 4', 2⅔', 2' and 1⅓'). Other sliders are used for sustain times, glide rates etc, whilst the final bank of five do the job of the audio mixer from the various tone generation sections.

The drawbars themselves are split such that the upper manual has 16, 8, 5⅓, 4, 2⅔, 2 and 1⅓ footages. It's funny that they are arranged in that order instead of the usual 16, 5½, 8 etc.; but really I would have liked to have seen a full nine drawbar compliment here - though this would obviously put up the price. For the lower manual we have 8, 4 and 2½ footages, whilst for the bass pedals there are 16', 8' and 4' drawbars with separate tone and sustain drawbars also. Incidently, although there is a somewhat limited number of drawbars for the upper manual, it is possible, by playing around with a preset voicing marked 'Chime' to conjure up a rather unusual 6⅖' pitch (one to be careful with when using it polyphonically).

The momentaries above the keyboard provide the preset ensemble and solo voices, as well as the most comprehensive Piano Section, with Stage Piano, Rock Piano, (straight) Piano, Spinet, Banjo and the aforementioned Chimes. The Comet seems to be big on guitar voicings having a wide variety of such sounds - I never thought too highly about guitar voicings on keyboard instruments, and to be honest, I don't think Wersi have done much better here than their 'ready-built' competitors.

The Comet includes a voltage controlled filter for the Solo voices which is particularly versatile. The filter tracks the keyboard, and consequently, if used in conjunction with the noise source can produce some remarkable chiffing sounds to enhance the woodwind and brass voicings. The organ also incorporates a separate voltage controlled amplifier enabling such effects as Repeat, Tremolo, and most interestingly, Solo Percussion, from which you can produce for example, snare sounds which can be introduced via the keyboard.

Wersi have developed some circuitry known as the WRS Program Memory, which can be programmed with different registrations, so you can have your favourite combinations available at the touch of a button. There are 20 memory locations. The Comet is full of interesting features that many manufacturers don't bother with. One particularly interesting one is the "Third Hand" as Wersi call it. This is basically a note memory for the upper keyboard such that you can play a note or chord and the processor will see to it that this note is sustained until another is played on that manual; meanwhile it is possible to use the lower manual to play against the sustained chord - okay it might not sound, on paper, particularly exciting, but you can do some rather nice things with it that gives an impression of more things going on.

Needless to say Wersi incorporate all forms of coupling and transpositioning switches on the Comet, you can in fact transpose the Comet into any key at the touch of a button - useful if you only know three chords! To the left of the lower manual are the Glide and Waa-Waa sliders. Hady Wolff, the International Demonstrator of Wersi products, was the man showing me around this organ, and he would continually be adjusting the WaaWaa slider whilst playing, to very great effect. It is amazing what can be achieved by a form of variable timbre control - Hady made the instrument really come alive with his playing style.

Wersi's striving for ultra-versatility is further shown in the automatic section, situated to the right of the lower manual. Here we have what is known as the WersiMatic Rhythm and Auto-accompaniment. For the rhythm, there are ten percussion voices which are used in conjunction with ten basic patterns - variations are possible, and for the auto-accompaniment we have twelve different patterns utilising five separate instrumentations. The voicings and patterns are really excellent, and naturally all the more common automatic features such as key-start and memory are to be found on this rather crowded panel.

I mustn't end this brief look at the Wersi Comet without mentioning its unique feature - the Satellite keyboard interface. You can, for an extra £138 (£250 ready built), purchase a Satellite keyboard, up to four of which can be hooked up to the Comet (Comet - Satellites - all very spacey!). Each Satellite consists of a four octave keyboard, six momentary buttons, and of course some internal circuitry. These Satellites make no sound on their own, but are hooked up to the main instrument and can be used to trigger various sections of the Comet's voice production circuitry; e.g. one Satellite can be used for strings, another brass, a third for guitar voices etc.; anyway, the manufacturers claim that this is the first electronic organ that up to five people can play - I think that they're right. On the face of it this satellite keyboard idea might seem a bit of a gimmick, however, it does make it possible for an entire family to play together at marginal extra expense - think of the arguments!

Wersi anticipate that the amateur could put together the Comet in around 100 hours, so if you go for a kit you could be saving yourselves over £1,500 and learning more about electronics into the bargain. Full marks to Wersi, for both a good idea, and a fine product.

E&MM

The Wersi Comet is sold in the U.K. by Aura Sounds Ltd, 14-15 Royal Oak Centre, Brighton Road, Purley, Surrey (Tel: 01-668 9733) and Electro-Voice, Rickmansworth, Herts RD3 6FP (Tel: 0273 23329).

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The WERSI Comet

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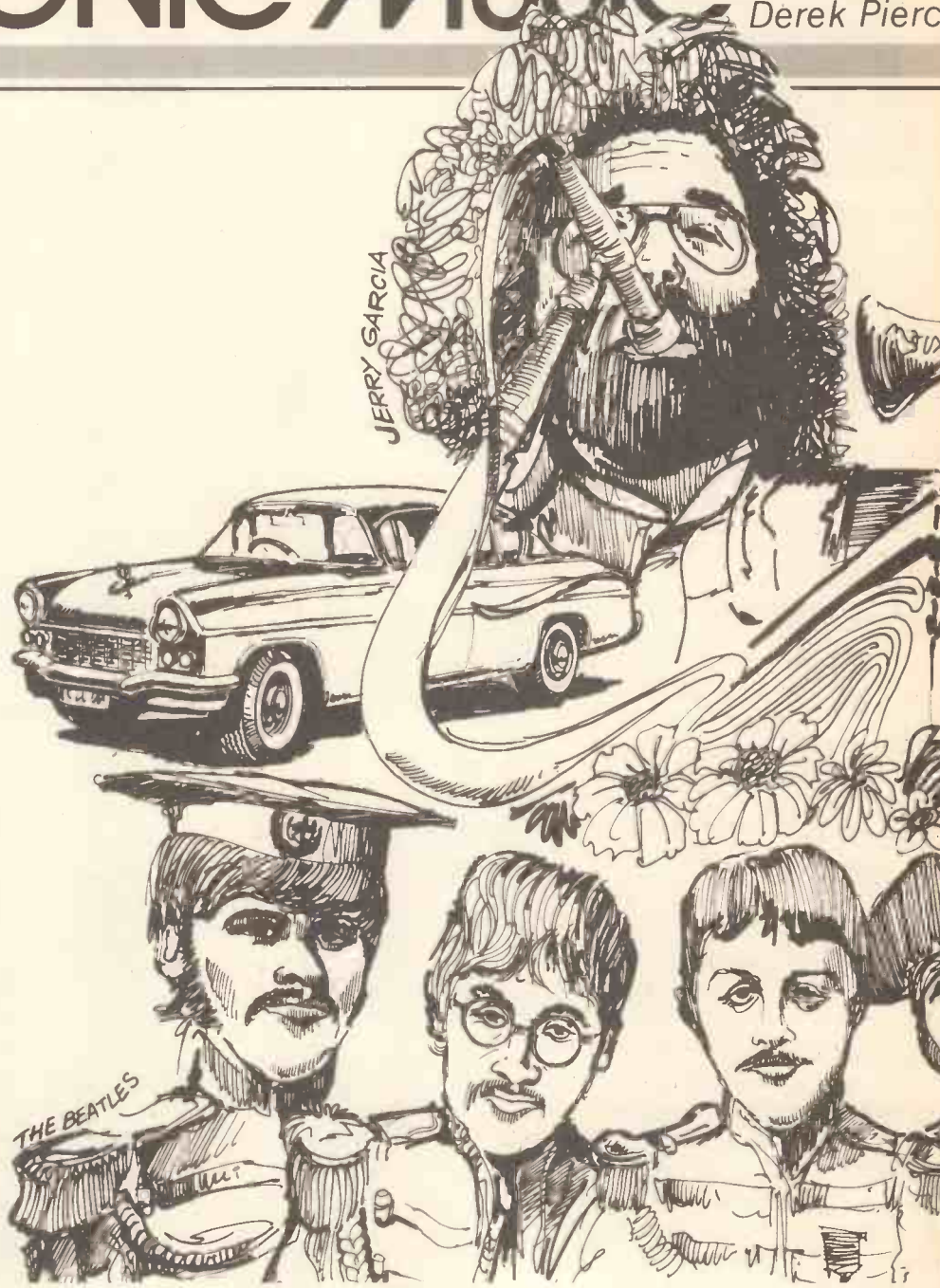
A HISTORY OF ELECTRONIC MUSIC

Derek Pierc



The developments in 'avant-garde' music began to find their way into jazz in the early sixties. In 1962 Bob James, a jazz pianist-composer, prepared tapes for use with Robert Ashley and Gordon Mumma. In Robert Ashley's 'The Wolfman', a six minute tape collage is played simultaneously with a straightforward jazz blues piece. The tape contains speech modulated by racing-car motors, often to the point of distortion. It is faded in and out during the performance and frequently covers the trio's playing.

Another jazz musician who combined instruments with tape pieces was George Russell. Although he was probably best known for his book 'The Lydian Chromatic Concept of Tonal Organisation'. The book, a theoretical study which predicted the shift from chord changes to scales or modes as a basis of jazz improvisation, paved the way for the so-called 'third stream' music. This music is noted for its absence of a constant rhythmic pulse, and is exemplified in the works of Russell, Charlie Mingus, Gunther Schuller and Ran Blake.

Comparable, although less sophisticated, use of tape manipulation appeared in a few isolated examples of rock/pop music as early as 1957. David Seville produced the 'Chipmunk Song' by overdubbing his own voice with speeded up versions, to derive four-part harmonies.

At about that time 'rock and roll' was born out of 'rhythm and blues' and it invariably used tape echo or reverberation, used previously by such luminaries as Otto Luening (e.g. in 'Fantasy in Space'). As well as tape-echo, rock and roll bands tended to use amplified instruments, particularly the electric guitar. The most popular being the Fred Tavares designed Stratocaster. The Fender company also developed, slightly later, the electric bass.

With the continued development of amplification and pick-ups, bands began to experiment with the use of feedback and sustain. Most notable of these were the 'Velvet Underground'. Their line-up included organ, electric guitar, electric bass, percussion and indeed an electric viola, as well as vocalist Lou Reed. In 1965, Andy Warhol asked them to perform in his sex and drug orientated multi-media show, 'Exploding Plastic Inevitable'.

Their lyrics were sung over an accompaniment of feedback, distortion and rock solid drumming courtesy of Maureen Tucker. Songs such as 'Heroin', 'European Son' and 'Run Run Run' used these effects to the extreme[1]. The late guitarist Jimi Hendrix used similar electronic techniques in his trio . Many of the effects used previously in studios were now available as "black boxes" enabling guitarists in particular to filter, distort and modulate their sound. Although the guitar was one of the first instruments to be treated this way, various players such as Eddie Harris and Miles Davis went on to use them to transform the sound of the saxophone and trumpet respectively.

Whilst the Velvets and Jimi Hendrix were based in New York, a revolution was taking place in San Francisco and especially in an area known as Haight-Ashbury. Until 1965 rock and roll bands played hit records, wore matching uniforms and tried to get a recording contract. These ideas were ignored by one George Hunter, who neither sang nor played an instrument, but conceived a band of existentialists, 'The Charlatans'. After one out of town gig they returned to Haight-Ashbury to find themselves stars amongst the new generation of pot-smoking LSD eating *Hippies*. Thus was born the sound of San Francisco. Within a year or two San Franciso gave birth to several notable bands, like Quicksilver Messenger Service, Big Brother and the Holding Company and arguably the best of them all, Grateful Dead.

They were folkies, with the exception of one avant-garde electronic music drop-out. Soon after getting 'electrified' the Dead became involved with novelist Ken Kesey and his Merry Pranksters. They attended Acid Test LSD parties and soon became the most notable acid existentialists on the scene.

They had a reputation for playing endless versions of 'In the Midnight Hour' which went on until everybody decided to stop at the same time. However, out of this chaos came some of the most influential music of the mid-sixties. The Dead treated feedback with a subtlety not seen before in rock music. They treated texture and instrumental colour as compositional elements. One of their best numbers, 'Darkstar', [3]was full of smooth, gradual timbral alterations. In the piece 'Feedback' the techniques were extended to include flute-like oscillator and bell sonorities; noise masses; simulated ring modulation and tape reversal; all produced from feedback regulation.

In Britain the Grateful Dead's counter-

Part 4

Avant-garde jazz, Rock and Roll, Fender Stratocaster, hippies, Jimi Hendrix to Beatles and beyond...

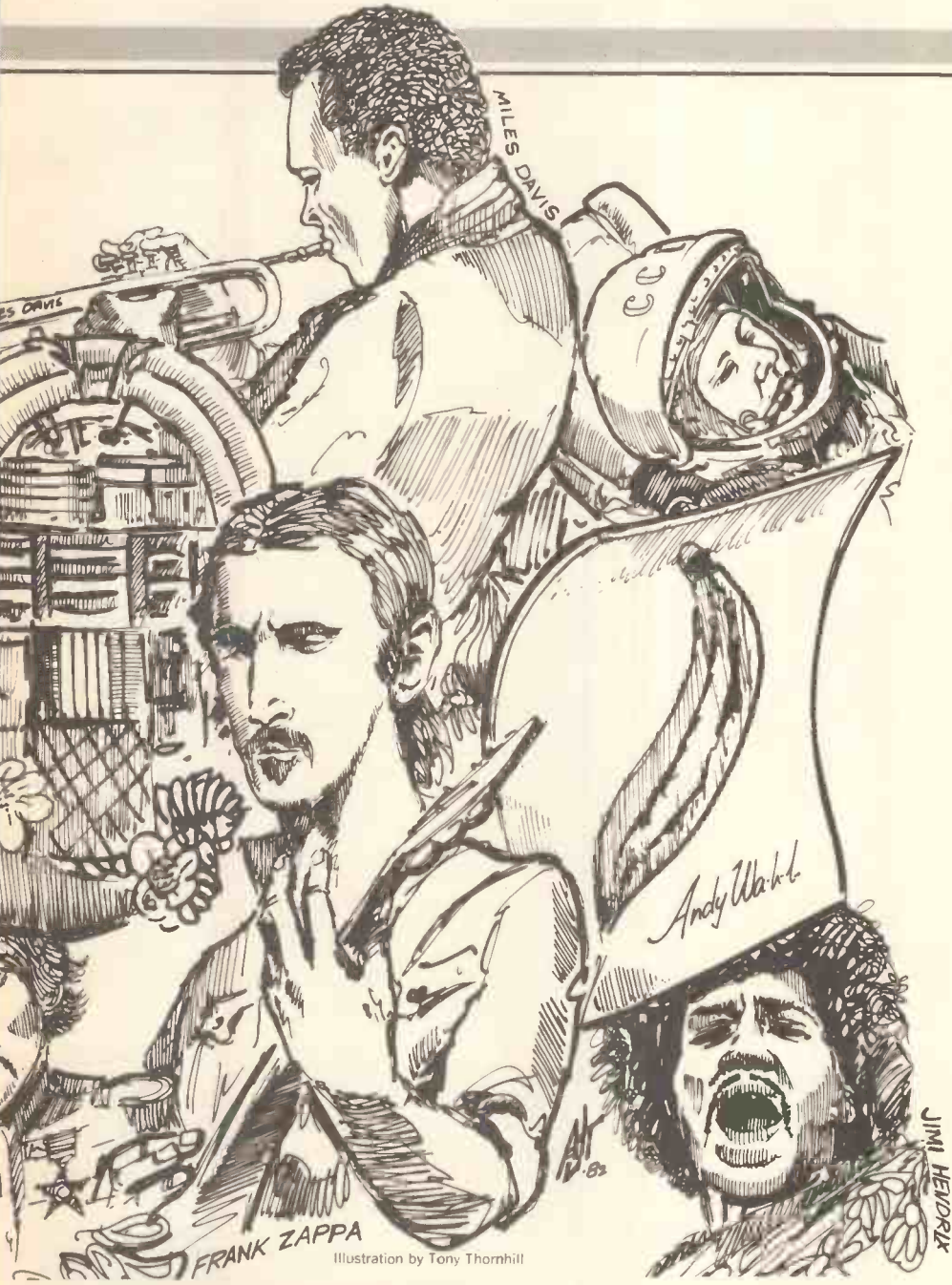


Illustration by Tony Thornhill

part were Soft Machine, and although they called their music avant-garde jazz, they found rock audience most receptive. They had appeared at the Museum of Modern Art in New York in 1968 and used many of the effects employed by the Dead. They were also one of the first British bands to work with a light show.

As well as the use of live electronics, rock bands had begun to use tape transformations in the studio. The most notable of these recordings was the Beatles' 'Sergeant Peppers Lonely Hearts Club Band'.[4] 'A Day in the Life', for example, included tape reversal and transposition loops as well as extensive splicing. Their next album 'Magical Mystery Tour' (1967), also incorporated tape reversal of both instruments and voices in 'Flying' and 'Blue Jay Way'. Both these albums influenced the production of the Rolling Stones, 'Their Satanic Majesties Request' being recorded in the same year (1967). The Stones used techniques on this album which they were not able to use in a live situation and consequently some of this music was only available on record.

The Grateful Dead made a more elaborate use of electronics on their album 'Anthem of the Sun'. They often performed with a pre-recorded tape and, despite the complexities of the transformations, were able to perform these pieces outside of the recording studio. Other bands instrumental in the evolution of a new rock style were Frank Zappa and the Mothers of Invention, and British band Pink Floyd. Zappa's interest developed after his purchase of a recording studio in California, and is shown to great effect on 'Uncle Meat'[5]. Pink Floyd, as well as employing the usual range of accepted effects of that time, isolated individual sounds on one or other of the stereo channels and then moved them to the other channel. A collaboration between Roger Waters of Pink Floyd and Ron Gessin resulted in the soundtrack for the film 'The Body', which utilised practically all of the techniques mentioned so far.

The bands mentioned used tape and effects as part of their overall sound, but to composer Steve Reich the tape recorder was his *instrument*. His composition 'Come Out'[6] was derived from tape loops of the phrase 'come out', repeated against itself for some twelve minutes. During the first thirty seconds the phrase remains in unison with its counterpart and the listener becomes aware of its pitch, rhythm and noise formants. Gradually the piece is characterised by temporal separation of the two channels, resulting in phasing. This amazing transformation emphasises various rhythmic patterns and the process is repeated with new loops created from the previous transposition. And finally the process is repeated yet again.

One other performer who is known for his extensive use of tape recorders is Terry Riley, an American. He used a system of tape delays to play at all night concerts in New York. By setting up delays he was able to play mesmerising motifs of great complexity by himself. His recorded works became popular with rock fans as well as lovers of the avant-garde - particularly his work 'Rainbow in Curved Air'[7].

Although we have seen in previous parts of this History of Electronic Music that synthesisers were being employed by the avant-garde, they did not make in-roads into rock music until a decade or so later. The first American band to employ the synthesiser were the 'United States of America'. Led by Joseph Byrd who was formerly organiser of the UCLA New Music Workshop, USA used a custom designed Byrd-Durrell synthesiser, as well as the 'foot pedals' used by the contemporaries Grateful Dead, and Mothers of Invention. They even ring-modulated their voices, a novelty for rock audiences. Within a year, however, they had disbanded and left behind just two albums.[8,9] Without a doubt, Byrds compositional training and awareness of the works of Stockhausen, Cage et al, made the 'United States of America' an unusual band in rock music at that time. Similar influences and awareness have contributed to more recent developments in the rock medium. The work carried out by the British Broadcasting Corporation's Radiophonic Workshop also influenced many British rock groups and composers. Next month I will look at their contribution to the world of electronic music.

E&MM

Discography

(1) The Velvet Underground with Nico. Verve 6-5008
(2) Jimi Hendrix Experience. Rep. 6281
(3) Live Dead. War. 1830
(4) Sergeant Peppers Lonely Hearts Club. Cap. SMAS-2653
(5) Uncle Meat. Biz.2MS-2024
(6) Come Out. CBS 3216 0160
(7) Rainbow in Curved Air. CB 64564
(8) The United States of America. CBS 63340
(9) Metaphysical Circus. COL. MS 7317

Hamer Prototype

Hamer Prototype.

Back in the early seventies Paul Hamer was a guitar dealer long before he ever became a manufacturer. His stock in trade was to materialise/blag his way backstage when all the major acts hit town and offer them goodies from his sackful of toys. Well actually it was really a bunch of guitars but the effect was the same. Paul would tempt the stars with his goods which were always of the highest quality and he soon got to know all the faces. Paul Hamer had for some time been experimenting, building his own instruments in very small numbers and rather than sell them to the stars he would ask them to try out his guitars on the road and report back to him with information regarding what was right, what was wrong and what could be put right with these said guitars. This proved to be a very sensible move since at that time the larger American guitar manufacturers had begun to believe in their own publicity, and for reasons known only to themselves, felt unassailable. Over in Japan they were only beginning to get their PR act together with the major guitar players. In effect the market place was wide open for a guy who really knew, studied and loved the instrument, to come in to the business and establish himself and his company, as people who were ultimately sympathetic to the needs of the musician. This he did with great success and I'm sure most of you by now have heard of Hamer guitars.

The latest offering from the Hamer laboratory is the Hamer Prototype. Continuing his theme of listening to the people who have to play his inventions, the guitar has been road tested for some two years now by leading rock players, amongst them the multi-talented (he used to sell guitars for a living too) James Honeyman Scott.

Visually speaking the Prototype follows the Hamer pattern by borrowing heavily from Gibson designs. Paul Hamer would probably deny it, but in my mind his instruments are mostly based on the more well loved Gibsons. The shape of this instrument is very similar to the old Gibson Les Paul Juniors and Specials that had the double cutaway, the main difference being the contours and rounded edges that have been grafted on to the basic design. Most one-pickup guitars feel like they were built to kill and this single pickup wonder is one of them. It is a very comfortable guitar to hold with none of the stiffness that I've come to associate with Hamer guitars. There is certainly a case of *dèjá-vu* when I'm holding this guitar and suddenly I feel like I've known the instrument intimately for years. It's certainly not a heavy guitar and probably weighs about the same as a Les Paul Junior. Funny thing here — the lower strap button has been moved about 5 inches closer to the player but has no adverse effect on the balance of the guitar which I find to be absolutely perfect. Incidentally the Hamer Prototype comes in a number of finishes including sunburst, white and red. Both body and neck are made of mahogany, a very useful substance when it comes to the pursuit of rock and roll which this instrument is undoubtedly intended for. Neck is a three piece job and the body is one piece.

A nice touch is the jack socket which is circular and knurled at the edges. Nothing special about that you may say, but it does look as though some thought went into it. Most of them look like they were designed 25 years ago as a last minute addition — they were, not so the Hamer. Another part of this guitar which impressed me was the very compact bridge. Adjustment screws are there to alter each string height and length on an individual basis, finish is a very trendy black satin look. All in it's small but solid.

Acoustically the guitar resonates plenty which you would expect from one good solid piece of mahogany. Machine heads are the medium priced chromed Schallers and every other piece of hardware on my test model is finished in black. This includes tone and volume controls which are styled like the old Gibson knobs, pickup selector switch, pickup surround and the bridge, of course. Scratchplate on my guitar is also black, with a fine white line around the edge but I believe the Prototype also comes with the choice of a white scratchplate. My only criticism here is that perhaps the scratchplate is a little on the thin side and given time, may be prone to warping — we shall find out.

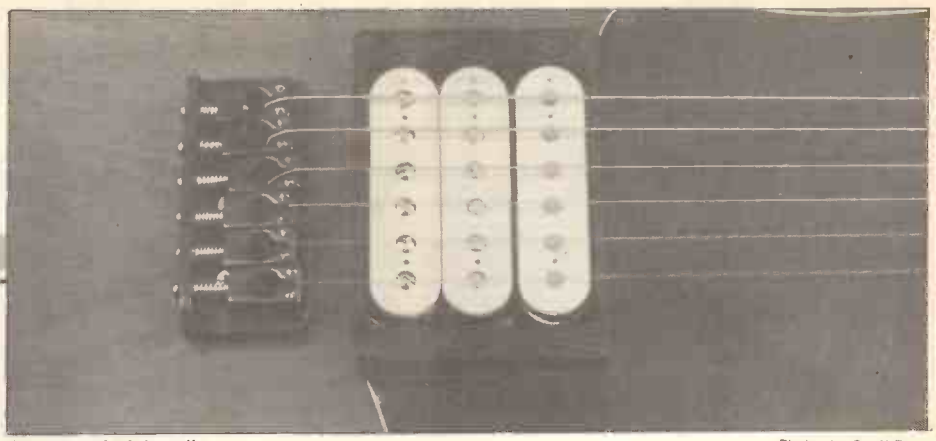
The neck of the Prototype is a joy to hold and feels like it was hand cut on a lathe though I very much doubt it. Neck join is perfect with plenty of access to the top fret. Camber is medium and the neck has 22 frets — fat frets. Though the guitar is called the Prototype it is, of course, a normal production line instrument and on this score the people at the Hamer factory have made a decent job of the fretting. Inlays are mother of pearl dots, but could possibly be abalone. The nut appears to be white plastic and the fingerboard which is very responsive is made from rosewood. I did notice some lacquer chipping at the top edge of the fretboard on my sample model and I hope this is not standard.

So far the instrument is holding perfect tune and I've had no reason to make any adjustments to the bridge, as the intonation, action and playability of the guitar were perfect from the moment I pulled it out of its case.

Homage is paid to Gibson in a serial number which is laid out just like the old ones, it's also yellow, again just like the old ones. The strings fitted to the guitar are called Hamer Ultimate and they start at 009 and finish on 042, how interesting! The guitar is strung through the rear of the instrument and for this reason there are six circular metal string wells fitted to the back of the Prototype.

A very nice touch that has been added to this guitar by the Hamer people is a recessed metal plate covering the electronics section — also at the back of the instrument. This plate is undoubtedly more suited to the job of screening the electronics than the more usual plastic plate. Again the finish is a matt black satin affair. So far this is the most exciting Hamer guitar it's been my privilege to play.

And so to the pickup which is the most unique part of this guitar. It is the



Close-up of triple coils. Photos by Geoff Dann

biggest humbucker I've ever clapped eyes on and instead of the usual twin coil here we have a triple coil. It is open topped (for extra belt) and comes in either cream or cream/black for the fashion conscious amongst you. The pickup is activated by the three way selector switch which offers the following options: single coil, double coil, or triple coil. This third position is referred to in the handout as 'sound combinations not found on any other instrument'.

Whilst this is easily the finest Hamer I've ever played, the pickup represents a major disappointment and prompts me to wonder if James Honeyman Scott's model has been doctored to suit his needs.

At low volume the pickup appears to offer a distinct lack of character. To my knowledge all the best guitars have a recognisable quality / character whether they be played at high volume, low volume or no volume whatsoever, and with this Hamer Prototype this is not evident. The first of these pickup selections (single coil) is not particularly thin, trebly or pokey, the second selection (twin coil) humbucker neither sounds hard, nor raunchy and in truth just sounds slightly more powerful than the single coil. All three coils together sound dirty and again slightly more powerful than the double coil. The tone control offers very little in the way of control and swinging it wildly from left to right I could ascertain very little difference to the sound I was getting. In short clarity, warmth and bite, all of them distinctive qualities in themselves, have all been sacrificed for that old demon, power. Hamer have to be admired for using a triple coil pickup but I believe the pickup needs to be rethought to achieve the most from the instrument. Promise is most definitely already there as the instrument plays like a good 'un and resonates very nicely before the addition of electricity.

And now the price. For £375 including VAT Hamer do give you a free case as well as the guitar. As single pickup guitars go, this one is not too cheap but for that money I would be perfectly happy to get just one original sound from one of its pickups. That aside, this is still Hamer's finest offering, and they are improving all the time. All in all a plucky product from a company that still cares.

Ed Park **E&MM**

You can try out the Hamer Prototype for yourself at Guitar Grapevine, 16 Denmark Street, London WC2.

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HOME ELECTRO-MUSICIAN

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"Home Electro-Musician without a Home"

Steve Howell's article in the November issue of E&MM is both encouraging and realistic, a rare combination. The information it contains will contribute a great deal, I am sure, to the matching of home recording techniques with serious musicians, something from which we can all potentially benefit. His emphasis on affordability and simplicity highlights the availability of this rewarding medium and reaffirms the central position creativity, I feel, must assume. Setting up a home recording studio is never a cheap or simple thing to do, but it is a cheaper and simpler undertaking when you have access to good advice.

The affordability of any home recording system will depend largely upon the cost effectiveness of each of its individual components, which is inextricably linked to their sound and versatility. A preference for versatile instruments and effects can go a long way towards avoiding the annoying and expensive duplication of functions. In addition, noise generated unnecessarily by duplicated effects will only further defeat the noise-reducing purposes or quality recording equipment. A principle factor in the design of a home recording system, then, is the rather careful and candid look you must take at what you already own: buying or building equipment of quality well in excess of what you already own is simply throwing good money after bad.

Home recording systems can be viewed essentially as a series of compromises between needs and means; while my system is no exception, my particular needs were rather unique to say the least. Size is ordinarily not much of a consideration in the design of a system, but in my case, it was of principal importance. My father had recently retired, and our family had made arrangements to move onto a purpose-built thirty-five foot yacht. As I was planning to spend a couple of years on the boat after graduating, I was faced with the rather difficult task of designing a home recording studio that would fit into an area the size of an average loo. Clearly, some compromises were in order. Versatility, therefore, was a primary consideration.

I chose the TEAC A-2340 simul-sync 4-track reel-to-reel tape deck as the heart of my system because of its flexibility and affordability. While TEAC offered the higher quality 3340 tape deck with a greater signal-to-noise ratio (due to an increased tape speed of 15 inches/second), I chose the A-2340 for its lower initial cost and tape economy, and have never regretted it. This deck has a multi-track capacity that enables me to record six relatively clean synchronised tracks. The simul-sync function allows the musician to monitor earlier tracks while recording later accompanying tracks, eliminating much of the guesswork systems.

My recording technique is thus very simple. I merely record three backing or rhythm tracks using the simul-sync function so that they are all synchronised, mix those three tracks down onto the fourth track, and then record three more tracks over the first three tracks, yielding a total of six clean tracks. I also have a stereo cassette deck that can increase this total to twelve tracks, but I find multi-generation recording utilising this technique too noisy without additional noise-reduction equipment.

A limiting characteristic of 4-track recorders is that separation amongst the various tracks is lost if too many tracks are involved. Clean recordings of more than six or eight tracks is usually limited to more complex systems and studios. Because the tonal qualities of the various tracks are seldom balanced, I use a ten band stereo graphic equaliser to make subtle tonal adjustments to the composite output.

The monitor consists of a rather modest low wattage stereo receiver coupled with the greatest space-saving components of the system, Visonic 'David' loudspeakers that each measure no more than 6" x 4" x 4". Realising that living on a boat I would only need low volume levels, I chose a low wattage monitor and could then afford to pay attention to the efficiency and accuracy of the playback system. All of these components were fitted into a plywood console which was itself then secured to the deck beams, and stringers via eye bolts and heavy nylon line. Having travelled over 5,000 miles, the system has certainly proven its dependability. While it may not be the best home recording system, it certainly is one of the best travelled. The system even had the unique ability to record at sea, utilising a voltage inverter that modified the ships 12 volt DC to AC.

The limitations of space did, however, force some regrettable compromises. Although my principal instrument is the drums, I received nothing but sour looks when I brought up the issue of bringing the drums on board. Instead, I opted for the percussive effects I could produce on the top and sides of my classical guitar. Because of the rather unique demands of the enclosed environment of the boat (you could hear the pages of a book being turned at the opposite end of the boat), I chose the Frap guitar transducer over a microphone because the Frap proved quieter with less of a tendency to pick up stray noises. While direct transducers take some getting used to, their predictability over microphones more than offsets the initial bother, given the limited space available (and by this time, limited funds), I chose not to buy an electric guitar, but instead to build and buy my way out of the prospect of owning two guitars. Through the rather judicious use of compression and equalisation, I have managed to produce a satisfactory substitute for electric guitar with a sizeable saving of funds, space and the frustration of tuning two, stringed instruments.

I also use a three octave polyphonic string synthesiser offered by the American company PAiA in either kit or assembled form. I, of course, chose the kit form and halved the cost of the unit. Perhaps the most versatile of the systems components, it offers violin, cello, organ and piano voicings with the option of computer control. Keeping the number of active components and effects to a minimum, I found I was able to produce tolerable multi-track recordings, even in Havana!

As a postgraduate philosophy student at a British university, the system has accompanied me and has enabled me to continue work on a musical I began three years ago. Without the unusual and vigorous demands of the boating environment, it is doubtful I would have developed a home recording system versatile and mobile enough to accompany me on my studies in the U.K.

If there is any lesson in this story it is that with a little bit of ingenuity and some good advice practically anything is possible in home recording studios. I was particularly lucky that only weeks before I made my decisions concerning which components to buy, I came across two very helpful books by an American author, Craig Anderton; 'Electronic Projects for Musicians' and 'Home Recording for the Musician' were responsible more than anything else for my rather fortunate and timely education.

'Electronic projects for musicians' takes musicians with only marginal experience with electronics through the basics of electronics and project construction including schematics for some useful projects like compressors and state-variable filters. 'Home Recording for the Musician' (reviewed in the December issue of E&MM), is a comprehensive survey of home recording techniques and is an invaluable aid for anyone setting up their own recording studio. Both publications are available from PAiA Electronics, 1020 W. Wilshire Blvd., Oklahoma City OK 73116.

In conclusion, although small in size the versatility of my home recording system is ideally suited to the compositional style I have been trying to develop. The classical guitar enables me to generate the acoustic sounds that are central to my compositions while the effects allow me to modify and develop upon the basic notes and progressions. The synthesiser offers an additional compositional format which inevitably broadens the stylistic base of my music. With an emphasis on syncopated acoustic progressions, my system and style is a good example of the matching of electronics and traditional (acoustical) musical techniques. But as Howell wisely notes, it is all too easy to become ensnarled in the trappings of equipment and effects, to lose one's creative way in the language and artifacts of electronics.

Creativity, even more than talent, is the defining characteristic of the successful electro-musician. You cannot buy a creative way out of the problems musical composition and style present, but then, no serious musician would want to do so.

Gerry Taylor **E&MM**

BATRACHOPHRENOBOOCOCOSMOMACHIA
BATRACHOPHRENOBOOCOCOSMOMACHIA
BATRACHOPHRENOBOOCOCOSMOMACHIA

Ben Duncan

Devised by poet and occultist Aljester Crowley in the early years of this century, this hideous word, when spoken in appropriately bombastic and sepulchral tones acts as a reminder of the ability of organised sound and music to exert influences beyond the mechanistic and physical, and accordingly the theme of this article is that music is much more than the sum of its constituent sounds. To quote John Newsham (ex-Hillage Band) and partner, Tony Andrews (together, designers of the widely acclaimed *Turbosound* Rock speaker systems), "Musicians should think about the medium they're using instead of just the notes they sling into it; sound isn't merely energy content at frequency — there are other qualities in it that are not necessarily measurable by scientific methods."

Along with musicians such as Robert Fripp and Steve Hillage, I believe Rock to be potentially the most potent force in terms of its ability to raise human conciousness, convey the spiritual message of the "New Age" and change people's attitudes for the better. Naturally, this set of positive characteristics attracts an equal and opposite burden in the shape of money, politics and debauchery. Few 20th century artistic endeavours have been so passionately regarded, so blatently misunderstood or maligned, as Rock music. In particular, it has suffered the cranky secular views of religious and political zealots, yet ironically, this paranoia in itself suggests that they are at least subconciously aware of the music's awesome power to change people's beliefs and attitudes to a more tolerant, enlightened wavelength.

Meanwhile, the news media unfailingly distort the rationale of the music, displacing its spiritual axis and amplifying its negative and trivial aspects out of due proportion. So let's walk briefly into this vague and largely undocumented territory, going way beyond the surface ethos of politics, money and stage dramatics.

Energy Balance

We can look at music as a dance of vital energies — William Blake's 'Arabesque of rhythms', as an interplay of yin and yang, the sum of the dance being zero, only the dance never stops, like life itself. This concept of music as a mirror of our own conciousness aligns with the occasional and fleeting experience, held by most readers, of the ability of good music to radically alter our conciousness in a manner no less powerful than meditation, hallucinogens, sensory-deprivation or ritual magic.

Although it's convenient to *assume* that musicians *make* music, it's probably more correct to think of them "drawing music out the air". Rock musicians, as a genre then, can be viewed as magicians, being adept in the invocation, control and transmission of psychic, or, if you prefer, *higher* energies. In the parlance of Steve Hillage and Robert Fripp, the musician conducts a powerful current which can bring enlightenment and enrapture, but which is apt to cause damage to the musician if he lacks the ability to control and balance it. The danger of unbalance to reckless, unprincipled or purely unlucky musicians is very real: initially, it breeds cynicism and egotism, and then descends via debauchery to fuseblowing tactics such as insanity and death. A handful of musicians may be regarded as having gone a step further, and as *Shamans*, projected themselves beyond the logos of human experience to bring music from 'The absolute elsewhere' or 'The place from where the music comes'; as a result of these endeavours, Jim Morrison and Hendrix, the latter especially, are posthumously acknowledged as absolute masters of Rock.

Regrettably, our Western understanding and appreciation of higher energies is not only scanty and fettered by minefields of scepticism, but is also confused by a mixture of vague labels culled ad-lib from occidental and Eastern sources of knowledge alike. At the same time, even if we could pin down the energies, it would be unwise to identify their relationship to the music too closely, because Rock music, lying beyond mechanistic and classical knowledge is damaged by analysis and limited by labels. A helpful analogy at this point is an impressionist painting. Although impressionistic art can exude vitality so great that it's easy with practice to 'step into' and feel a part of the scene portrayed, if one adopts an analytic 'mode of seeing', the painting just falls apart, appearing to the unimaginative eye as a mass of meaningless paint blobs. In a sense then, the crude texture of Rock Music attains similar vitality which can easily be destroyed by listening in the wrong fashion: specifically listening to so*und* rather than letting music flow spontaneously through the mind and body.

So, in metaphysical terms, we can best limit our exploration to sketching out two opposing energies, these balancing to form a third. Of course, this model shouldn't be regarded dogmatically, but rather as a useful tool to aid the perception of the multi-dimensional and synchronistic energy interactions between musician, audience, source of inspiration and the sound equipment which comprise the whole picture. (By synchronistic, I mean to suggest relationships beyond our cause and effect perception of forwards flowing time and three-dimensional space). The first energy is sensual, sexual and therefore polar (in Fripp's euphemism, "coming from The area below the navel. . .") being variously termed feminine, spacious or yin, whilst its male complement is known as yang, Kundalini, dragon-current or Orgone energy (after psychologist Wilhelm Reich). The second energy is spiritual, and is commonly identified as light, spark or spirit, whilst the third, resulting from the harmonious coalescence of the two probably lies beyond words, but is well within the experience of many readers, being manifest as the fleeting wave of enrapture or bliss flowing through audience and musicians alike at the best concerts.

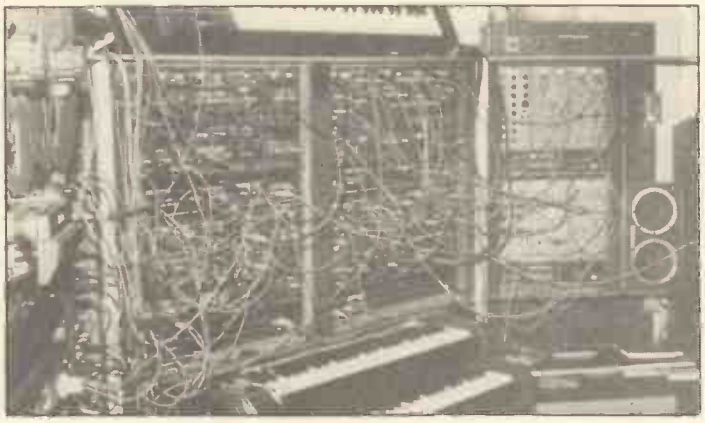
Of course, imbalance is much more prevalent. The new generation of HM is particularly infamous for generating enormous quantities of "orgone" or "masculine" sexual energy which is perceived by sensitive members of the audience as an unpleasantly "heavy vibe". However, if you dig out your long forgotten Led Zeppellin I album, it's clear that the balance of sexual energies was much more harmonious in the original heavy metal. Indeed, the metaphysical state of the music is reflected quite clearly here in physical terms: Listen for the 120Hz and 3kHz regions, where the sound is hard, aggressive, sharp and masculine. Then look for the softer, more spacious and feminine bass sound in Led Zep I, *alongside* the harder sounds. A good balance of these polar components also occurs in a lot of Dub Reggae, Funk and New Wave material, but it's inadvisable to assume that metaphysical characteristics in music are more than spuriously connected by predominance of certain frequency resions, though *it is* notable that Hendrix is unique in that his music seems at times to make almost equal use of the whole audible spectrum. As for spiritual components, these aren't normally aurally perceptible, though the "magic chords" of Hendrix, Santana, Hillage, the Isleys and Robin Trower approach audibility. Rather, these energies are manifest as a movement of one's attitudes from within.

An Fx miscellany

Our knowledge of psychoacoustics is vague and piecemeal, particularly in the domains of phase and time, and as regards the subjective effects of plane wavefronts, ultrasonics, infrasonics, distortion and extreme sound pressure levels. Yet musicians make daily use of these manipulations, the "Aphex" aural exciter and the "Turbo" Rock PA speakers being prime examples of equipment which is only vaguely understood, and yet used to good effect to enhance the higher energy content of music without perceptible or meaningful physical effects resulting in reflection. And most readers will have experienced the bizarre distortions of space and time that can result from listening to very loud music, either live or recorded. Typically, peak SPL's in the 120 to 145dB(A) range exert considerable control over the "space" generated by the music, whilst the most powerful music can be perceived (rather than seen) as a violent movement of silver light, slaying out of speaker stacks in three dimensions, or as a kaleidoscope of "pumping" and pulsating coloured light dancing around the room. Moreover, this *kinaesthesia* can be experienced by people who are perfectly sober and have no previous experience of these effects through other means. The sensation of floating and of music coming from within one's own head is also common. This topic leads us on naturally to a survey of synchronicity and psychotronics, indeed to the fringes of science, where our everyday casual perception of reality breaks down, time flows sideways and the fragile nature of electron currents in sound equipment becomes apparent. But these are merely offered as thought-provoking regions until space permits again. In the meanwhile, listen to Steve Hillage — he knows! **E&MM**

GUIDE TO ELECTRONIC MUSIC TECHNIQUES

by David Ellis



Patchwork

With Spring hidden well around the corner, we think that reader participation is just what's needed to thaw out them old bones. So, PATCHWORK is for those amazing flights of synthetic fancy that you're just itching to spread across the oceans. And, so that you'll be persuaded to put patch to paper, we'll be offering regular prizes for the best patches printed on this page. We don't really mind in what format the patches are presented, i.e., you could use the sort of patch chart issued by manufacturers for their own synthesisers, or else you could work out all the "in machine" patch cords and draw out the patch using our suggestions for how you might go about doing this. If you felt super enthusiastic and wanted to make sure that we really appreciate your inventive genius, then a quick bit of dumping on to cassette of the final product, and the context in which you envisage it being used, wouldn't go amiss either. We feel it's wise to translate patches into a common language, rather than present a potentially confusing mass of different ways of doing virtually the same thing, so this is how your patches will eventually be printed. Finally, please make sure that you include all the relevant parameters critical to a particular patch. So, remember: PATCHES MAKE PRIZES!

Patch Principals

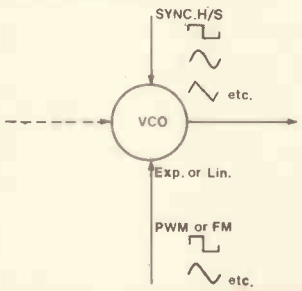
It's very easy to get confused between which "cord" represents what sort of signal in the majority of patch representations, so we think it makes good sense to distinguish between audio signals, control voltages (CVs) and gates right from the start, using solid lines (————) for audio, dashed lines (— — — —) for CVs and dotted lines (.....) for gates and triggers. That idea was taken (and slightly modified) from the excellent articles by Chris Jordan in the March and April 1981 issues of E&MM. PATCHWORK will always give credit where credit is due!

When it comes down to the actual shape of modules as they're drawn in patches, one can obviously do the logical and conventional thing of a square box with the initials of the particular device inside. On the other hand, there's also some sense in using shapes that signify more what the modules actually do. So, the remainder of this month's PATCHWORK will be devoted to presenting our ideas for shaping-up the common synthesiser modules.

VCO

A circle seems to be the best symbol for the VCO as it emphasises the cyclic nature of the output waveform. The CV enters from the left leading to an audio signal emerging from the right:

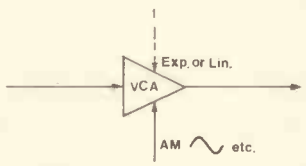
We also need to include indication of such features as hard and soft sync (SYNC. H and SYNC. S, respectively), pulse-width modulation (PWM) and frequency modulation (FM) applied to either linear (Lin) or exponential (Exp) modulation inputs:



It seems sensible to apply SYNC to the top half of the VCO circle (imagine stamping on the CV→audio line with your foot!) and modulation signals to the bottom half (the CV→audio line balanced like a see-saw on this input). It also helps to indicate the basic waveform type at the point of audio output from the VCO and at the point of any modulation input.

VCA

The ubiquitous op-amp gives the shape for this module, but, in this case, we suggest applying the CV from the top and any amplitude modulation (AM) from the bottom. This is admittedly twisting things around in comparison to the usual CV patching to a VCA, but it is in line with the logic behind the "vertical" inputs to the VCO circle. Let us know if you violently disagree! Some recent VCA designs (the Digisound '80 module, for instance) provide both exponential and linear control inputs, so the one actually used should be indicated with Exp or Lin at the relevant point. The waveform of the applied AM should also be shown.



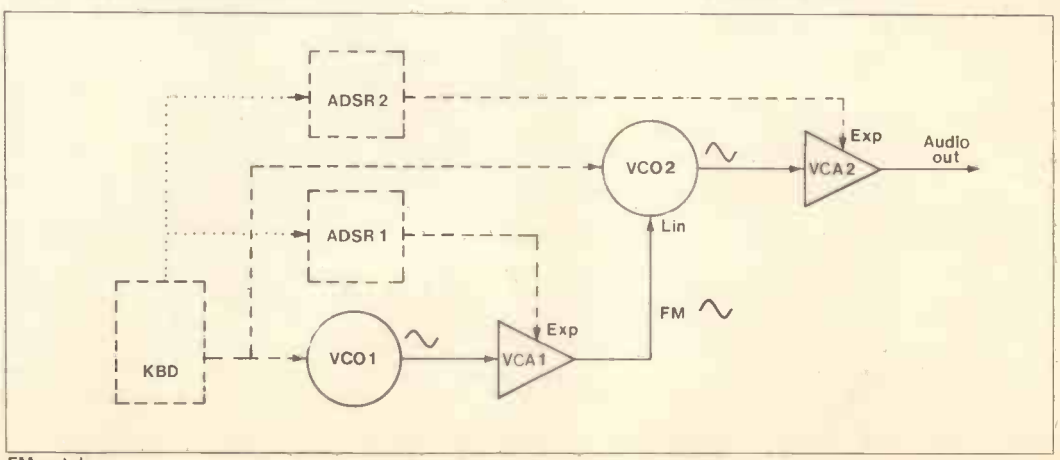
ADSR

We've tried to be consistent in our approach to patches, and this includes the idea of using solid outlines for modules producing audio signals and dashed outlines for those delivering CVs. Envelope generators do the latter, of course. The introduction of the CEM 3310 voltage-controlled envelope shaper from Curtis Electromusic Specialities enables remarkable control to be exerted over all portions of the envelope, so we also need to include the potential of CVs being applied to the A, D, S or R control inputs — that's assuming you're lucky enough to have such a versatile beast!

Keyboard FM

We finish this month with a patch for FM, that much beloved tool of digital synthesists. The March '81 issue of E&MM explains the principles with crystal clarity, so I won't dwell on the theory. Suffice it to say that a modulating waveform (usually a sinewave) — from VCO1 in our patch — is applied to a carrier waveform (also a sinewave generally) — from VCO2 — producing an output with added harmonic components above and below the original carrier harmonics — hence the logic of using a carrier with only one harmonic component, i.e., a sinewave. The patch makes use of the effect of a change in the modulating index (the ratio of the FM-induced frequency deviation to the modulation frequency) produced by applying a keyboard-triggered envelope to the modulation signal from VCO1 fed to the linear FM input of the carrier oscillator, VCO2. This results in a more or less subtle change in the emerging harmonic spectra, the so-called dynamic depth FM synthesis. This is only a basic FM patch, but it should give some idea of the potential of the technique in analogue synthesis. What about some variations on this theme? The shape for the keyboard in this patch continues our policy of dashed lines for non audio-producing modules, and, with just a single gate and CV output, there's nothing more to say about it!

Finally, some acknowledgements (other than those mentioned) for this month's PATCHWORK and future pages: PAiA's "The Source" (not to be confused with Moog's new machine!) — an interesting, if somewhat quirky view of patching, and totally geared towards their own modules; "Electronic Music Synthesisers", by Delton Horn — a useful source of info on a variety of synthesisers (though a few years out of date — no Prophet 5!) and includes some cheap, cheerful (if rather inaccurate) circuits for voltage-controlled and non voltage-controlled modules; "Musical Applications of Microprocessors", by Hal Chamberlin — definitely worth acquiring by hook or by crook, and full of invaluable stuff on analogue circuits as well.



FM patch.

Sequential Circuits Pro-One

RECORDED ON CASSETTE NO. 6

We are often asked which fully variable monophonic synthesiser we can recommend. Generally, I advise the person enquiring to take a look at either the Moog Prodigy or the Sequential Circuits Pro-One (though I know that our editor isn't too keen on the Prodigy because it doesn't have a white noise source). Anyway, in my, and most other peoples' book, the Pro-One takes a hell of a lot of beating - i.e. it's good, not that you can start laying into it with a piece of lead piping; so we thought, as we haven't previously taken time to examine said instrument, that now was a good time to give it the proverbial 'once over'.

Sequential Circuits, as you should all be aware, are the people who developed the Prophet 5 synthesiser - the first commercially successful polyphonic programmable voice-assignable. They are headed by a guy called Dave Smith, who started the company some eight years ago building sequencers in his bedroom. He is now President of a very big synthesiser manufacturing and design company based in San Jose, California - so take heart all you closet designers, you too could 'come-out' in a big way.

The Pro-One was launched officially in February '81, as a monophonic non-programmable version of the Prophet 5. SCI (Sequential Circuits Inc.) had wisely decided not to have all their eggs in one basket, and by bringing out a monophonic version of their prime line, they could take advantage of the quantity orders they had for components, thus keeping costs down as far as possible. And this was very important because at the time, it appeared that the last thing the musical instrument market wanted was another monophonic synthesiser. But, as you will see from this review, the Pro-One has some very nice design features, and for the money it represents excellent value.

The styling of the Pro-One is much in keeping with the Prophet 5 - similar control fascias, same performance wheels, wooden end cheeks, however the main body of the instrument is basically an ABS moulding, which could be a bit stronger. The forming is accurate, and there are no nasty bits of unwanted plastic, but the casework could have been a bit more substantial, without a drastic increase in price, couldn't it? Having said that, I have popped into Rod Argent's Keyboards (the U.K. importers) repair shop on several occasions, and never have I seen a Pro-One with any form of damaged casework. In fact, I'm informed that, save for some initial problems with the mains on/off switch and oscillator scaling, the Pro-One is a very reliable little unit. I have, however, made some comments regarding the casework, such that I would strongly recommend the use of a flight case for anyone taking a Pro-One on the road. Ignore this advice at your future Pro-One's peril!

The keyboard is a three octave C to C Pratt Reed job, and very nice it is too; a good firm positive action, although the contact system employs silver J-wires, and as such there is some physical noise to be heard as the contacts make - though there is no noise introduced to the key voltage and it's derived digitally anyway, so this is not too important. The actual layout of the main control panel is remarkably similar to that of the Prophet 5, with the synthesiser voice controls almost corresponding one for one. The most obvious difference, however, is that the Pro-One uses basic slide switches as opposed to the Prophet's LED momentaries - but then you can't have everything on a low cost machine.

This is a dual oscillator synth, with Oscillator A providing sawtooth and pulse (width variable) waveforms that can be pitched in octave steps, over four octaves, and varied continuously between the octaves. Oscillator B offers the same frequency control along with a LO Frequency option, for sub-audio modulation work. Osc. B generates ramp, pulse (width variable) and, in addition, triangle waveforms, and can also be disconnected from the keyboard control voltage if necessary. Syncing is also

Sequential Circuits Pro-One.

Rod Argent's Keyboards

WHY WOULD ANYONE BUILD ANOTHER MONO-SYNTH?

Because it's about time that you stopped putting up with nasally filters, single oscillators, and stripped-down electronics when you buy a low-cost monophonic synthesizer. To put things back in perspective, SCI introduces the Pro-One, a synthesizer that delivers the quality sound and features you want, not just a cheap approximation.

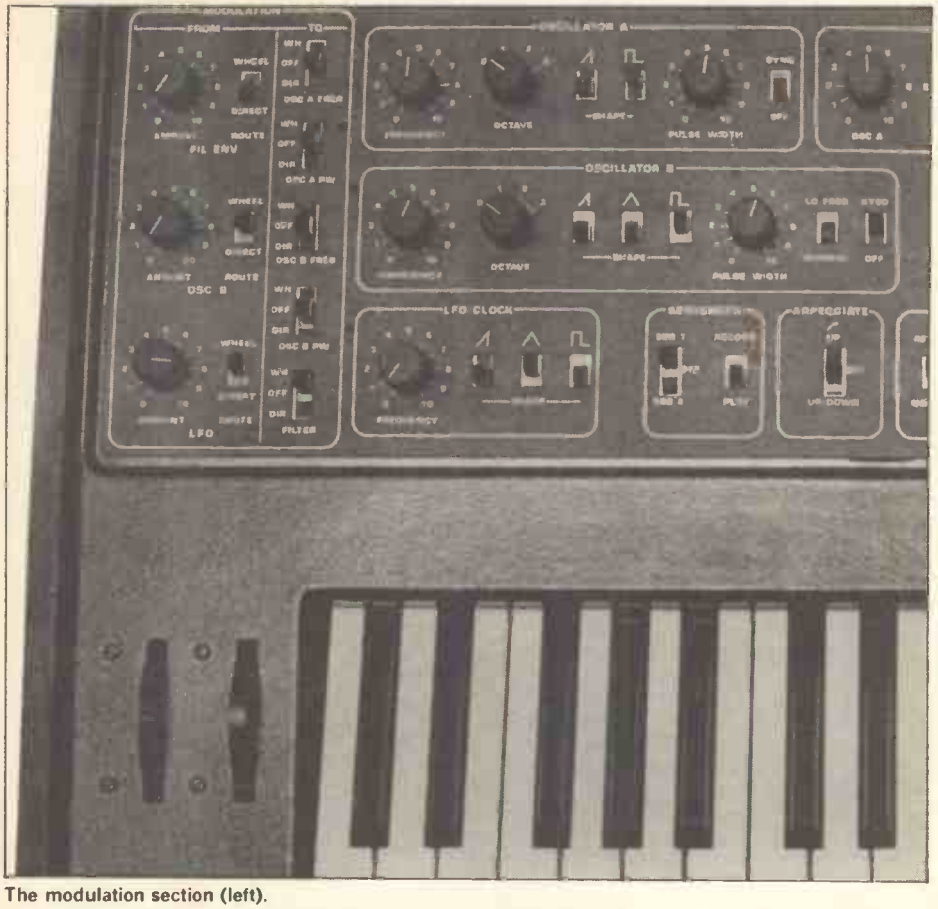
To start with, the Pro-One has the same electronics as its big brothers, the infamous Prophet-5 and the Prophet-10. You get the same sounds with no compromises. Add pitch and mod wheels, extensive modulation capabilities, a C-to-C3 octave keyboard, single and multiple triggering modes, repeat and drone switches, and an audio out that can drive stereo headphones.

Enough? Hardly. A built-in digital sequencer with 2 sequences and up to 40 notes storage between them. An arpeggiator (that can be latched) for up or up/down arpeggios. Complete interfacing facilities including standard 1 V/octave CV in/out, gate in/out (also used for external clock on the sequencer and arpeggiator), an audio input with pre-amp for using microphones, guitars, other keyboards, etc. A special gate generator that automatically obtains gates from the external signal, which can then trigger envelopes, advance the sequencer, etc. A unique "automatic" glide mode that allows selective glide between notes. Also, there is an internal digital interface — something that opens up a new realm in synthesizer/computer connections — especially with home computers.

We could keep going, but you must check out the Pro-One for yourself. Listen to the sound, look at the capabilities. No Compromises!

£395 FREE DELIVERY *anywhere mainland Britain*

20 Denmark Street, London WC2. Tel: 01-240 0084



The modulation section (left).

available, and operates such that Oscillator A can be latched onto a harmonic of Oscillator B. So a pretty versatile pair of oscillators.

The low frequency oscillator, which will only work between 0.1 and 30 Hz, cannot be used as an audio oscillator, nor is it voltage controllable, but then you seldom find LFOs that are. This LFO will give you ramp up, triangle, and pulse modulation waveforms, and you can also combine these shapes together for some interesting, if not particularly useful composite waveforms. We will come onto the modulation section itself, a little later, but I can warn you that it is one of the most complex, and hence versatile, modulation sections that I've ever seen on a non-modular monophonic.

The Oscillators' output level is balanced via a three channel audio mixer before being fed into the filter. The third channel introduces a noise source, but it can also be used to control an external audio input. There's an audio input jack on the rear panel, and when this is connected to an external signal, the mixer's Noise/Ext knob acts as a threshold set control such that when this signal passes the threshold level, a gate signal is produced which will open the two envelope generators for as long as the amplitude is above the threshold - thus the Pro-One can *effectively* be used to process other instruments. Those of you who are home constructors might find this feature a worthwhile mod on your own instruments.

The mixed audio signal is fed onto the Pro-One's filter - a voltage controlled low pass 24dB/octave type, which gives the Pro-One rather a nice clear crisp sound, not coloured like the sound of many other synths. I generally consider that if you can recognise what make of synth you are listening to, then (with the exception of the Minimoog) this is a bad thing. It's a bit like the old school of thought that reckons that if you notice the incidental music to a film or TV drama, then the music isn't doing its proper job. The Pro-One's filter, as it causes no residue colouration is then a useful tool for synth work. The filter offers all the usual control parameters, variable keyboard tracking, resonance that can be advanced so that the filter breaks into oscillation, and its own envelope generator (ADSR) and amount control. So the filter section scores full marks.

The final stage of the voice module is the VCA, which has a particularly silent background 'noise'. It too is controlled by an ADSR envelope generator; there is no control voltage bias facility for manually opening up the VCA - though this isn't particularly vital.

We must now look at the modulation section - which is quite something. It can be best described by considering the three modulation sources - the filter envelope; Oscillator B; and the LFO. Each of these three sources has an amount control, and each signal can either be sent directly, via a summing node, to its destination, or it can be summed and fed through the modulation wheel before being passed to its destination. There are five modulation destinations: Osc A frequency; Osc A Pulse width; Osc B frequency; Osc B Pulse width; and Filter Frequency. At each of these points there is a three-position slide switch that will accept either the direct modulation signal, the signal from the wheel, or no modulation at all... so it's as simple as that! In fact it really is quite simple after you've got used to it, and it certainly is versatile - you can do things here that just aren't possible on any other monophonic - save for a fairly comprehensive modular system.

We've mentioned the modulation wheel, which is situated to the left of the keyboard, and next to it is the pitchbend wheel, which will raise and lower the oscillators up to a fifth. This control isn't sprung, but there is a centre-dente, so that it can be returned simply to its initial position. If you look inside, this is the most simple of mechanisms, relying on nothing more than half a cable grip!

There are three areas which are still to be looked at: The glide, the sequencer, and the arpeggiator, and all of these contribute to the excellent performance characteristics of the Pro-One. The glide circuitry (or lag processor) has two modules, Auto and Normal. In Normal mode, the glide operates in the traditional manner, i.e. the control voltage continually slews between notes at a rate determined by the rotary control - if the rate knob is at zero, then the slew is so fast that it becomes indiscernible from normal stepping between notes. The Auto mode will only introduce glide between notes when the first note is still held whilst the second one is played; so if you play legato you will have continual glide between notes, whereas, you won't cause any glide by playing staccato in Auto mode (you hum it, I'll play it).

Believe it or not the Pro-One also incorporates a 40 note sequencer - which can be split into two banks: Sequence 1 and Sequence 2. The sequencer is programmed via the keyboard, but every note is assigned an equal duration so it doesn't function as a true digital sequencer. Nevertheless, it is a handy tool to have on board. The sequencer's replay rate is determined by the LFO/clock rate control, and the sequence(s) can be transposed using the keyboard control voltage.

Finally we have the arpeggiator, which I found to be particularly useful, though its operation is very simple - you just play two or more notes on the keyboard, and the Pro-One plays them in turn at a rate again determined by the LFO/clock control. There are two arpeggio pattern options UP or UP/DOWN. A nice feature about the arpeggiator is that it can be latched by playing a chord and moving the sequencer Play/Record switch to Record - to unlatch it simply return the lever to Play.

As you will have guessed, the Pro-One is processor controlled, using an 8021. Inside the unit there is very little discrete circuitry, as SCI have opted to use the Curtis range of custom synth chips. However, even though there is little circuitry, I would have liked to have seen the PCB and the PCB pots better mounted - this does look as if it could be an area of weakness. Otherwise, the Pro-One is a marvellous synth, and very very versatile - I don't think that there will be a non-programmable monophonic that is going to beat it for some time. The Owner's Manual is also very well prepared and designed, and I would have no hesitation in recommending this instrument to a beginner. On the rear of the unit there are CV and Gate inputs and outputs, (the Gate in will trigger the Sequencer/Arpeggiator) so this unit can be linked up to all sorts of external devices. I found that it was particularly useful when used with the Roland TR-808 rhythm unit, as you can use the Accent trigger out (say) to trigger the sequencer, so as the TR-808 is fully programmable, the combination of the two units can provide a great bass/rhythm section.

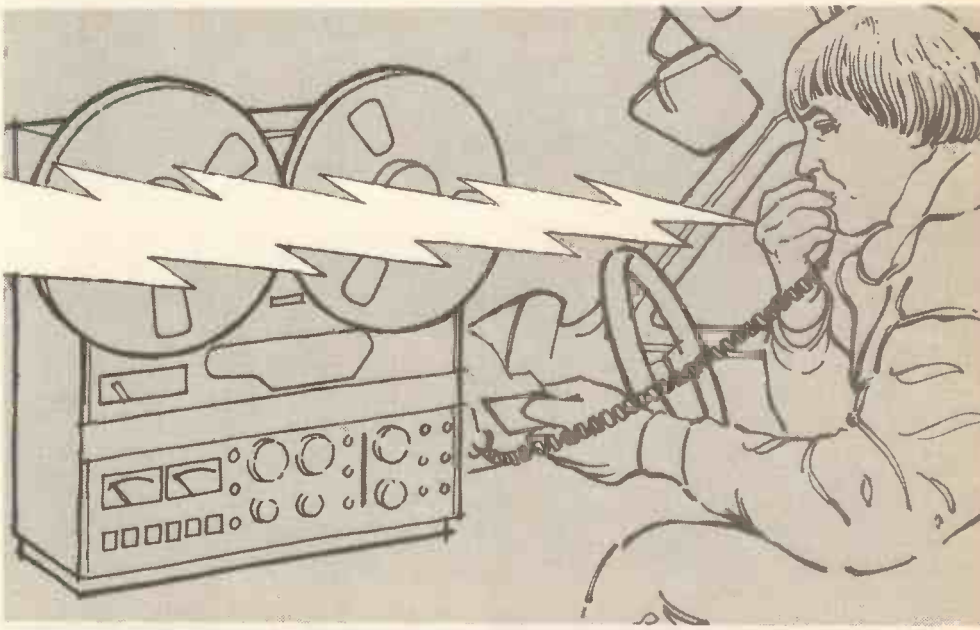
Full marks to SCI here, but a possible word of advice. At present the Pro-One retails at £416.00 with Rod Argent's Keyboards acting as the importers directly from the Californian factory. Over the next few months SCI are setting up their own European distribution network in Rotterdam, and will be supplying the products through there - which is an extra step in the chain. This could cause the price of the Pro-One, and other SCI products to rise, so if you are thinking about a Pro-One then I'd advise you to get in quick. I don't say that the prices will definitely rise, but there is a good chance.

Dave Crombie **E&MM**

KILLING CB INTERFERENCE

Robert Penfold

While interference from Citizens Band equipment is quite understandable when using a piece of sensitive radio frequency (RF) equipment such as a domestic TV set or hi-fi tuner, many people are rather puzzled when such interference occurs with an item of audio equipment. Strictly speaking an RF signal should not interfere with a piece of audio equipment such as an amplifier or mixer, since audio equipment should be just that, and should not respond to radio frequency signals. Therefore, it is the responsibility of the supplier or user of the audio equipment to cure the interference, and the user of the CB transceiver (or other transmitting equipment) is under no obligation to do so. Of course, if the interference is being caused by an illegal AM (amplitude modulation) Citizens Band transmitter and not a legal FM (frequency modulation) one, then it may be possible to have the transmissions stopped. In other cases though, interference caused to audio frequency (AF) equipment by RF signals is legally deemed to be due to a fault in the audio equipment concerned.



Causes

So how does an RF signal interfere with audio equipment? If an RF signal manages to leak into an item of audio gear it may not produce any audible effects, and it is only likely to do so if the affected circuit manages to demodulate the signal by some means. By demodulation we simply mean that the audio signal which was modulated on to the RF carrier wave at the transmitter is recovered, and the RF signal is filtered out. This leaves just the audio signal which is processed in the same way as a proper audio input and duly appears at the output of the affected equipment.

Demodulation of an AM signal is not at all difficult to achieve; inadvertently or by design. The audio signal is used to vary the strength of the RF signal at the modulator, and this gives a waveform of the type shown in the oscillograph of Figure 1. In order to demodulate the signal and recover the audio modulation it is necessary to rectify the signal so that only positive or negative half cycles remain (or, in other words, so that only the top or bottom half of the waveform remains), as in the lower trace of Figure 1. If the signal is then passed through an RF filter, the output signal is equal to the average RF level and this is the required audio signal.

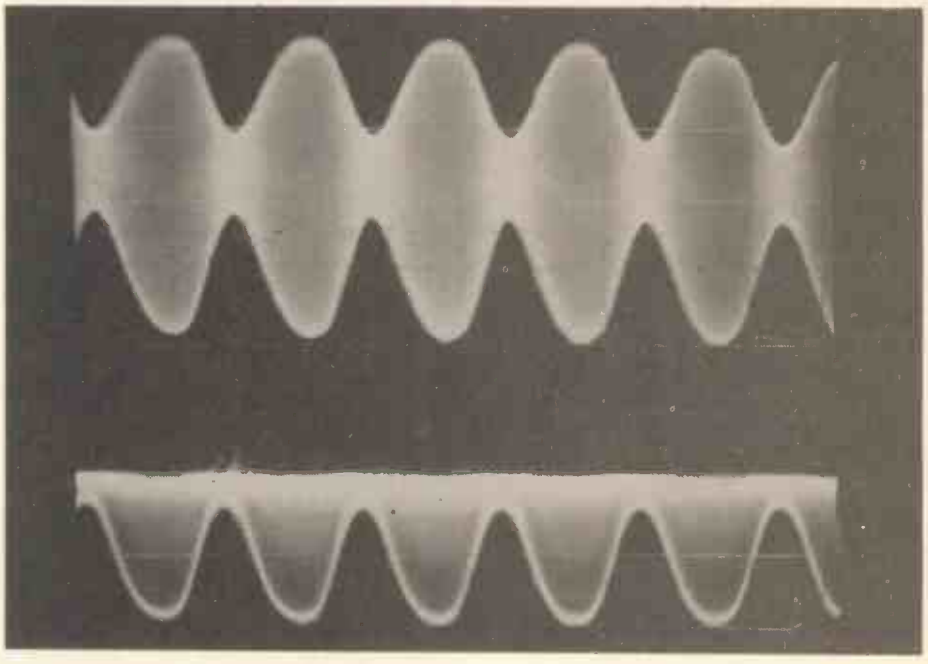


Figure 1. Demodulation of an AM signal.
(a) Resultant waveform when the audio signal varies the RF signal at the modulator.
(b) Rectified signal.

Any audio circuit will provide the RF filtering as the frequency response of audio equipment simply does not extend far into the RF spectrum, and the loudspeakers or headphones will provide the necessary filtering even if the preceding circuit does not since no audio transducer will respond to radio frequency signals properly.

The way in which the necessary rectification could be produced by an audio circuit is less obvious, but it is a fact that virtually any audio amplifier will demodulate an AM radio signal. One effect that can produce a crude rectification is the distortion that is produced by any normal transistor. The gain of a transistor changes with variations in collector current, and this tends to give increased gain on one set of half cycles and reduced gain on the other set of half cycles. This is obviously only very inefficient rectification, but in practice it is sufficient to demodulate a strong RF signal and produce a significant audio output.

The base-emitter junction of a transistor effectively forms a diode junction and this can sometimes produce rectification at high frequencies. It should be borne in mind that an audio circuit will not respond to an RF signal in the same way as it will respond to an AF signal, and the fact that there may be no rectification or significant distortion of any kind at audio frequencies does not mean that the same will be true if an RF signal is fed into the circuit. In fact it is highly unlikely that this will be the case.

Of course, the legal CB system uses FM, and this is far less likely to cause interference with audio equipment (which is one of the main reasons that FM was chosen by the authorities). Unfortunately, there are still a great many illegal AM sets in use, and there are numerous legitimate AM transmissions which could cause interference. Such sources include radio telephone transmissions and AM broadcast stations. Also, it is just possible for an FM transmission to cause interference on audio equipment.

With an FM signal the audio modulation

causes the frequency of the carrier wave to be varied slightly either side of its normal unmodulated frequency. The maximum change in frequency is very small in the case of legal 27MHz CB equipment, and is only ± 5kHz. Demodulating this type of signal is relatively complex, and it is unlikely that any item of audio equipment would do so. However, there may be a degree of amplitude modulation on the signal, and if a mobile transceiver is powered from a simple mains power supply it is likely that 50Hz mains hum will be slightly amplitude modulated on the carrier wave. Many CB base stations actually consist of a mobile transceiver plus a simple mains power supply unit. Strong breakthrough of an FM signal could also cause interference simply by affecting the biasing of the audio circuit and causing clipping to occur, although the breakthrough would need to be extremely strong indeed to severely degrade the performance of the affected item of audio equipment.

In order to cause interference the radio signal must find a suitable path into the audio equipment, and there are three main ways in which this can happen. Probably the most common of these is by pick-up in a microphone, cartridge, or connecting leads at the input of the affected item of equipment, rather than the signal actually being picked-up in the equipment itself. Leads, microphones, etc are screened of course, but there are almost invariably small sections of lead that are not screened, and the screening may not be 100% effective at radio frequencies. Quite strong pick-up can result, but fortunately this is fairly easily removed by adding an inductor at each input. The inductor is inserted in the non-earthy lead (i.e. in the central conductor not in the outer conductor). Together with the input capacitance of the audio equipment the inductor forms a simple low pass filter which enables audio frequency signals to pass but severely attenuates radio frequency signals.

The value of the inductor is not critical, and a component of about 100uH in value should be satisfactory. A higher value can be used if greater attenuation is needed, but it would be unwise to use a much higher value as this could affect audio frequency performance. It may be possible to fit the inductors on the rear of the input sockets of the audio equipment, but in cases where this is not possible it is an easy matter to build a simple filter unit which can be fitted externally. All that is needed is an inexpensive metal box fitted with input and output sockets, and a filter inductor wired between each input socket and its respective output socket. The earth connection between the input and output sockets is carried through the case. Short screened leads terminated in the appropriate connectors are used to wire the filter to the main equipment.

An alternative route for RF interference is via the mains. It is unlikely that any RF signals picked-up in the mains wiring or leaked into the mains from a transceiver will find a direct route through the power supply circuit of the audio equipment. Smoothing and decoupling components in the power supply will be very effective at filtering out RF interference. It is more likely that stray coupling from the power supply wiring to the input circuitry of the equipment will be the route taken by the interfering signals. The equipment will be designed so that stray coupling of the 50Hz mains to the input will be of negligible proportions, but RF signals are much more readily coupled from one part of a circuit to another by stray capacitances and inductances.

The third method of coupling into the equipment is by direct pick-up of the RF signal by the wiring at the input of the equipment, and within the equipment. There are nearly always non-screened wires and printed circuit tracks carrying sensitive input connections, and these can produce significant pick-up of strong RF signals, especially at higher radio frequencies where short wires make relatively efficient aerials.

If the signal causing the problem is picked-up in external equipment or wiring it is fairly easy to prove this since unplugging the input leads will result in the interference disappearing. There is no easy way of ascertaining whether the interfering signal is coming through the mains or is being picked-up direct by the input wiring of the equipment if the simple test described above does not cause the interference to cease. It is really a matter of trying to eliminate both routes to see which one proves to be effective.

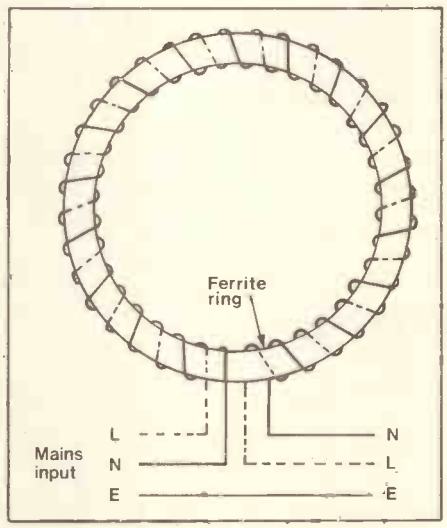


Figure 2. Inductor wound on a ferrite ring.

Remedies

Mains borne interference can be removed using one of the excellent ready-made filter units that are available. A simple alternative is to use a home-made inductor wound on a ferrite ring (one about 25mm in diameter is suitable). The inductor simply provides a high impedance at radio frequencies and blocks the interference, but has a low impedance at 50Hz so that the mains signal can pass with no significant attenuation. If you try a home-constructed inductor, two 1m lengths of PVC covered copper wire are needed. The two pieces are placed side-by-side and wound together around the ferrite ring in a single layer, as shown in Figure 2. One lead is used to carry the live mains supply and the other is used to carry the neutral mains supply. The earth mains lead connects straight through to the main equipment.

A simple way of adding the filter into the mains wiring is to house it in a double, surface mounting, plastic switchbox with one half of the box being fitted with a mains outlet and the other fitted with a blanking plate. An entrance hole for a mains lead is drilled in one side of the box, and the live and neutral leads are connected to the input of the filter inductor. A two way connector block can be used to make these two connections. The mains earth lead and the output leads of the filter inductor are then simply connected to the appropriate terminals of the mains outlet. The filter is then plugged between the audio equipment and the normal mains outlet. If you use a different method of construction make sure that the normal safety precautions are observed and that there is no danger of anyone receiving an electric shock from the unit. Anyone unfamiliar with electrical wiring would be well advised to use a ready made filter.

If the interference is caused by pick-up in the wiring and printed circuit board tracks at the input of the equipment it can be quite difficult to eliminate the problem, although it is comparatively rare for interference to be caused in this way these days. One way of curing the problem is to add "base stopper" resistors to the transistors in the input stages of the equipment. This simply entails the desoldering of the base leadout wire of each transistor, and then connecting each one back into circuit via a resistor of a few kilohms in value. With virtually all modern circuits even quite a high value resistor in series with the base of a transistor will not adversely affect the biasing of the circuit, but what it does do is to reduce the high frequency response of the circuit and thus filter out the unwanted RF signal. The resistor leadout wires should be cut very short, and for optimum results the resistors should be added in the base leadout wire of each transistor and not at some earlier point. This may not look very neat, but it is normally very effective. This should only be tried with transistors in the input stages of equipment, and should definitely not be employed with output and driver transistors of audio power amplifiers. Incidentally, this method of interference is one that used to be very common in the days of valve circuits when grid stoppers were a normal part of audio amplifier designs.

An alternative to using a resistor is to connect a low value inductor in the base lead of each input transistor. A value of about 100uH should suffice, and using an inductor has the advantage that the resistance of the component is negligible and its addition cannot affect the biasing of the circuit. The only disadvantages are that an inductor is likely to be a little more expensive than a resistor, and probably a little larger and more difficult to wire into circuit.

Another, and similar method, is simply to desolder the base leadout wires of the input transistors, and then thread a few ferrite beads on to each leadout wire prior to reconnecting it. The ferrite beads (which are simply small rings of ferrite) have the effect of significantly increasing the inductance of each base leadout wire, so that in conjunction with the input capacitance of each transistor a series of RF filters are produced.

It can be difficult or practically impossible to add a base stopper resistor or inductor at the input of an integrated circuit, and in attempting to do so there is almost certain to be some risk of damaging the integrated circuit. It may be possible to break the printed circuit board track next to the appropriate integrated circuit pin, and then use the resistor or inductor to bridge the gap. However, this method of interference suppression seems to be less effective with integrated circuits than with transistors.

A system which is often better is to add a capacitor from the input of the integrated circuit to earth. The value of the capacitor must be found by empirical means and is the lowest value that gives sufficient suppression.

Before attempting even a simple modification to expensive commercial equipment, bear in mind that doing so might invalidate the guarantee if the equipment is still within the warranty period. Modifications should not be attempted unless you have the necessary knowledge to undertake the work confidently. **E&MM**

MUSIC MAKER EQUIPMENT SCENE

ARP to CBS

CBS Musical Instruments in the U.S. who market Fender, Rogers and Rhodes instruments among others, have acquired several lines from the bankrupt ARP synthesiser company. The products will in future be marketed under the name 'ARP by Rhodes', although the logo is to remain unchanged. The full implication of these moves to synth players in the U.K. is unclear, but CBS have apparently only purchased the unreleased ARP Chroma programmable polyphonic synthesiser, and the ARP electronic piano models which they are planning to modify. The balance of the ARP company is to be liquidated, although several ARP personnel will stay on, including the company's founder Alan R. Pearlman.

ARP began as a synthesiser company in 1970. In May of that year David Friend and Alan Pearlman completed work on the large 2500 modular synthesiser. The 2600 appeared soon after, followed by instruments such as the classic Odyssey, the preset Pro/DGX, the basic Axxe and Solus, the Avatar guitar synth, the Omni string synths and the polyphonic Quadra. The Chroma has been seen in various prototype stages at U.S. trade shows, but has yet to be released on to the market.

Alan R. Pearlman, ARP Chairman.

Prophet Rev

The Prophet-5 synthesiser from Sequential Circuits has been with us for about five years now, and various changes have been made along the way. Below we've listed the changes made and the 'Rev' numbers associated with the changes, 'Rev' standing for 'Revision'. Thanks to Tim Wallhead at Argent's Keyboards service department for help in compiling the information.

Rev 1
Basic first model Prophet-5, introduced in 1977.

Rev 2
Tune Edit button added, enabling performance editing of preset. Counter timer chip added to improve tuning.

Rev 3
Complete re-design of internals to incorporate Curtis chips, replacing the previous SSM chips. Cassette interface introduced.

Rev 3.1
Changes to computer-operated PROM and non-volatile RAM. 2716 EPROMs, giving 2K of operating program, replace 1K 2708s. 2114 non-volatile RAM chips replace 86508s.

Rev 3.2 (current model)
Interface with Poly Sequencer enabled by addition of Signetics 2651 digital chip. 2732 EPROMs, giving 4K of operating program replace 2K 2716s. Changes to common analogue section of computer board. Modulation wheel can now be voltage-controlled.

If you have a Rev 3 or a Rev 3.1, Argent's can modify them to Rev 3.2 spec. Unfortunately, these mods cannot be made to Rev 1 or Rev 2 models, which have completely different software. You can have a cassette interface added to a Rev 1 or 2, however. If you're not certain which of the Rev 3s you have after studying our plan, look on the top edge of the computer board inside, where you'll see the Rev number silk-screened.

Rose-Morris

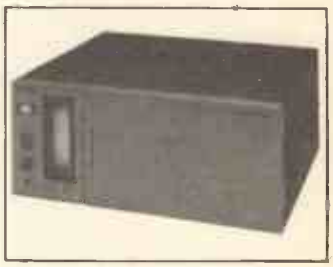
The winner of the Rose-Morris sponsored Solid Body Guitar Design competition was recently announced as Martin Hartwell, who received his first prize of £350 for what Rose-Morris describe as 'an original piece of engineering design with exciting development possibilities'.

Rose-Morris sponsored the competition in association with the London College of Furniture. Of the students from the college who entered the competition, six were invited to produce detailed working diagrams of their designs. The finalists then constructed a full-size, working prototype for final selection at the judging, which took place at Rose-Morris on December 16 last year. The judging panel consisted of: Philip Shirtcliffe, Head of Department, Musical Instrument Technology at the London College of Furniture; Herbert Scwartz, Lecturer responsible for the competition; Peter Clarke, Executive Chairman of Rose-Morris; Jim Wilmer, Marketing Manager; and Adrian Legg, Guitar Technician. The photograph shows Martin Hartwell receiving his winner's cheque from Peter Clarke.

Kraftwerk

If your synthesisers have suffered at all this year from snow, you may be amused to hear that Kraftwerk have also been having weather problems. They certainly weren't amused on their recent world tour when their arrival in Bombay coincided with that of the monsoon season. They were eventually forced to put back their ensuing recording schedule by two weeks, during which time essential repairs were carried out after the 100% humidity in Bombay had caused havoc with the Robotniks' electronics. Well, I suppose this rain isn't quite so bad after all...

Digital Cassettes



There are already some digital audio cassette machines on the market, but they all use standard video cassettes. For example Technics' SV-P100 machine, which uses VHS cassettes and sells for around $3,000 in the U.S. - a competitive price to Sony's PCM100 machine which obviously uses Betamax cassettes, although the Technics machine does include an electronic editor. But with major companies now going for PCM machines using Compact cassettes as well, the day of domestic digital machines could be even nearer. What next?

AHB

Allen and Heath Brenell Ltd recently announced the appointment of Music Laboratory in London as main warranty and service agents for AHB equipment. You can also find a permanent display of the equipment on demo at Music Laboratory, which is at 72-74 Eversholt Street, London NW1, opposite Euston Station. Phone them on 01-388 5392.

For readers in the north of England, enquiries should be made in the first instance to Audio Services, 25 South Meadway, High Lane, Stockport, Cheshire, telephone 066 32 2442. **E&MM**

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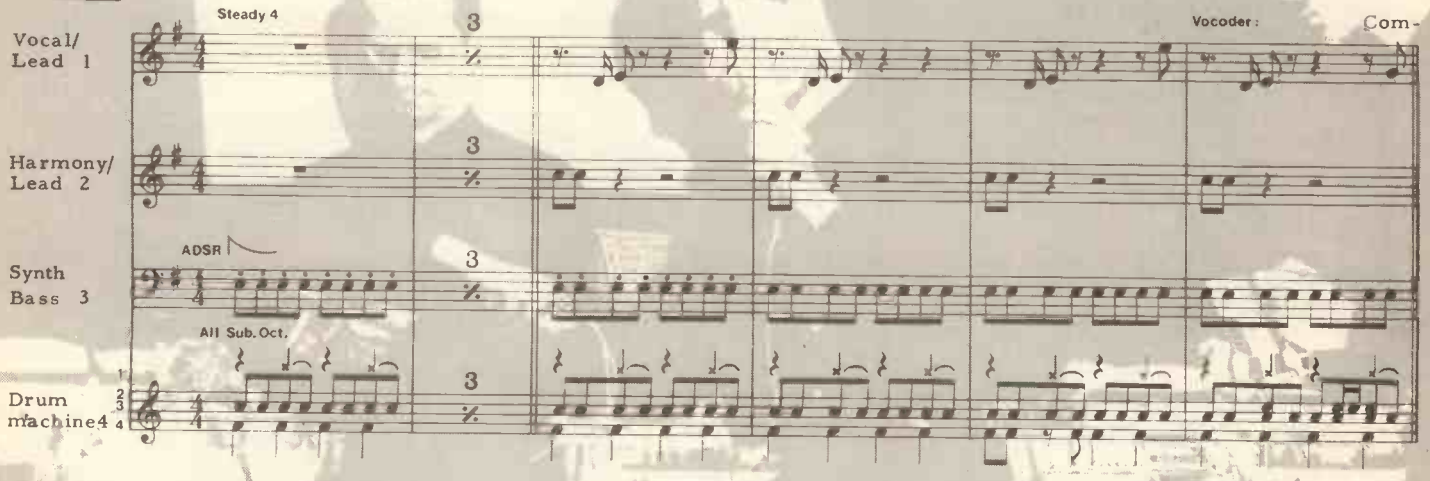

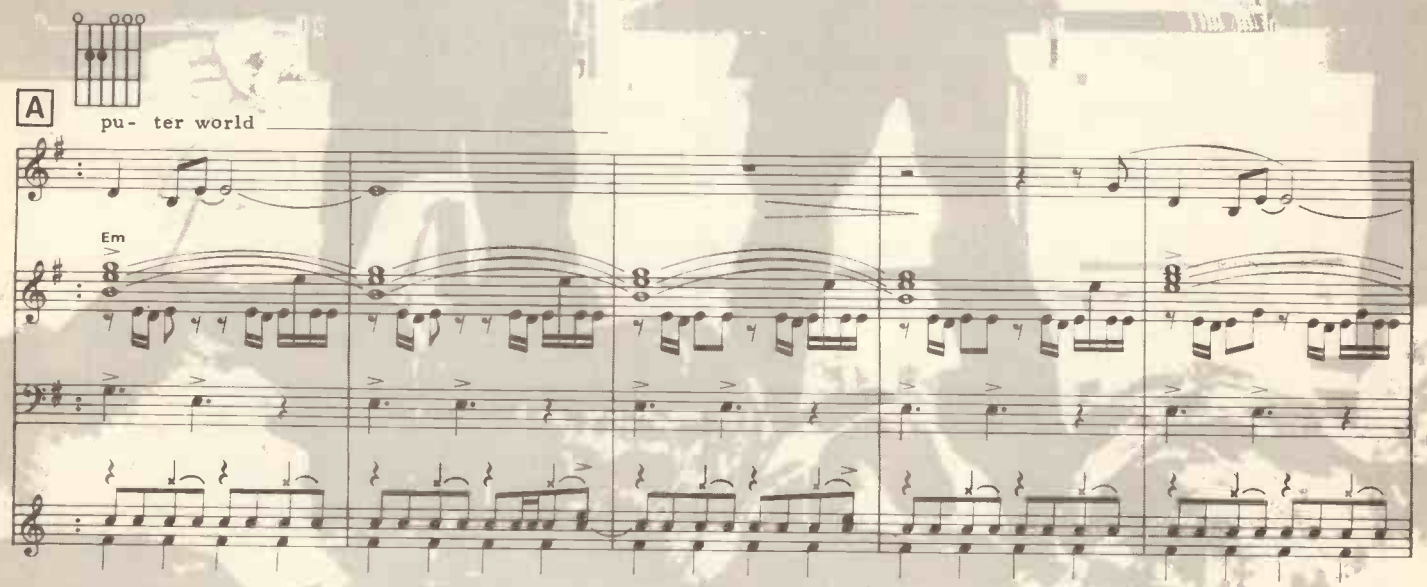

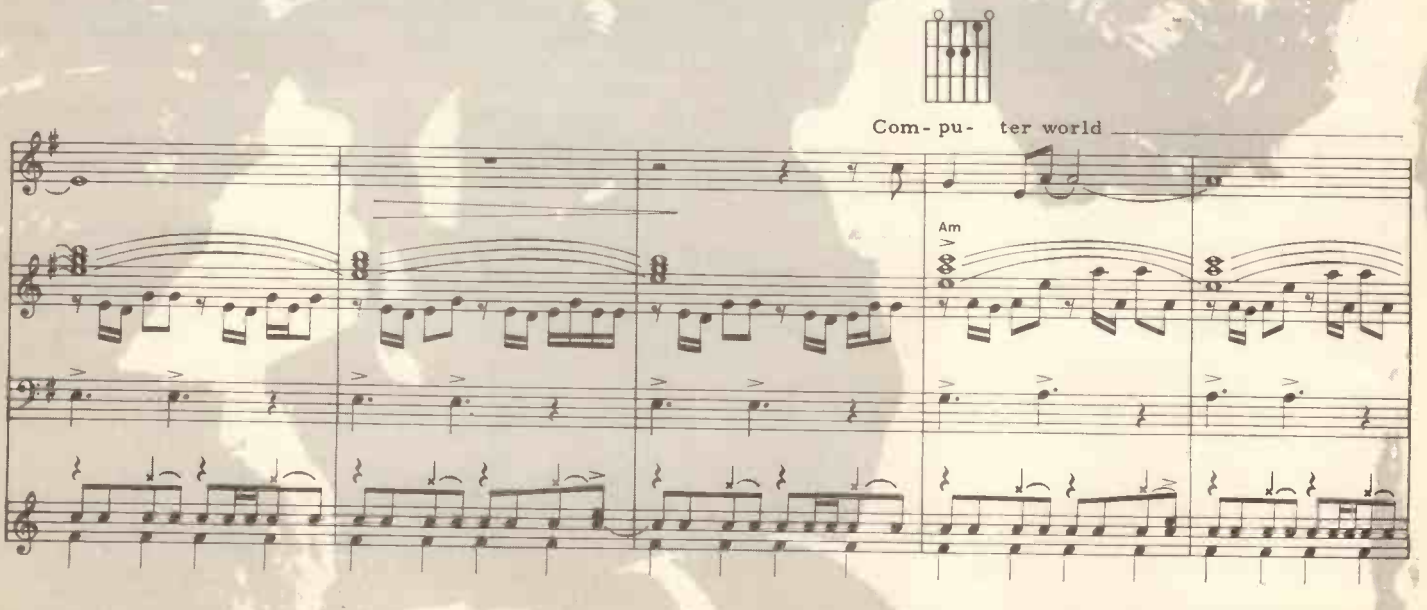

A full article on Kraftwerk is given in E&MM Sept. 1981 issue.

'COMPUTER WORLD'

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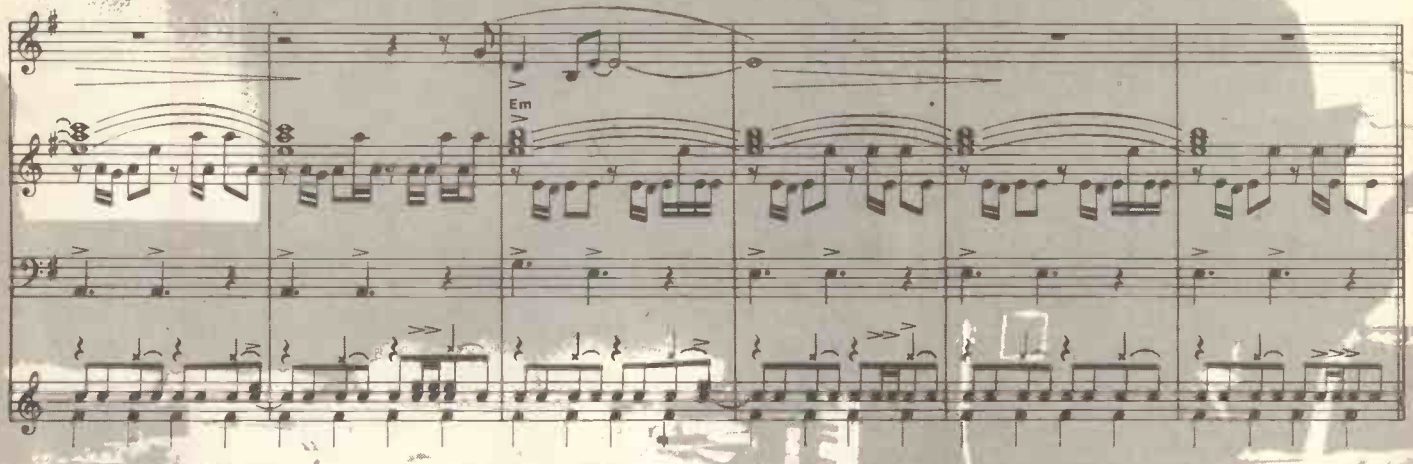

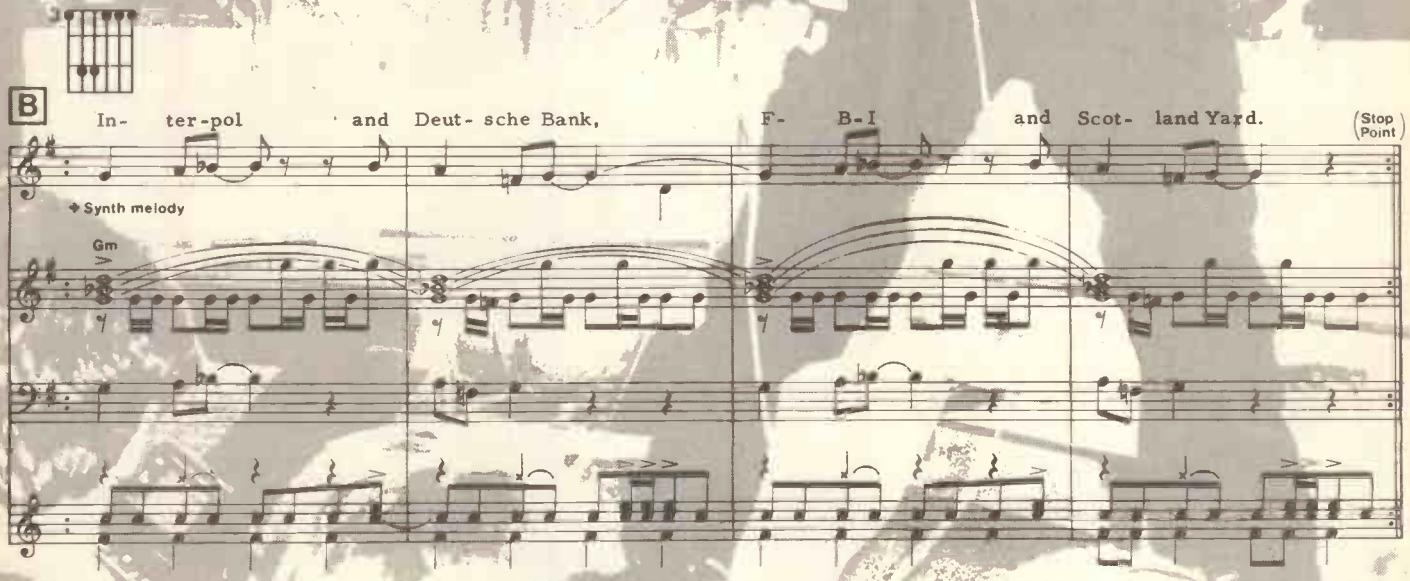

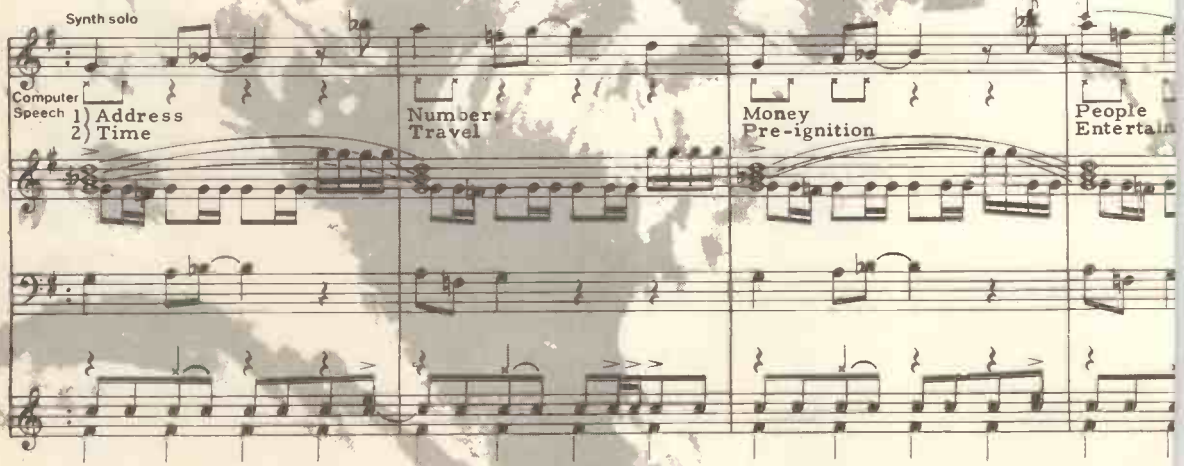

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E&MM MARCH 1982

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Shure 517SA and 517SB

The first thing that has got to be highlighted is the £21.92 plus VAT price listed in the Shure press release which came with the mics. If the mics prove to have no shortcomings then they must be excellent value. I suppose initially one is suspicious that here will be something which will look and feel "made down to a price". We shall see.

I must confess to not being all that familiar with the extensive Shure range of mics. Nevertheless, on unpacking I immediately recognised the Shure style in general and thought that the 517s were in their typical presentation. They are called Unidyne B but I'm sure that the description is a type name, as it is applied to other mics in their range. Unidyne is a registered trade name and would indicate a unidirectional dynamic microphone, which is what the 517s are. The SA and SB suffixes refer to there being two basic versions. SB being the more usual nominal 150Ω job, whereas the SA is a high impedance type. Just that — "high", with no actual ohmic appendage in the Shure data sheet. Now could it be that this impedance business is still a cause of concern amongst E&MM readers? In case I'll pause the review to attempt enlightenment.

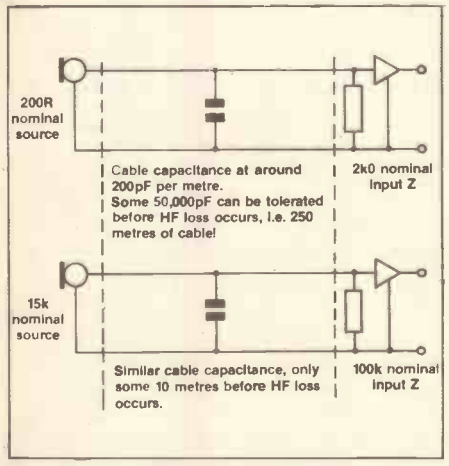


Figure 1. Low/High Impedance problem.

Low Versus High Impedance

Some facts first of all. Mics of 150Ω, 200Ω, 600Ω or what have you are not connected to the input impedances the figures might seem to demand! Anything some five to ten times greater is intended, and this is the case with the majority of modern equipment, be they amps, recorders or mixers. They may quote "for 600Ω mics" but they will fit the convention mentioned. In the past with valve gear there was a need to "match" mics to their unavoidable high input impedances (100kΩ to 1MΩ at least) or there would not be sufficient voltage to drive the input. So step up voltage transformers were needed. But there is more to it than this. You cannot use long leads with high impedance circuits, due to the high shunt capacitance preventing the "arrival" of high frequencies at the amp. See Figure 1.

Low impedance circuits can tolerate a lot more shunt capacitance and hence longer leads are possible. Certainly the SA version is still needed where valve (or FET) inputs are providing the high impedance unless the somewhat messy separate transformer is employed. Whisper — the difference between the two types of Shure 517 is that the SA has a small transformer in its body.

Physical

The transformer in the 517SA is the only physical difference. The mic is heavy and solid with the capsule in a rubber moulded suspension. The capsule is user-replaceable by three soldered wires and is available as a spare part as is the grill screw on fitting. This is mainly plastic but it is flexible and in that sense will absorb the shock of a fall. An on/off switch is provided with a screwdriver locking "on" arrangement. A Switchcraft XLR connector is provided and an optional accessory cable C5-X was thoughtfully submitted for us to use. This has the female Switchcraft socket at one end and a tip and sleeve ¼" jack plug, screened, at the other — all standard arrangements. The mating at the mic end could surely be tighter though as it was easy to produce clunks in use.

Now I thought that I could lump together both versions throughout this physical description, but no, as we are back to the transformer again. The SB has a balanced output as one would expect — the lead used determining whether its connection remains so. The high impedance version is unbalanced out of the mic with pins 1 and 3 commoned and the signal on pin 2.

Auditioning

My usual usage with other mics to hand took place along with a few regular well used sound sources and other things happening at the time. It's just got to be said that there is nothing shrill, peaky and bass-less about these low cost Shures. I suppose I was expecting that! On the contrary, in the company of a Beyer Soundstar II moving coil and a Calrec CM 656D capacitor there was the sort of similarity that puts all the mics in the quality class. One can do a whole string of comparisons with numerous odd instruments and general sounds and although there are varying differences it is not possible to say that it is a particular mic being used at any one time unless one announces each or sticks to a particular order. Interestingly, in investigating the differences heard, one only had to use them in a different acoustic to get more confused. This bears out a point I seem to make no doubt too often for some, that an instrumental or vocal mic's sound is environment affected in the way it "colours" the sound. More so than "flat" crossed pair recording where the acoustic is being captured in its own right in a sort of addition to the instrumental sounds.

An interesting aspect that came to light as a result of the high impedance version was its use in a TEAC Model 2A mixer compared to the low impedance version. The TEAC needs the high impedance version! The level from the normal model was significantly lower and in consequence "noisier". The same applied to the Beyer. The Calrec being a "proper" capacitor does not follow the same rules.

Handling noise from the Shures was par for the course as was close-up proximity and popping. On the latter point I have a cure for that difficulty. Incidently the number of times I hear diaphram popping in local radio chat shows is excessive in my opinion. I'll reveal my simple arrangement in a future look at mics.

Summing up, it has to be admitted that there is excellent value in the Shure 517 pair. There aren't any nasties as far as I can gather so I can recommend it thoroughly and not just for those who must embrace economy.

Mike Skeet **E&MM**

ROBERT SCHRÖDER

I arrived at Robert's apartment in Aachen in the midst of a panic caused by the Schroder's eight week old kitten's abortive attempt at harikari, resulting in a suspected broken leg. So it was between hurried telephone calls to the vet that I was introduced to wife and family and Joe, a friend of Robert's who was there to help with language difficulties as Robert tends to underestimate his abilities with English.

Panic over, we finally settled down and I began to find out more about the man who's interest in electronics began at the age of six. Now, 20 years and three albums later, Robert finds that music is taking up more and more of his time and for that reason his technical interests have fallen by the wayside to some extent. He first showed an interest in music at the age of eleven and was given the opportunity to take guitar lessons which he kept up for only a few months. His musical interests did not wane, however, and at thirteen he was saving for his first guitar. At fourteen he had formed his first group, a short lived affair which was to set the pattern for the following twelve months or so. Altogether five groups were formed and split up in a matter of weeks, due mainly to financial reasons and too little enthusiasm on the part of the other members. In 1970, at the age of fifteen, Robert gave up the guitar to concentrate on school exams after which his interest in electronics once again took over; for four years he undertook no musical activities.

Robert's technical training consisted of just one year in computer studies, which he found unsatisfying. Other than that he is completely self-taught from books and from his experience repairing hi-fi equipment whilst working as an assistant in an electronics shop. He then went on to open his own electronic components shop in Aachen which he kept for two-three years and it was during this time that his interest in music was re-awakened.

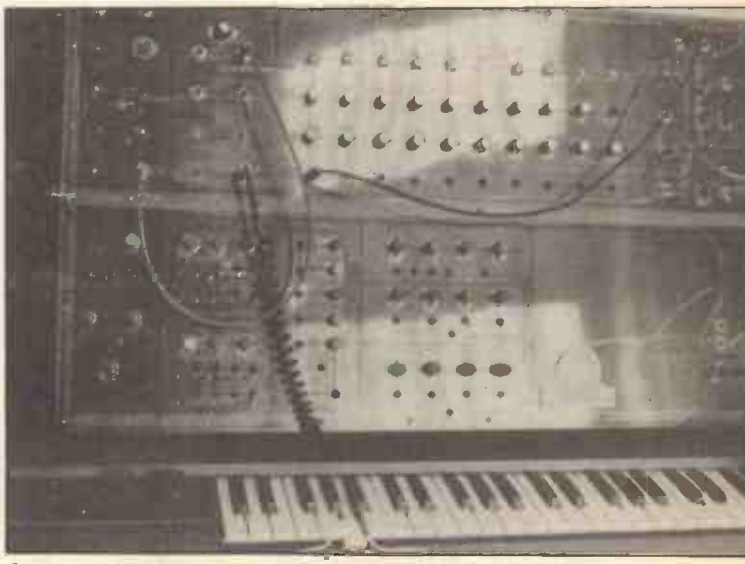
Schulze Links

Klaus Schulze's album "Blackdance" had some effect on Robert in making him aware of the possibilities of electronic music synthesis and he built some synthesiser modules, using these to make tapes of his own music purely for his own enjoyment and to prove his technical development. Contrary to the sleeve notes on his first album, Robert did not send a demo tape to Klaus Schulze, in fact they were already friends. Indeed Klaus is godfather to Robert's son and it was during a visit that he first heard Robert's music, which happened to be playing at the time, he expressed an interest and this started the musical career of Robert Schröder.

Recording and Writing

His first album "Harmonic Ascendant" was released in 1979 and took almost a year to produce. I asked Robert why it had taken so long; "It's a long story!" he replied, "at first I had made a record, my first record, and the company says it's not so good, you must make another. And then I have half a year later made 'Harmonic Ascendant'," I asked what happened to the first, unreleased album; "The company said it's too electronic; for me it was a great record! At first it was an experi-

Recording engineer Barney Roth-Profenius (on left) takes a break with Robert Schröder during a late night session.



Sequencer described by Robert in his book.

ence for me to actually make a record, but today I agree it was not so good for the market. But it was very good for the musicians side." Did he want the original released at the time? "Yes, at this time it was for me a great record (laughs) but only for me! Klaus (Schulze) said it was not so good also."

Part of the original was used on the title track of "Harmonic Ascendant", which lasts the whole 22 minutes of the "A" side, but with a different mix and with the addition, on Schulze's suggestion, of cellist Wolfgang Tiepold. The two tracks that make up the "B" side are dominated by Robert's voice treated so as to make it almost unrecognisable. Actually he is telling a self-penned science fiction story in German, played backwards and heavily treated through a vocoder! He found this fulfilling in two ways; one, it was a new sound that could not be produced from his instruments alone and two, the science fiction aspect, he explained, "Science fiction with words from today is for me not science fiction — it must be all. I destroyed words but when you listen you hear sounds or endings that could be heard today in technical language, but the words don't mean anything."

The synthesisers and sequencers used on "Harmonic Ascendant" were all designed and built by Robert. All the synthesisers were monophonic. I asked him if he had ever designed or built a polyphonic synthesiser or had any plans for doing so in the future; his answer was a very definite "No!"

"Harmonic Ascendant" was released on Klaus Schulze's I.C. label which was at that time still under the control of WEA and, as I.C. had no studio of its own, was recorded on 16 track at Panne Paulsen studio. It achieved considerable success in Germany and appeared in the German critics "List of the Best". The guitarist on the album is Robert's friend Udo Mattusch.

After the release of his first album, Robert wrote a book entitled "Sequencer — Ein Musikcomputer(?)". Available only in German, it gives full details on how to build a complete 30-note sequencer, including component lists, PCB patterns and circuit diagrams, all designed by the author himself. He claims it can be built for a tenth of the price of commercially available sequencers in Germany.

1980 saw the release of his second album, "Floating Music", which was also the first record to be released on I.C. as an independent label and, in keeping with all later releases on that label, is meant to be played at 45 r.p.m. although, as suggested by the sleeve notes, you can play it at 33 r.p.m. for a completely different effect, it also lasts a lot longer than the 18 minutes per side imposed by cutting an album for 45! This 18 minute restriction also appears to be the root cause of the reservations Robert has about the album.

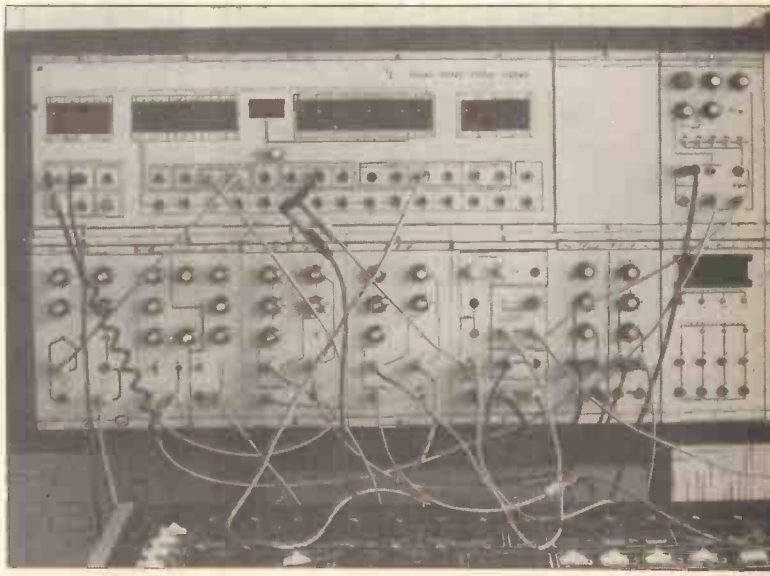
It is Klaus Schulze's practice, when a new artist is introduced to I.C., to help and advise with the first album and then leave them to their own devices, and this was the case with Robert and "Floating Music", Robert doing the final mix alone. However, Klaus then took the tape to his home studio and re-mixed and shortened it to 18 minutes per side. It was this version that was released, much to Robert's disappointment as he preferred his own original mix which he claims was more powerful. Also during this re-mixing, the track titles were transposed, the "A" side titles being shown as the "B" side and vice-versa, therefore the title track is on the beginning of the "B" side! Robert laughingly suggests that perhaps the album should have been called "Harmonic Accident". In spite of this "Floating Music" is a fine album and totally different from "Harmonic Ascendant" in everything bar excellence. As if to prove his change of priorities from the technical to the musical, Robert uses commercial synthesisers on this album, and also for the first time a drummer, Fred Severloh from the I.C. band "Lorry", although there is no mention of it in the sleeve notes.

Like his first album, "Floating Music" was received well in Europe, mainly in Germany, Austria and Holland, but not so much in France and Belgium, where perhaps, there is the biggest audience for electronic music. In these two countries they seem to prefer the heavier, more moody music of the pre-"Dig It" Schulze variety. Outside of Europe his albums sell well in Australia, Japan and, surprisingly, America, where he would very much like to tour.

Playing

Robert has been giving concerts for three years but has so far restricted these to his home territory. For his first concerts he used tapes for the basic tracks and sequences, and monophonic synthesisers for the melody, but over the past two years he has moved on

PPG & Moog.



Detail of self-built sequencer.

ROBERT SCHRÖDER DISCOGRAPHY

HARMONIC ASCENDANT	WEA	IC 58 087	(1979)
FLOATING MUSIC	I.C.	KS 80 001	(1980)
MOSAIQUE	I.C.	KS 80 016	(1981)

Robert Schröder Book
SEQUENCER — EIN MUSIKCOMPUTER(?) Catalogue No.: RPB 150
Published by: FRANCIS VERLAG MUNCHEN
Karlstrasse 36
8.000 Munchen
(Only available in German language)

to polyphonics and now has the computer-based "PPG Wave 2" machine (see detailed review in E&MM July 1981) which he uses for the sequences, thus freeing him from the restrictions imposed by the use of the same home-prepared tapes for each performance in a tour. With the PPG he can simply re-program it for each individual concert. As for the music, Robert uses no score as such, when performing live or in the studio. All the information he requires is written in his own form of shorthand and reminds him of certain sequences and melodies he plans to use and the necessary synthesiser settings.

The PPG is also put to great use on his new album "Mosaique", certainly his most commercial to date, the whole "A" side being very rock orientated. Once again Fred Severloh appears on drums, plus two other musicians; Charly Buchel on guitar and Rob Van Schaik on bass. A new departure for Robert is the use of a "Voice Box" on some tracks, where a tube is fed from a speaker monitoring the guitar, to his mouth, he then speaks or sings and his voice is modulated and takes on the sound of the guitar.

Moving into his tiny studio, it was difficult to understand how anyone could produce music in such confined conditions. Directly under the window, which looks out on to a very noise main road, is Robert's self-built and as yet unfinished 16-channel mixing desk. The PPG Wave 2 stands in the centre of the studio with the obligatory Moog above and behind it. Behind these and also on the left are the sequencers, the latter being the one described in his book. Other equipment includes a Dynachord PA, Otari MX 2050 tape machine and various effects units, some self-built. No multi-track facilities exist, but the PPG with its abilities to play eight tracks helps enormously in any recording Robert wishes to make at home, although his albums are obviously recorded at I.C.

Influences

Our time in the studio was foreshortened by the fact that my photographer was unable to take any pictures of the equipment without including either Robert or myself, or indeed our interpreter Joe, who was completely engrossed in a Casio VL-Tone which Robert had produced from the top of the mixing desk. We therefore retreated to the lounge where I asked about the people who had influenced Robert's music; "You can say a little bit Mike Oldfield," he replied, "not the music he's doing now, more 'Tubular Bells' and 'Ommadawn'. You can hear it a little on the 'A' side of 'Harmonic Ascendant'."

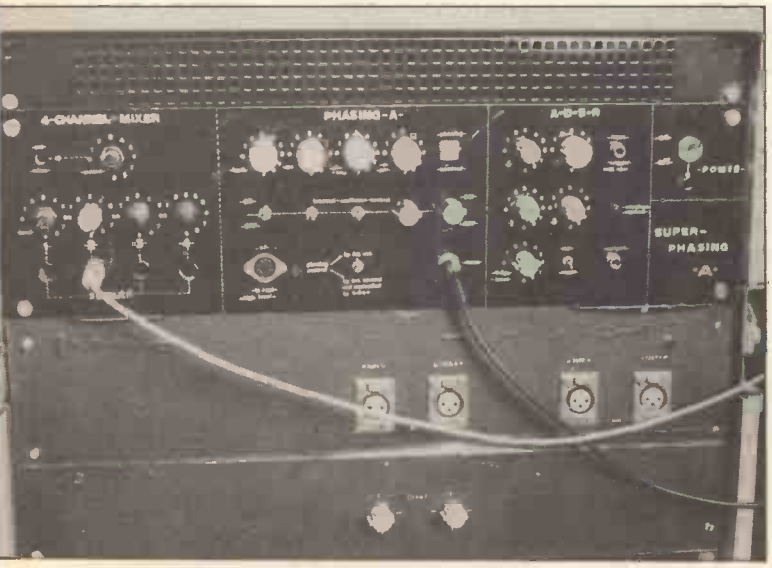
It seems to have become the rule over the years to accuse anyone who has touched a synthesiser of copying Klaus Schulze, in some cases rightly so. Robert is no exception to this rule and has been described as a Schulze clone, a reputation he is fighting against, although I strongly doubt if any of the people making this accusation have ever sat down and really listened to the music of either party. Robert explains it by saying that Schulze is the "father" of electronic music as we know it and therefore it is inevitable that anyone coming after will be compared to him. "Today this is my music," he says vehemently, "no-one influences me." All three albums so far released have been completely different from each other, showing no distinctive Robert Schröder sound. He says that he is still looking for the sound he wants and is still not 100 per cent satisfied, although the "A" side of "Harmonic Ascendant" comes very close to what he is seeking.

The Future

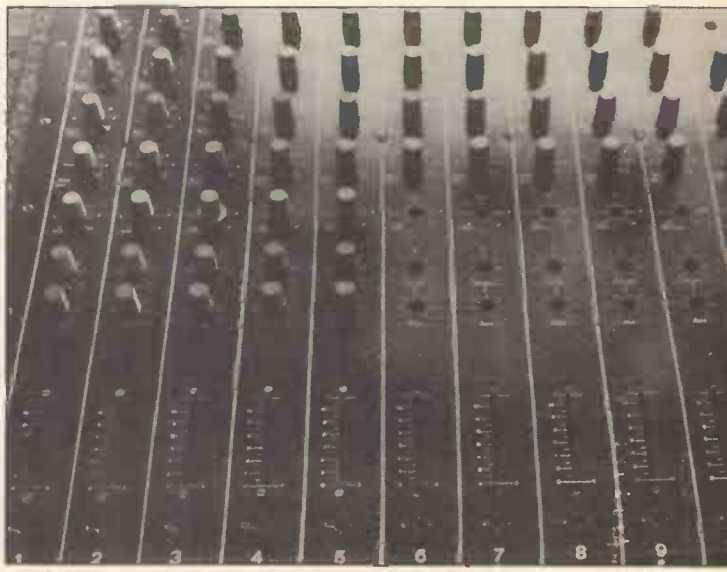
Robert has just signed a new two year contract with I.C. but he does have his own plans for a studio for electronic music production. He sees an interesting future in film music and is currently working on his first commission for this. A new album is planned for 1982, and, in addition, Robert would like to re-release "Harmonic Ascendant", using the original tapes but with a different mix and the addition of some new pieces.

A 1982 concert tour is planned, but no dates or venues have yet been finalised. **E&MM**

Dennis Emsley
Photographs by Nessie



Some of Robert's self-built equipment, phaser etc.



Self-built (unfinished) mixing desk.

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Four intermixable Voice Controls may be used to obtain a wide variation of Piano Tone, including Harpsichord.

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SIX OCTAVE DOMESTIC MODEL

COMPONENT KIT £217
COMPLETE KIT £363.90 MANUFACTURED £595

Component Kits include Keyboard, Keyswitch 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.

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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.

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(As Published in conjunction with 'Practical Electronics')

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MANFD. £399

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THE Programmable DRUM MACHINE

(As Published in conjunction with 'Practical Electronics')

EIGHT TRACK PROGRAMMING/TWENTY-FOUR PATTERNS/TWELVE INSTRUMENTS SEQUENCE OPERATION.
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 Instrumentation tracks. 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 8½" x 5" x 2½".

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(As Published in conjunction with 'Practical Electronics')

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FIVE OCTAVE £38.00
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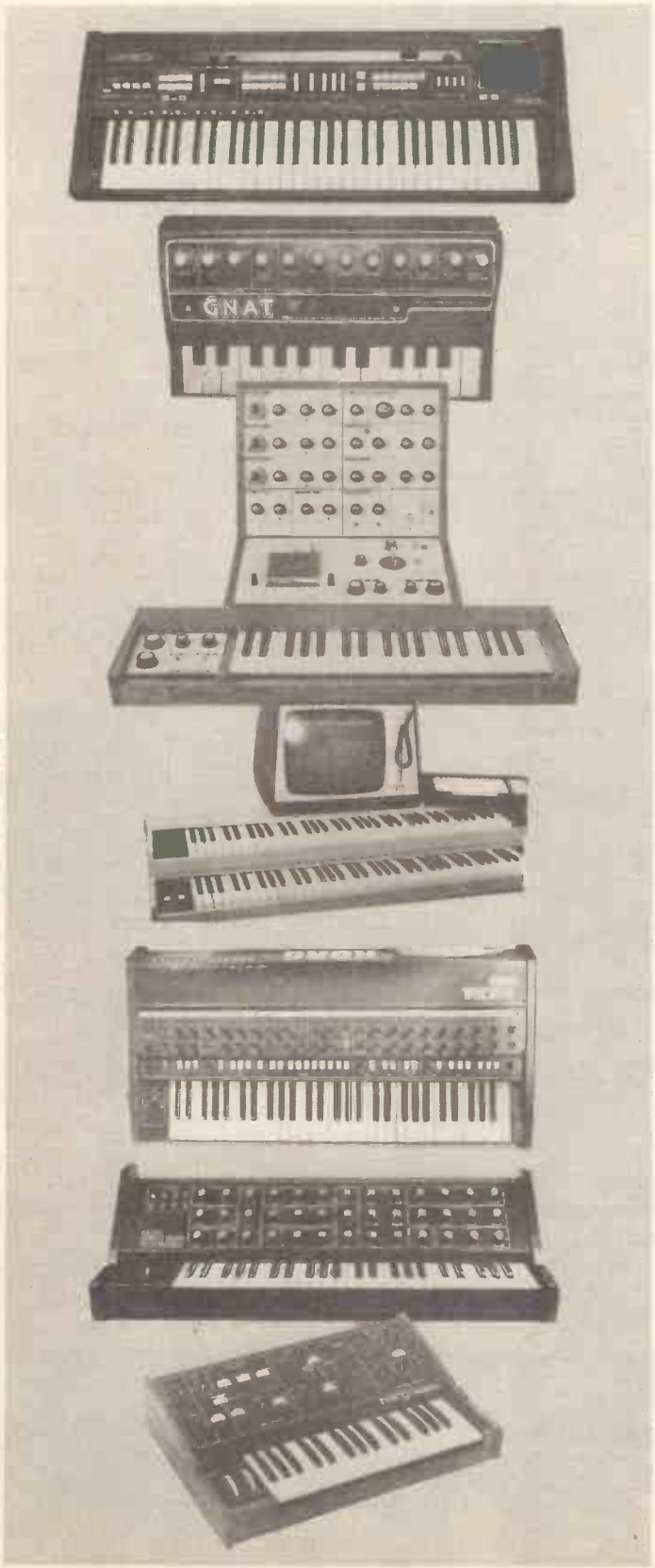
CLEF PRODUCTS (ELECTRONICS) LIMITED

(Dept. E&MM/3/82), 44a Bramhall Lane South, Bramhall, Stockport, Cheshire SK7 1AH 061-439 3297

SYNTHESISER

Buying a keyboard synthesiser these days is a bewildering business. Since the humble Minimoog entered the market just over ten years ago, we've had all manner of new devices pushed under our fingers - the synths on offer now cover multivarious musical applications and the choice is more difficult than it ever has been.

To guide you and your wallet through this ever-increasing wonderland of hardware, E&MM now presents the first of a continuing series of Buyers Guides. What we've done is to bring together all the current prices of keyboard synthesisers on the market in the U.K. at present. The listed prices are INCLUSIVE OF VAT and were correct at press time as recommended retail figures. We suggest that you check with the distributor listed for current bargains.



CASIOTONE

Casio Electronics Ltd, 28 Scrutton Street, London EC2. 01-377 9087.

VL-1		39.95
MT-31	Preset, 8nt poly	79.00
MT-40	Preset, 8nt poly	125.00
CT-101	4oct, 25 presets, 8nt poly	255.00
CT-202	Preset, 8nt poly	325.00
CT-403	4oct, 25 presets, rhythm, 8nt poly	325.00
CT-701	5oct, 20 presets, rhythm, 'reading', prog, 8nt poly	555.00

ELECTRONIC DREAM PLANT

Electronic Dream Plant (Oxford) Ltd, 228 Headington Road, Oxford, 0X3 7LS. 0865 63628.

Wasp	2oct, 2 osc mono	199.00
Spider	Sequencer	199.00
Caterpillar	Poly controller	149.00
Gnat	1 osc, mono	125.00

ELKA-ORLA (U.K.) LTD

Elka-Orla (U.K.) Ltd, 3/5 Fourth Avenue, Bluebridge Industrial Estate, Halstead, Essex. 07874 5325.

Soloist	4 oct, 1 osc mono, 11 presets	407.00

EMS

Electronic Music Studios, 277 Putney Bridge Road, London SW15 2PT. 01-788 3491.

Synthi A		1,360.45
Synthi AKS	30nt, 3 osc	1,667.50
Synthi KS	Sequencer	307.05
Synthi DK2	Keyboard, 3oct	541.65
Synthi VCS3 Mk fl	Synth only, 3 osc	1,458.20
Synthi E	Synth/ribbon/int keyboard	641.70
Synthi DKE	Keyboard for E	232.30
Vocoder 1000		934.95
Vocoder 2000		1,033.85
Vocoder 5000		8,238.35
Polysynthi	4oct, 'fully polyphonic'	2,402.35
Synthi 100		POA
Computer Synthi		POA
Sequencer 256		POA
Universal Sequencer		POA

FAIRLIGHT

Syco Systems Ltd, 20 Conduit Place, London W2. 01-723 3824.

CMI	Including music composition language	20,125.00

KORG

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

MS10	2½oct, 1 osc, patchable, mono	289.00
MS20	3oct, 2 osc, patchable, mono	467.00
MS50	Synth only, 1 osc, patchable	295.00
M500SP	2½oct, 30 presets	320.00
Sigma	3oct, 19 presets	699.00
Lambda	4oct, preset poly	1,199.00
Delta	4oct, poly	775.00
Trident	5oct, 8-voice, 3 presets, 17 memories	2,310.00
SQ10	Sequencer	299.00
VC10	Vocoder	399.00

MAPLIN

Maplin Electronic Supplies Ltd, PO Box 3, Rayleigh, Essex SS6 8LR. 0702 554155.

5600S	4/5oct, 4 osc, stereo, patch panel, kit	599.95
3800	4oct, 2 osc, mono, kit	336.75
E&MM Spectrum	4oct, 2 osc, stereo, kit	199.93

MOOG

11 Forth Wynd, Port Seton, East Lothian, Scotland. 0875 812033.

Rogue	1 osc, mono	315.00
Prodigy	3½oct, 2 osc, mono	381.00
Taurus	Bass pedal synth	811.00
Liberation	3½oct, 2osc, 'worn' synth	893.00
Source	3oct, 2osc, prog mono	910.00

NEW ENGLAND DIGITAL

U.K. Enquiries: Keyboard Hire Ltd, 8 Thornhill Road, London N1 1HW. 01-607 8797/8.
Prices fluctuate daily, but include VAT and Duty. Shipping costs are not included.

Synclavier II	8-voice, 32K memory, 5in floppy disk drive	8,774.67
	16-voice, as above	11,842.11
	32-voice, 40K memory, as above	15,000.00
ADM3A	Alpha-numeric terminal (needs 40K memory)	756.58

BUYERS GUIDE

We've had to keep the instrument descriptions necessarily brief, but felt it better to have some information beyond the normal 'product-number-and-price' approach of most lists. Again, you'll get fuller information from the distributor listed – remember to mention E&MM when you write or phone.

ABBREVIATIONS USED
int = internal; mono = monophonic; nt = note; oct = octave; osc = oscillator; poly = polyphonic; prog = programmable.
All prices include VAT at the current rate.

VT100/640	Graphic display terminal (needs 56K memory)	2,631.58
Decwriter	Alpha-numeric printer (needs 40K memory)	1,250.00
Script/MAX/XPL	Needs 40K memory, two disk drives	631.58
	5in Floppy Disk Drive (additional)	631.58

OBERHEIM

U.K. enquiries: Argent's Keyboards, 20 Denmark Street, London WC2. 01-240 0084.

OBXa	8-voice	3,770.00
OBXa	6-voice	3,470.00

POWERTRAN

Powertran Electronics, Portway Ind. Estate, Andover, Hants SP10 3WW. 0264 64455.

Transcendent 2000	3oct, 1 osc, mono, kit	189.75
Transcendent DPX	5oct, poly, kit	339.25
Transcendent Polysynth	4oct, expandable, poly, kit	(basic) 316.25

RHODES

CBS/Arbiter Ltd, Fender House, Centenary Estate, Jeffreys Road, Brimsdown, Enfield, Middlesex EN3 7HE. 01-805 8555.

Chroma	5oct, 16-voice poly, 50 user prog presets, 100 voice programs from cassette tape interface, dynamic keyboard	POA
EK-10	73nt, poly Rhodes piano plus mixeable synth section	1,709.41

ROLAND

Roland U.K. Ltd, Unit 6, Great West Trading Estate, Great West Road, Brentford, Middlesex TW8 9DN. 01-568 4578.

SH09	2½oct, 1 osc, mono	375.00
SH2	3oct, 2 osc, mono	549.00
Saturn	Synth/piano/organ	499.00
ProMars	3oct, 2 osc, 10 presets, 8 memories, mono	999.00
Vocoder VP330		1,299.00
Jupiter JP4	4oct, 4-voice, 10 presets, 8 memories	1,599.00
Jupiter JP8	5oct, 8-voice, 64 memories	3,999.00
CSQ100 Sequencer		395.00
CSQ600 Sequencer		599.00
Modular System 700		POA
Modular System 100M		POA

SEIL

Minns Music Ltd, 5/7 Gervis Place, Bournemouth BH1 2AL. 0202 291277.

Mono	3oct, 1 osc, 10 preset, mono	249.00
Cruise	4oct, 10 preset mono, 4 preset group poly	599.00

SEQUENTIAL CIRCUITS

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

Pro-One	3oct, 2 osc, mono	475.00
Prophet-5	5oct, 5-voice, 40 memories	2,710.00
Prophet-10	Two 5oct manuals, 5 voices each, 32 memories each	5,600.00
Poly Sequencer		790.00
Remote		790.00

TEISCO

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

S60F	2½oct, 1 osc, mono	320.00
S110F	3oct, 2 osc, mono	640.00
S100P	3oct, 32 presets	640.00
SX400	4oct, 4-voice, 8 presets, 8 memories	1,690.00

YAMAHA

Yamaha Musical Instruments, Mount Avenue, Bletchley, Milton Keynes MK1 1JE. 0908 71771.

CS5	3oct, 1 osc, mono	299.00
CS10	3oct, 1 osc, mono	355.00
CS15	3oct, 2 osc, mono	475.00
CS15D	3oct, 29 presets, 1 prog	595.00
CS20M	3oct, 2 osc, prog memory	979.00
CS40M	3½oct, 4 osc, prog memory	1,399.00
CS70M	5oct, 4-voice, prog memory	3,479.00
GS1	FM synthesiser, 88nt, 4 sets equation generators	9,979.00
GS2	FM synthesiser, 73nt, 2 sets equation generators	4,775.00

America

Tim Schneckloth

Serious synthesists certainly aren't strangers to the name Buchla. As a synthesiser pioneer, Donald Buchla has persistently come up with some of the more innovative ideas and systems in the world of electronic music.

The latest project to bear Buchla's name seems to have been an ambitious one indeed. The result is the Buchla 400, which Buchla and Associates describe as "a multi-functional electronic musical instrument suited to composition for traditional as well as electronic musical instruments, sound track and theatrical composition, media output, music education and, of course, performance".

Actually, the instrument seems to have really been designed with the composer in mind. One feature that should really help the composer with his chores is a musically sophisticated score editor that functions in real time. Six orchestrally differentiated voices can simultaneously be displayed, auditioned and edited, and a high resolution graphic display uses linear-time notation to visually present musical data. According to Buchla, this method makes possible the presentation of quite a bit of data - much more than could be presented with conventional symbolic notation.

Instrument definitions, dynamics, tempi, registration and tunings are all completely programmable, and an efficient cursor control combines with menu-driven displays to provide efficient interactive editing capabilities. The 400 can also decode, display, and track a SMPTE time code signal, making it easier for composers of film and video music to get their work done.

Performers haven't been neglected either, since the instrument boasts a tunable touch-sensitive keyboard, pressure sensitive joysticks, control voltage interconnections, and analogue modifiers.

Stick Enterprises' Patch of Shades.

The Buchla 400 uses three computers to accomplish all this. The first is a host computer, which can reside in or out of the instrument. It takes charge of user communication, data handling and executive control. A second processor is responsible for processing temporal parametric data, and a third processor applies digital pipelined techniques to the generation of sound.

The 400's operation language - called MIDAS - is programmed in musicFORTH, a high-level language which, according to Buchla, is "distinguished by its transportability, operational efficiency and ease of user access". The language incorporates subroutines specifically dedicated to musical functions, making it easier to implement and extend interactive musical languages.

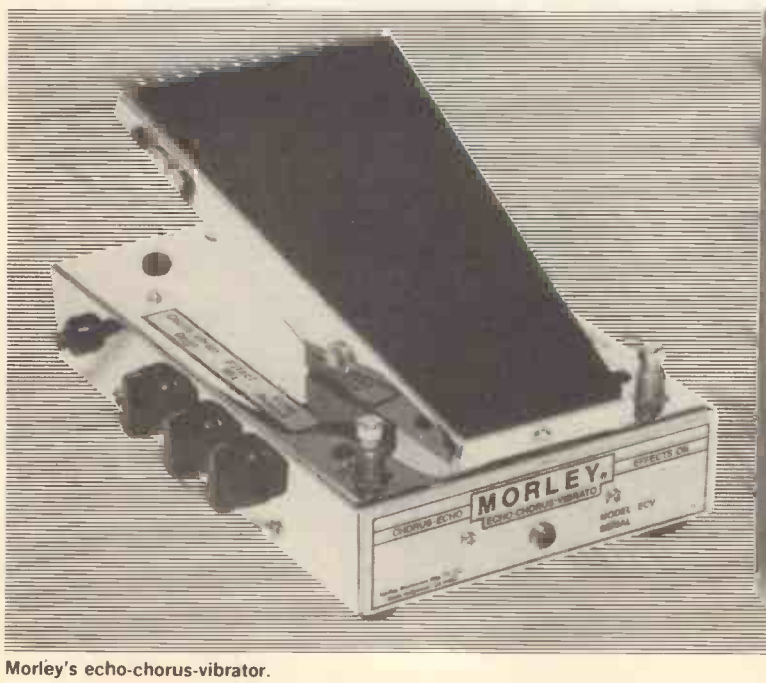
The Buchla 400 is just now being made available. Prices range from $3,000 for the bare bones system to $12,000 for a full-scale development system.

Buchla is not the only innovator with something new this month. Emmett Chapman, noted inventor of the Chapman Stick, has entered the sound modification market with a device called 'Patch of Shades', suitable for use with guitar, bass, keyboards and, of course, the Stick.

What does it do? Well, the device is basically a wah-wah effect that substitutes a pad for the usual pedal. The musician can press his toe on the pad to gradually 'shade' into the bass end of a smooth and noiseless wah. By shifting his weight, the musician can then move through all the wah frequencies.

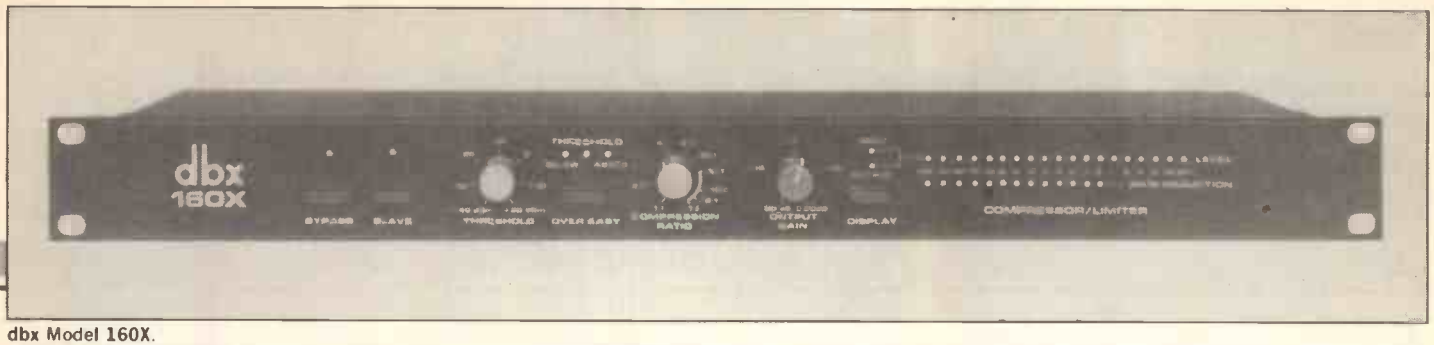
This pressure pad simultaneously operates a volume output for shading in echo, flange, etc. into a second amplifier or channel. An added bonus is the fact that the player can use the unit's send/return loop to operate his old effects in a new way, shading them with the built-in wah. 'Patch of Shades' carries a retail price of $275.

Another new item for foot-happy musicians is the ECV (Echo-Chorus-Vibrato) from Morley. This device gives the musician instant control over a wide range of delay times, letting him select from a short delay of 15 milliseconds all the way up to 300. With a

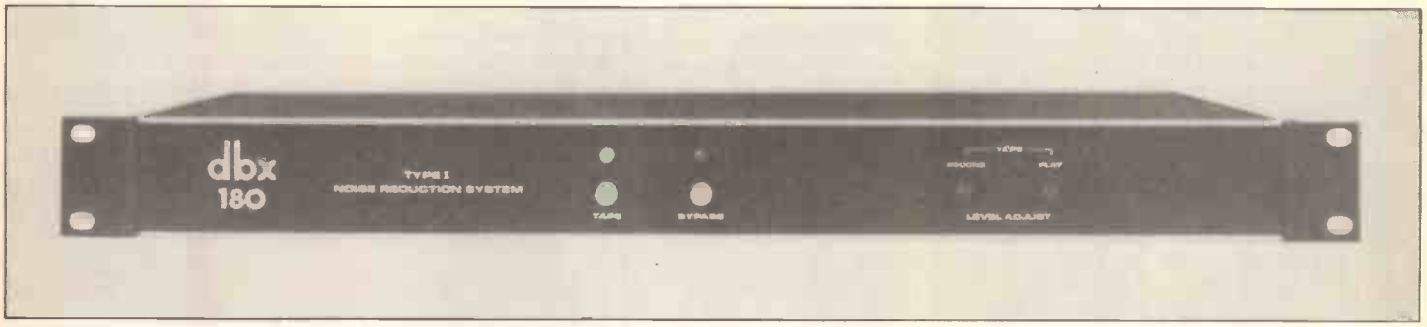


Morley's echo-chorus-vibrator.

Shure Model 711 speaker system.



dbx Model 160X.



dbx Model 180.

continual movement of the foot, the player can create a wide variety of sounds, and the unit's repeat and mixture controls offer further possibilities for sonic experimentation.

When the device is put in its 'Chorus Vibrato' mode, the user can choose among rates ranging from eight cycles per second down to the chorus rate of one cycle every 20 seconds, and the entire range is continuously variable by pedal position during play. The intensity or frequency excursion of the Chorus Vibrato effects are controlled by the device's depth control, while the mixture control blends in the desired amount of modulated signal with the direct signal. Monaural and stereo outputs are provided for both Echo and Chorus Vibrato modes. LEDs indicate the functioning mode and rate of Chorus Vibrato. Noise-free performance is assured by the units' state-of-the-art noise reduction circuitry, a compandor, three 18dB per octave filters and a regulated power supply.

One of the more innovative companies involved with signal processing is the Massachusetts-based *dbx*, Inc. And, at a recent meeting of the Audio Engineering Society, the company impressed the participants with the introduction of a functional new compressor/limiter - the Model 160X. Basically, an improved version of *dbx*'s Model 160, the 160X features switchable 'Over Easy' and hard-knee operation regardless of compression ratio selected. It also has an exclusive precision dual-display system with an expanded range for continuous monitoring of gain reduction as well as input or output levels.

The rack-mountable unit's true RMS display system incorporates a 19-LED display, which monitors input or output signal level over a 60 dB range, and a 12-LED display to indicate the amount of gain reduction over a 40 dB range. Other features include both input and output connectors via convenient tip/ring/sleeve phone jacks, as well as a barrier strip connector for economy, reliability and ease of use. The 160X's continuously variable compression ratio provides selection of the precise ratio needed for any situation. An independently accessible detector input allows compression pre-emphasis or de-emphasis, anticipated compression and other effects.

Another new product from *dbx* is the Model 180 Type I noise reduction system, which provides two channels of encode electronics and two channels of decode electronics. It's intended for use with professional two-track tape machines.

According to Lance Korthals, *dbx*'s director of marketing and sales for professional products, "the new noise reduction system will produce a stereo master tape which fully preserves the dynamic range of live music and is completely free of audible tape hiss as well as distortion due to tape saturation".

The Model 180 is designed for installation between the console of mic mixer and the line level inputs to the tape machine. It's compact and light in weight and can be easily taken into the field on remotes or on location jobs. The separate encode and decode electronics permit decoded monitoring off tap of the signal being tested. Additional features include: active balanced high level inputs; +24 dBm output drive capability with provision for output balancing transformers; more than 40 dB additional dynamic range, and true RMS level detection for perfect encode/decode tracking.

dbx also used the Fall 1981 Audio Engineering Society meeting to launch its new F-900U frame, an unpowered version of the *dbx* F-900 frame. It will accommodate up to eight active 900 Series signal processing modules, with storage for a single unpowered module. No soldering or special interconnections are necessary. Suggested retail price is $400.

A new monaural reverberation system - the Master Room XL-121 - comes from MICMIX Audio Products, an electronics firm in Texas. According to the company, this new unit eliminates the unwanted sounds that seem to go with most spring-type reverbs - you know, that "boing" that occurs whenever you kick your guitar amp. MICMIX is quick to add, however, that the elimination of these noises is accomplished without internal limiting or any other form of signal processing intended to compensate for reverb deficiencies.

The XL-121 has a preamp gain control that lets the unit accept a low-level musical instrument output such as a guitar, or higher level signals associated with recording and sound reinforcement consoles. The output level control permits further flexibility in interfacing with other signal processing equipment. The front panel output mix control allows blending of the direct and reverberated signals, giving the user a chance to get some really interesting sound shadings. This flexibility is further enhanced by the unit's equalisation section, which includes a low, mid and high control, all with 12 dB of boost and cut. Suggested retail price is $450.

For those in the market for a public address speaker system, the Shure 711 may be worth considering. It's designed with the needs of small to medium-sized performing groups in mind, but it's also suitable for sound reinforcement applications in schools, churches and auditoriums.

Each system consists of the new Shure-designed, 15-inch, die-cast frame woofer, in a front-ported bass reflex cabinet, and a Shure high frequency horn and driver combination. Both woofer and horn are front mounted for easy field servicing. The power handling capacity is 150 watts of continuous programme material. The 711 has an impedance of eight ohms and produces 101 dB SPL at one meter with only a one-watt input.

One of the 711's unusual features is the VARAD variable sound dispersion control. Its operation simply involves adjusting two sliding controls for one of four sound dispersion patterns: 60 or 90 degrees left, 90 degrees right, or 120 degrees. The 60 degree setting is used where narrow, long throw coverage is desirable. The 90 degree settings are for medium range coverage or for odd shaped rooms, and the 120 degree setting is for wide area coverage in short throw applications. The 711's cabinet is constructed of durable, lightweight plywood. It also boasts an acoustically transparent metal grille and convenient built-in carrying handles. **E&MM**

Names and addresses of companies mentioned:

Buchla & Associates, P.O. Box 5051, Berkeley, CA 94705

Stick Enterprises, Inc., 8320 Yucca Trail, Los Angeles, CA 90046

Morley, Rosetti (EMI) Ltd, 138-140 Old Street, London EC1V 9BL. Tel: 01-253 7294.

dbx, Inc., Scenic Sounds Equipment, 97/99 Dean Street, London W1V. Tel: 01-734 2812.

MICMIX Audio Products, 2995 Ladybird Lane, Dallas, TX 75220

Shure Brothers Inc., Eccleston Road, Maidstone ME15 6AU. Tel: (0622) 59881.

ELECTRO-MUSIC ENGINEER

by Ben Duncan

MAINS CONNECTORS

Of all the connectors used in the Electro Musicians Workshop, perhaps the most important are those carrying the mains supply: if this supply disappears *everything* stops functioning. Mains voltages also have the unquestioned ability to generate RFI, transient kilovoltages, involuntary fires and pyrotechnic exhibitions and are also particularly adept at electrocution. So with this in mind the following article describes some of the more reliable, high quality mains connectors.

13A Plugs

The 13A plug, a symbol of Britain's oft-maligned genius, is potentially a very reliable and safe connector. But some, having sunk to supermarket level (like records), barely meet acceptable standards. Though being cheap, they tend to find a home amongst the gear of impoverished musicians.

Hard plastic plugs are prone to shatter at inconvenient moments, but are usually acceptable for the sedentary pace of the studio and workshop. Those made by MK and Eveready are accredited with the highest standards, and are recommended. In particular, the old style MK plugs manufactured in the 60's, frequently found in virtual mint condition on second-hand equipment, are particularly tough and well designed. But that's a special exception; most second-hand plugs will be in a poor condition, and if the body is cracked or the terminals are suspect *in any way*, they should not be used.

For stage work, shatterproof rubber plugs are called for. Obviously, this designation must exclude rubber topped plugs which retain the hard plastic insert. And it's important to be aware that Duraplug, who lead the field, produce two styles of rubber plug. The cheapest and most commonly available is much the same size as a hard-plastic version, but it suffers from an unfortunate malady which made these connectors disreputable. Namely, if the plug pins lie prostrate, and the plug is then trodden/jumped on, nothing breaks — but the pins 'do the splits'. So when the unfortunate plug next meets a socket, great patience and electrocution defying finger-work is needed to persuade the avant-garde V-shaped pin alignment to conform to the socket. So if such treatment is inevitable, the larger and altogether more rugged rubber plug must be sought — it's known as the *Husky*. Apart from the steadfastness of the pins, this plug also features meatier cable clamping and bushing, suited to the 15 and 20A rubber extension cables it's designed to be used with. And to all intents and purposes, Duraplug's Husky is the nearest one can get to a roadie-proof 13A plug.

When wiring up 13A plugs, spurious disconnection at a future date can be avoided by taking simple precautions in three areas. First examine the fuseholder and fuse. The springy fuse grips will move apart in time, so it's a good habit to squeeze them together whenever changing a fuse. The grips and fuse may also be tarnished. Apart from causing intermittent contact, this can also give rise to overheating. A mild abrasive, e.g. cutting polish, can be used to clean off the corroded layer, but out 'on-the-road', an equally effective cure is to rotate the fuse a few times in the now tightly fitting grips.

A selection of mains connectors.

Next, the termination must be firm. The 13A plug's course-threaded brass screws are soft, and by judicious tightening, the threads will lock. But the amount of torque this requires is something of a knife-edge between the screws slackening off at a later date (particularly if your music invokes large doses of bass), and the screw-head shearing. As the latter event makes the plug useless, it's wise to play safe and undertighten if you're not adept at sensing the elastic limits in metals. Plugs should be inspected periodically in any case, so marginal under-tightening simply makes this precautionary task psychologically more rewarding.

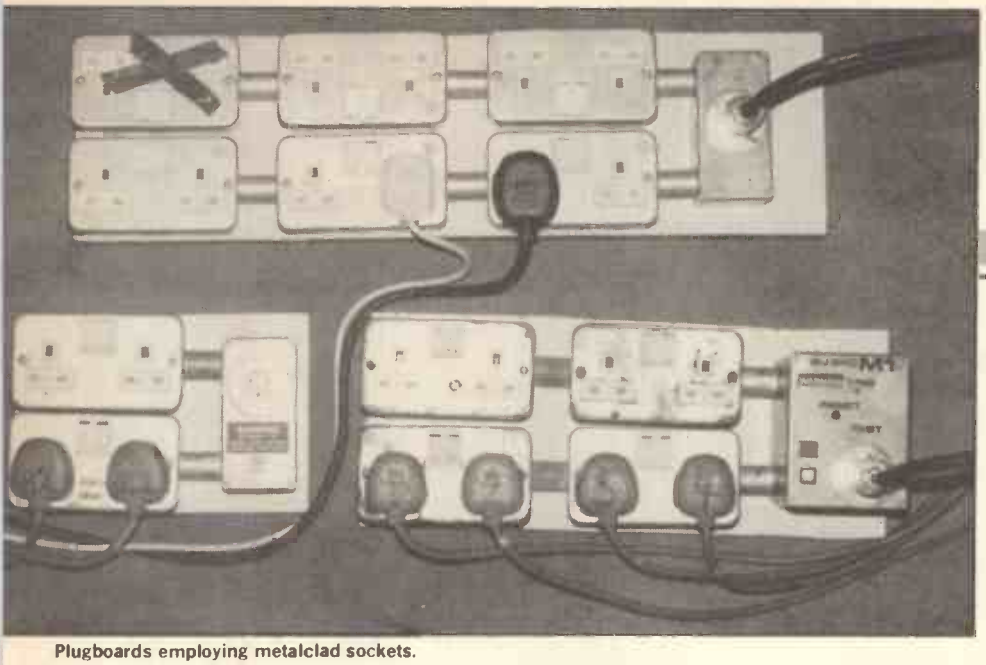
Nonchalant overtightening is also prone to cut through the conductors, particularly the relatively thin 6A (0.75mm^2) cross-sections that are standard for sound equipment. To an extent, this can be avoided by tinning the wires, though the conductor may then be prone to break through fatigue as the tinned section is manipulated into the terminal. A better technique is to tin doubled-over and twisted conductor strands. Once a reasonable cross-sectional area of conductor has been built up, it will be possible to tighten the screws such that their crushing, cutting action doesn't significantly weaken the termination, but makes it more reliable through a cold welding effect.

Thirdly, tug the cable sharply to check that it's firmly secured. With a rubber plug, this test must be performed after the plug's lid is in place. Otherwise the tightened grip screws will foul. If the cable is too thin to be thoroughly squashed by the grip, a couple of binding sleeves, a short length of PVC tube or even several turns of good quality insulating tape will enlarge the diameter. And as cable grips aren't infallible, particularly if you insist on using cheap plugs, it's good practice to leave slack in the earth wire, so that this most vital conductor parts company with the plug sometime after the live and neutral wires have been torn away from their terminals.

A neat finishing touch is to mark plugs boldly with unique and indelible figures, e.g. A for amplifiers, X for crossovers, D for mixing consoles, so that the task of identifying them in a large array can take place quickly, without the series of *bangs* and expletives that signify trial and error unplugging! And of course, in the case of rubber plugs, ink shows up best on the white or orange species.

13A Sockets

Sound equipment invariably requires a large number of mains plugs (n), and you can be sure that the number of outlets available in any home or venue will never exceed (n - 1), and generally tends towards (n/10)! The conventional domestic remedy, in the shape of three-way adaptors won't make



Plugboards employing metalclad sockets.

much impression on this problem, and for recording or performing, their precarious physical stability leaves much to be desired. They are also prone to shatter. Thus, at an early stage you'll have to build up an array of sockets — a *plugboard.*

Perhaps the cheapest and simplest way to do this is to mount a number of four-way 'Multibloc' distribution boards on a sheet of plywood. Being fabricated of soft plastic (PVC), the exterior of these boards is certainly rugged, but the socket insert springs and internal connections aren't really up to use 'on-the-road', particularly in respect of the massive peak current requirements of large amplification systems. In addition, these boards don't feature switches, which makes life very tiresome when specific items of gear have to be isolated from time to time.

The universal component for 'on-the-road' use is the MK metalclad socket. This has a hard plastic switch, and is insulated around the terminals, so they're not perfect, and they're also expensive. But the long term reliability and ruggedness of the body and the terminations is beyond question, and, in practice, they prove very trouble free.

Unlike an integrated 'Multibloc', some effort has to go into mounting and wiring up discrete sockets. Metalclads are either surface mounted on a ply board, being linked with short lengths of threaded conduit and brass male nipples, the conduit protecting the link cables and assuring fail-safe earth continuity. Or the mounting is flush, in a stage-box or flightcase, usually with a recessed surface to protect the sockets should the plugboard be dropped face downwards.

If the plugboard features a permanently attached extension cable, it's essential that this is securely restrained and protected from abrasion at the anchoring point. For stagebox and surface style mounting alike, brass cable glands with butyl rubber inserts are available from electrical wiring contractors. Again, binding sleeves may be used to make a thin cable thicker.

Wiring metalclad sockets calls for the same considerations as plugs; but also leave enough slack cable so that sockets may be removed for inspection, giving the earth conductor the most slack of all.

Finally, with the terminals being designed to fit two or more 2.5mm² conductors, 0.75mm² or 1.5mm² (6 or 13A) extension cables will require substantial building up if the terminal screws are to make reliable contact.

Connectors for the other end

By now, 13A outlets are mercifully almost universal throughout the U.K.. But after 35 years, a few 5 and 15A round pin outlets linger on, and if you habitually play in seedy village halls and decrepit cinemas, it's a good idea to carry round-to-square adaptors, or to make up a pair of tough rubber conversion cables. These consist of a short length of cable, with 13A rubber 'extension' sockets on one end, leading to 5 and 15A plugs, again of the rubber variety. Although you won't engender much sympathy if you seek these in the high street on a Saturday afternoon, round pin connectors are still widely used in stage lighting, and are thus available from lighting equipment distributors.

A less satisfactory situation exists as regards standardisation of the sundry mains connectors that lie at the *equipment end* of your mains cables. Clearly detachable mains leads are a desirable feature, both in mobile systems and whenever equipment is stacked ceiling high in studios and workshops and equally desirable is a standard connector. In this case, a number of resident spare leads will overcome the nuisance when detachable cables to go astray, and will also enable equipment withdrawn from a rack or other awkward position to be plugged in without the need to unravel the original lead from the usual spaghetti. There's also no need to tie the cable around the gear for transportation, nor the suffering to plugs and feet alike if the cable unravels itself and drags along the floor. On 60's equipment, most connectors are of the round pin Bulgin style, and here again, hard plastic together with tiny screw terminals plus inadequate cable grips and bushing makes an unsatisfactory connector outside the workshop.

The modern equipment — the "IEC" or "Euroconnector" is largely devoid of these shortcomings, provided you choose an upmarket version, typically those produced by British manufacturers such as Bulgin. Versions with integral, moulded cables should definitely not be used. Wiring is straightforward, and being designed for soldered connection long term reliability in the presence of loud Reggae is excellent! The IEC can also be made to latch, making it equal to connectors costing much more. However, manufacturers appear to be reluctant to fit latching clips because these all too readily spring out and disappear in transit. Replacements are cheap, but it's easy to loose hundreds of clips each year, so the IEC remains, for the most part, unlatched. A simple expedient here is to feed 20swg tinned copper wire through the retaining pillar holes, wrapping both ends together around the clip and soldering the joint. The outcome is a very reliable latching mechanism, consummating the IEC's aim — to specify a safe, elegant and troublefree universal equipment connector.

If you have large funds, an even better, albeit less common connector is the XLR-mains. This is very similar in style and idiosyncrasy to standard Cannon XLRs, and apart from the small screws, fragile pins and lower current rating (2A versus 6A for an IEC), it's an altogether much more rugged and reliable connector.

For plugboards and equipment racks, more substantial plugs will be required, to withstand mean currents of 10 to 20A, and in the case of PA systems, peak amplifier currents of 100 to 200A. One standard here is the Cannon EP connector, rated at 20A. Being the XLR's predecessor, it was originally used as an audio connector — and may still be in some installations — and the mains wiring isn't a universal standard, though it sensibly mimics the wiring of familiar 5/15/13A plugs, see Figure 1. So be wary of using other people's EP connectors! As with the IEC and XLR-mains, soldered connections assure long term reliability.

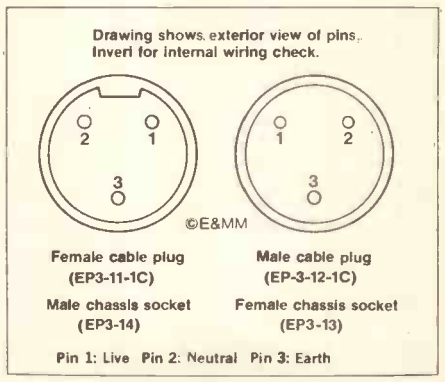


Figure 1. EP connector wiring.

A more bulky, but cheaper and in many respects, a better alternative is the 16A 'Industrial plug'. These are designed for use on building sites, and apart from the screwed terminations, there can be no quibbles about their stamina! Also, they are available in two, non-interchangeable colour-coded styles, one being intended for 110/120V equipment. A particular advantage of the EP series, however, is the wide range of pin configurations, multipin versions being particularly useful for terminating mains multicores in studios and lighting rigs. In addition, the EP is the only range of mains connectors which caters for both mains inlets and outlets, viz: both male and female varieties are available in cable and chassis mounting format **E&MM**

RECORD REVIEWS

Rainbow Delta
by Patrick Gleeson
Passport Records PVC 7914

I heard some of Patrick Gleeson's earlier work when in the States at the beginning of 1980, and it seemed even then that the American creative muse was shining pretty favourably on him. His third album, 'Rainbow Delta', confirms this impression and goes much further.

The tracks on this album were recorded at Different Fur Recording, San Francisco, and provisionally released at the beginning of 1979 as 'I Just Got Here Myself'.

Side 1 consists of a suite of four pieces unified by "the intention to describe a kind of ecstacy". The first of these, 'Frank Stella by Starlight', commences with a remarkably realistic solo cello line beneath a bright, tightly-filtered sequencer pattern. Tonal noise bursts and bass line reinforcements rhythmically propel the track into confrontations with more parts reminiscent of strings, flute and organ, whilst, at the same time, the recorder-like solo line developes a melody that flowers out of the original sequencer pattern. Atonal glissandi add to the almost free-form contrapuntal style until, at the climax, a tight splice is made into a snappy disco-type ensemble. Lots of interaction between temple blocks, wood drums and a punchy synthesiser bass line make for a powerful contrast to the first track, and the shortness of the track is explained by the title, 'Unacceptable Dance Styles'!

Another tight splice drops the listener in the middle of 'Take the 5:10 to Dreamland', a haunting landscape of crickets and night creatures which provide a backcloth for a mellow piece of strings-based introspection. As with previous pastoral portrayals, 'Nature' has its own way by ending the calm scene with a powerful thunderstorm complete with driving rain.

This segues into 'La Grange Point Five', supposedly expressing the composer's joy and optimism about Gerald O'Neill's vision of artificial planets. The track could be described as a sort of cosmic mambo with plenty of galactic swirlings and suitably spaced-out keyboard improvisation. Near the end, each change of key is accented by a cymbal crash, sound effect, or cluster sweep and this leads into a majestic recap of the main themes.

All the tracks were recorded part-by-part on 24-track using E-Mu Systems and Sequential Circuits analogue synthesisers — a wise choice because the clarity of these systems really shows through.

Whilst Side 1 is dominated by a free, improvised quality, Side 2, a suite entitled 'Draconian Measures', lives up to its title with a rather tighter, more disciplined structure. This, Gleeson informs us, is because "the core of each of the four pieces in the suite is a single measure stored in computer memory and manipulated and edited on a Z-80 microprocessor . . . consequently the forms of the pieces have generated in part by compositional choice and in part by the edit and storage structure of the computer". This is actually a bit of a red herring as the tracks on this side are in many ways much more exciting and liberated than those on the first.

The longest track, 'Arrival Music', really stands out with some stunning synthesis of brass instruments. Using short enveloped bursts of FM during the attack period of the main envelope, Gleeson produces sounds with a real quality of vibrating brass.

Overall, the complex filtering and precision with which he generates balanced or opposing harmonic structures renders instrumentation which is incredibly real and 'acoustic sounding'.

One of my all-time favourite albums of the electronic ilk is 'Zero Time' by Tonto's Expanding Head Band; Patrick Gleeson's 'Rainbow Delta' has now replaced it!

David Ellis

Mosaique
by Robert Schröder
IC KS 80.016
Distributed by Making Waves in U.K.

'Mosaique' opens with the 12 minute long title track, starting with a simple sequencer pattern. This is soon joined by Charly Buchel on guitar with the addition of Robert's vocals, recorded with the use of a "voice box" *à la* Peter Frampton. The melody line then takes over and continues for the rest of the first half of the track with Robert's PPG Wave 2 which he uses on the whole album.

Upon first hearing, the combination of a relatively simple melody line and the sequencers and drums being right up front makes the track appear somewhat repetitive. Upon subsequent listenings, however, more subtleties are realised that make it far more acceptable, or to put it simply, it grows on you. The latter half of the track is livened up considerably by the reintroduction of the guitar and vocals, once again with voice box.

Track two, "Utopia" follows the same pattern but takes a long time to build up and ends very suddenly, which I personally find unnerving. I have visions of Barney Roth-Profenius (I.C.'s recording engineer) popping up and saying "come in Robert, your 18 minutes are up!" Both tracks are up-tempo and this combined with the guitar and voice box give the "A" side a more conventional rock sound.

On to the "B" side we start with the 6½ minute long "Aix-La-Chapelle", the French for Robert's home town of Aachen incidently. This track takes the form of a march and I have a strong suspicion that it may have been based on the poem "From Aix to Ghent". It's a catchy little piece, however, and although certainly different from the styles associated with electronic music, you can't help liking it. Now on to the real high spot of the record, the 12½ minute long closing track "Computervoice"; it starts very quietly and builds with a slow fade up of sequencers to a beautiful melody, and the addition of Fred Severloh's excellent drumming adds just the right amount of excitement. This then gives way to the solo piano which lulls you into thinking the piece is coming to an end. This misapprehension is soon corrected, however, by the almost ominous sound of Charly Buchel's guitar, whereupon Robert starts into another slow melody, the beauty of which lies in its simplicity. This lasts for a further 3-4 minutes when the track finally fades to a close. Whereas the majority of the album takes time to grow on you, the last track needs no such time and is certainly his most beautiful piece since "Harmonic Ascendant" and, in my opinion, should have been the title track. One other artist not previously mentioned who appears on the album is Dutchman Rob Van Schaik on bass.

To join "Harmonic Ascendant" and "Harmonic Accident" (see article) with the vast differences in styles on this album, perhaps we now have "Harmonic Experiment". "Mosaique" is not as immediately attractive as Robert's previous albums but is worth buying on the strength of the last track alone. Hopefully you will find, as I did, that the rest will grow on you.

Dennis Emsley

Trancefer
by Klaus Schulze
Innovative Communication
KS 80.014

This is Klaus Schulze's first solo release since I.C. has been independent and is a digital recording which is technically very good. Unlike all the other releases on his label, this record is meant to be played at 33 r.p.m., but in spite of this the two tracks which make up the album only last just under 19 minutes each. The "A" side, "A Few Minutes After Trancefer", opens with some very aggressive chords whereupon the sequencer's quite fast rhythm takes over and establishes itself at the front of the sound stage where it is to remain for the majority of the track. After some more aggressive chords the solo synth fades in with a slow melody that belies the speed of the sequencer. As the loudness of the solo increases with the addition of Wolfgang Tiepold's cello the sequencer's volume increases to maintain its prominent position, only to be overpowered by more aggressive chords which have now taken on a sound not unlike a male voice choir. The whole piece now becomes louder and faster reaching a crescendo with the various component parts vying for position. Calming down, the lead is taken in turn by various combinations: sequencer/drums, cello/drums, sequencer/cello, the latter being the start of the most beautiful part of the piece as it is joined by Schulze whose synth has taken on the sound of a cello also. The sequencer's change to the tinkling bell sound is reminiscent of "Crystal Lake" (the "B" side of Mirage), and as the solo melody increases in volume you begin to look forward to the good things to come, only to be disappointed by the fade down and finish of the side.

The bongo drums used on this side, where played along with the sequencers, make some parts sound both monotonous and cluttered. Also the unfulfilled promise of the last few bars I find personally disappointing.

Side 2 starts with 'mournful' synthesiser which is soon joined by a simple sequencer pattern that continues throughout the piece over the background of a single continuous note. This increases in volume as the sequencers speed increases. A cello melody is accompanied by the opening sad swirling synth. Michael Shrieve's drumming on this side is

much more imaginative and there are changes that are so subtle that it would take a book to explain them all, but in my opinion it is the better side.

The title "Silent Running" is of interest; I know Klaus Schulze has a video tape of the excellent film of the same name (certainly the best sci-fi film I have seen), I don't know for certain if this piece is based on it, but the fast beat and imaginative drumming reflect well the excitement of future technology whilst the sad sound of synth and cello reflect the human emotions revealed in the story.

Wolfgang Tiepold's contribution maintains throughout the same high standard that we have come to expect from his earlier work with both Klaus Schulze and Robert Schröder. Whatever I say about this album, Schulze fans (of which I freely admit I am one) will buy it, but I would not recommend it for those of you who may be tempted to buy this as an introduction to his work. It neither attains the heights reached by his earlier work nor is it a significant step forward, but I would add in its defence (as Schulze himself admits) that this album needs a few listenings to be fully appreciated.

One point I would like to mention: WEA have released a compilation album of Klaus Schulze's earlier work, the cover of which looks remarkably like an I.C. release, so don't be mistaken. Trancefer was the only NEW Klaus Schulze release.

Dennis Emsley

VIDEO REVIEW

Kate Bush
"Live at Hammersmith Odeon"
Running Time 52 minutes
EMI TVD 90 0503 2

The first Kate Bush concerts were given at the London Palladium in April 1979. They were a tremendous success and brought to the public eye her wide range of talent. This film was made from recordings at London's Hammersmith Odeon on 13th May 1979.

Kate's use of dance and mime as a natural part of her stage act, combined with her musical skills as a songwriter, vocalist and pianist, make her performance ideal for the video medium.

She conceives, designs and produces all of her shows which is a feat in itself and is assisted in her stage performance by two dancers: Gary Hurst and Stewart Avon-Arnold, an illusionist and mime artist: Simon Drake, along with first-class 7-piece band and vocal duo. Backing vocals are provided by Liz Pearson and Glenys Groves with the band's personnel including Alan Murphy (guitar, whistle), Brian Bath (guitar, mandolin and vocal harmonies), Del Palmer (bass), Paddy Bush (mandolin, vocal harmonies, additional instruments), Kevin McAlea (piano, keyboards, sax, 12 string guitar), Ben Barson (synthesiser, acoustic guitar) and Preston Heyman (drums).

The opening song 'Moving' is a creative fusion of bubbling sea and dolphin-like noises as Kate emerges silhouetted against a single bold spot. Her use of a discreet radio mic headset allows complete freedom as she makes her sensitive dance movements.

'Them Heavy People' follows without a break and brings in two dancers in raincoats and hats. There is considerable use of over-dubbing of recorded pictures in this and other numbers, with subtle use of colour. The stage set can now be seen with backstage drop containing Kate's entrance 'circle' and central sloping ramp to stage level, with the band positioned across the back on both sides.

'Violin' has interesting harmonies and musical arrangement (with predominant use of root, fifth, flattened fifth motiv). Simon Drake appears as the mad violinist whilst dancers become elongated double basses. 'Strange Phenomena' uses an opening space landscape and floating dance movements which create plenty of emotion over the steady tempo. Words are sometimes obscured and it would have been nice to have a printout of Kate's own lyrics, although the interpretation always carries the songs through.

'Hammer Horror' shows Kate stepping out of the pupil of an eye to dance energetically to a taped backing including her vocal part. At this point the complete costume changes for each number becomes a noticeable feature of the performance. This song also shows Kate's tremendous vocal range. 'Don't push your foot on the heartbrake' has overdubbed torchlights and dancers which fill the screen, with grand piano opening accompaniment that soon breaks in and out of a strong rock piece. It is in fact quite difficult to place your band behind you and still achieve lighting control that 'paints' the set picture. Here it is extremely well done using the minimum of props - just three 'fence grids' here.

Audience applauds as dry ice rolls across the floor for 'Wow'. This is one of her most popular songs and shows off her unusual emphasis on movement (for a vocalist). 'Feel It' is a gentler solo with Kate on piano. 'Kite' puts echoed chords and rhythm to good use against a lighthearted beat - the dancing is particularly good and the visual effects make this artistically interesting.

'James and the Cold Gun' is a powerful piece, yet containing Kate's softer articulated lyrics as well. Inevitably the gun appears and a long dance sequence portrays the dramatic shooting enhanced by drum 'ricochets' and strong lights. 'Oh England my Lionheart' brings Kate into close-up with piano and harpsichord accompaniment and distant bird sounds.

'Wuthering Heights' provides a suitable end to this memorable collection of songs, which are all complete in themselves. Sound balance and production from the Manor Mobile is well done, with plenty of interchanging solos from the band, and only the one criticism of indistinct vocals in places.

Considering this is a video derived entirely from the stage performance alone, it must serve as a prime example of the integration of music, dance and visual effects and should capture your interest time and time again - one of the most difficult requirements of any video film.

TOP 20 MUSIC VIDEO CHART

1.	(2)	Queen — Greatest Flix	EMI
2.	(3)	Rock Flashback — Deep Purple	BBC/3M
3.	(4)	The Best Of Blondie	Chrysalis
4.	(5)	Adam & The Ants	Home Video Production
5.	(1)	Siouxsie & The Banshees	Spectrum
6.	(8)	Thin Lizzy — Live & Dangerous	VCL
7.	(7)	Pink Floyd Live At Pompeii	Spectrum
8.	(16)	Paul McCartney & Wings Rockshow	EMI
9.	(12)	Cliff Richard — Thank You Very Much	EMI
10.	(20)	Kate Bush Live At Hammersmith Odeon	EMI
11.	(9)	ELO Live In Concert	VCL
12.	(10)	Abba Vol II	Intervision
13.	(—)	Black Sabbath	VCL
14.	(—)	Toyah At The Rainbow	BBC/3M
15.	(13)	Elvis — King Of Rock'n'Roll	World of Video 2000
16.	(11)	Slipstream — Jethro Tull	Chrysalis
17.	(—)	Elvis In Hawaii	Mountain Video
18.	(—)	Iron Maiden	EMI
19.	(—)	Blondie — Eat To The Beat	Chrysalis
20.	(14)	Rude Boy	Video Space

Compiled by HMV Shop, 363 Oxford Street, London W1.

Twenty of the best selling records during E&MM's first year.

1.	Toy Planet	Irmin Schmidt
2.	Sequences	Didier Bocquet
3.	Silk Roads	Kitaro
4.	Floating Music	Robert Schröder
5.	Voyage Cerebral	Didier Bocquet
6.	Some Deaths Take Forever	Bernard Sjagner
7.	Computer World	Kraftwerk
8.	Trancefer	Klaus Schulze
9.	Exit	Tangerine Dream
10.	Heaven And Hell	Vangelis
11.	Regions Of Sun Return	Michael Garrison
12.	Film Music	Irmin Schmidt
13.	Tago Mago	Can
14.	Re-Entry: White Noise 3	David Vorhaus
15.	Synthesist	Harald Grosskopf
16.	Silence Is The Answer	Hari Deuter
17.	Electronic Meditation	Tangerine Dream
18.	Sei Stille	Popol Vuh
19.	Movies	Holger Czukay
20.	After The Heat	Eno, Moebius And Roedelius

This chart doesn't include records released since January 31st 1982. Compiled by concensus of sales by Making Waves Record Distribution; Lotus Retail and Mail Order; Miracle Mail Order.

Micromusic

BASIC music loading program for the ZX81

RECORDED ON CASSETTE NO. 5

So far in this series we've discussed machine code programming of the ZX81, and output ports for feeding synthesisers. This means we can feed out numbers representing notes to up to seven synthesisers, giving polyphonic music. In this, the last article on this subject (for a while at least) we shall describe a program for entering the coded notes into the machine. The machine code routine given last month expects to find its data in array A$, and Table 1 lists a program for entering numbers into the array. This program is the result of much alteration and "honing" — which explains the eccentric line numbering system — and this process is still continuing; there is plenty of scope for alteration and customising to suit personal requirements.

The REM statement in line 1 is the machine code routine itself, and is included only to give some idea of what this will look like; don't try to enter it from the keyboard, because it won't work. Instead, enter a REM statement with 180 characters in it (I usually use full stops) and then use the "machine code monitor" discussed in December; this is subsequently erased, leaving only line 1 of course, and the rest of the program can be entered as usual.

Line 9990 enables the program to be stored on cassette in "LOAD" and "RUN" fashion (actually LOAD and GOTO in this case) which saves the embarrassment caused if you try to start the program with RUN; this erases all the music data, of course. If you do stop the program when it contains data you want to keep, always restart using GOTO 100 to avoid bad language and broken computers.

Using the Program

When the program is first run, it will start off by asking you the number of voices (synthesisers) you want to use, the number of notes, and the name of the piece. The number of notes is not necessarily the same as the number of "blobs" in the music; this variable should more accurately be called "events". For instance, if a quaver is the shortest note in the piece, and the music is in 4/4 time, there will be 8 quavers per bar. For reasons which will be explained, you would probably want 16 events per bar, and a 100 bar piece would require 1600 events. You will need a 16K RAM pack to fit the program in, and with this amount of memory there is room for over 12800 events; using the maximum of seven voices, this allows 1825 events per voice, which should be sufficient for most uses.

Once the initial conditions are established, the program moves on to the "title page" which repeats the information you've just fed in, and also presents a list of choices of what to do next; this also happens when the program is loaded from tape.

The choices are selected by entering the appropriate letter. P, T and S should be self explanatory; C enables you to start again from scratch, and E (or indeed any character other than P, T, C or S) is for writing or altering the music. The letter E by itself will start at event 1; if you want to start halfway through, enter E250 (for instance) to start at event 250.

Once you are in edit mode, these letters still have the same effect, so you can skip about by entering E followed by a number for example; and there is also a further "menu" to aid the music entry. If the entry is a number (detected by lines 2115 to 2135) this is taken as a note to be entered; the note code system will vary according to the synthesiser in use, and this was covered in January.

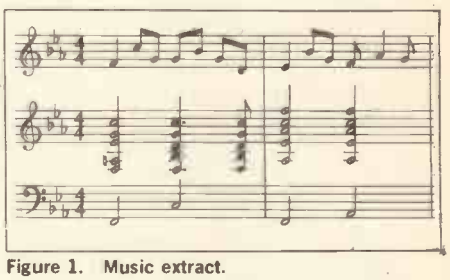


Figure 1. Music extract.

V followed by a number allows you to choose which voice to enter; e.g. V2 selects

Table 2

1	30	37	32	28	22	18	6
2	30	37	32	28	22	18	6
3	30	37	32	28	22	18	6
4	R	37	32	28	22	18	6
5	37	37	32	28	22	18	6
6	R	37	32	28	22	18	6
7	32	37	32	28	22	18	6
8	R	R	R	R	R	R	R
9	32	37	32	27	23	18	13
10	R	37	32	27	23	18	13
11	35	37	32	27	23	18	13
12	R	37	32	27	23	18	13
13	32	37	32	27	23	18	13
14	R	R	R	R	R	R	13
15	27	37	32	27	23	18	13
16	R	R	R	R	R	R	R
17	28	42	37	33	28	21	6
18	28	42	37	33	28	21	6
19	28	42	37	33	28	21	6
20	R	42	37	33	28	21	6
21	35	42	37	33	28	21	6
22	R	42	37	33	28	21	6
23	32	42	37	33	28	21	6
24	R	R	R	R	R	R	R
25	30	42	37	33	28	21	9
26	R	42	37	33	28	21	9
27	33	42	37	33	28	21	9
28	33	42	37	33	28	21	9
29	33	42	37	33	28	21	9
30	R	42	37	33	28	21	9
31	32	42	37	33	28	21	9
32	R	R	R	R	R	R	R
33	STOP						

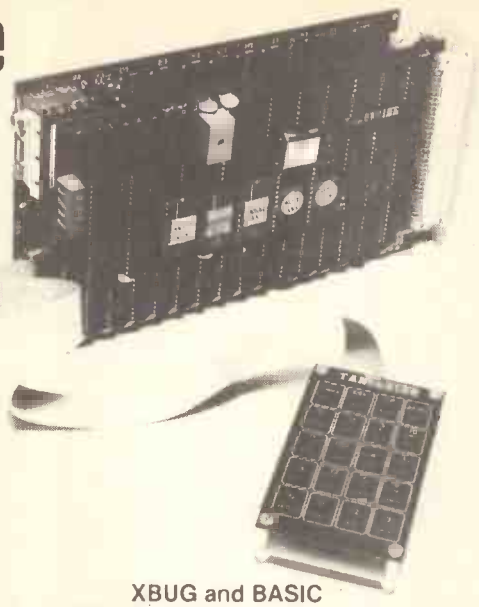
Table 2. Figure 1 music in "linear" code.

Table 3

1	23	16	21	25	35	39	39
2	23	16	21	25	35	39	39
3	23	16	21	25	35	39	39
4	R	16	21	25	35	39	39
5	16	16	21	25	35	39	39
6	R	16	21	25	35	39	39
7	21	16	21	25	35	39	39
8	R	R	R	R	R	R	R
9	21	16	21	26	34	39	32
10	R	16	21	26	34	39	32
11	18	16	21	26	34	39	32
12	R	16	21	26	34	39	32
13	21	16	21	26	34	39	32
14	R	R	R	R	R	R	32
15	26	16	21	26	34	39	32
16	R	R	R	R	R	R	R
17	25	7	16	20	25	36	39
18	25	7	16	20	25	36	39
19	25	7	16	20	25	36	39
20	R	7	16	20	25	36	39
21	18	7	16	20	25	36	39
22	R	7	16	20	25	36	39
23	21	7	16	20	25	36	39
24	R	R	R	R	R	R	R
25	23	7	16	20	25	36	36
26	R	7	16	20	25	36	36
27	20	7	16	20	25	36	36
28	20	7	16	20	25	36	36
29	20	7	16	20	25	36	36
30	R	7	16	20	25	36	36
31	21	7	16	20	25	36	36
32	R	R	R	R	R	R	R
33	STOP						

Table 3. Figure 1 music in Wasp code. Note that the bass Wasp will need to be set an octave lower than the others to get in range.

Step by step with the computer system designed for tomorrow.



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

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Microtan Accessories
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Aerial connector lead
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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).

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* 10K Microsoft Basic
* 32 Parallel I/O lines
* 1 Serial I/O port
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* 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.

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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.

To complete Tanex, a comprehensive user guide is supplied which contains full constructional details. This manual is also available separately.

Tanex (Min Config) Kit £50.95 inc VAT and P & P
Tanex (Min Config) Assembled £62.45 inc VAT and P & P
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E&MM/3/1982

tangerine computer systems ltd Forehill Works, Ely, Cambs. CB7 4AE.

```
   1 REM TAN                  " RETURN
GOSUB ?STAN Y4 ?TAN " 3 Y GOSUB
?LN RND( RUN LN RNDS CLS " 3 Y6
 GOSUB ?LN RND( RUN TAN E(RND C
OS NEW STEP RETURN ?C? RETURN C
( RETURN STEP C<????7/?)  /"7ACS
 -K CLS / POKE ) > ;/SGN )  ;TAN
?:3<>RND<>7( POKE <> FAST <> LPR
INT <>7<>?LN RNDSQR <= TO #S RU
N LN GOSUB RNDACS ?C  RETURN STO
P 4 LLIST COS LN RNDSQR <= TO *
K RUN LN GOSUB RNDACS ?C<= RETUR
N STOP 4LN TAN
  10 REM CLEAR
  20 CLS
  30 PRINT "ENTER V"
  40 INPUT V
  50 IF V>7 THEN LET V=7
  60 PRINT AT 0,6;"N"
  70 INPUT N
  80 PRINT AT 0,7;"AME"
  85 INPUT N$
  90 DIM A$(N,V)
 100 CLS
 110 PRINT "**** POLYPHONIC SEQU
ENCER ****"
 120 PRINT
 130 PRINT N;" NOTES"
 140 PRINT V;" VOICES"
 145 PRINT
 150 PRINT N$
 155 PRINT
 160 PRINT "ENTER:-"
 170 PRINT
 190 PRINT "E TO ENTER OR EDIT"
 200 PRINT "P TO PLAY"
 210 PRINT "T TO TUNE"
 220 PRINT "C TO CLEAR"
 240 PRINT "S TO SAVE"
 300 INPUT C$
 360 IF C$(1)="E" THEN GOTO 2000
 370 IF C$="P" THEN GOTO 7000
 380 IF C$="T" THEN GOTO 8000
 390 IF C$="C" THEN GOTO 10
 410 IF C$="S" THEN GOTO 9990
 440 GOTO 100
2000 REM EDIT
2005 CLS
2010 LET L=1
2015 LET Z=1
2017 IF LEN C$>1 THEN LET L=VAL
C$(2 TO )
2020 SCROLL
2040 GOSUB 9500
2070 PRINT AT 0,0;"
                   "
2080 PRINT AT 0,3+3*Z;"V"
2100 INPUT C$
2110 IF C$="" THEN GOTO 3040
2115 LET M=1
2120 FOR I=1 TO LEN C$
2125 IF C$(I)<"0" OR C$(I)>"9" T
HEN LET M=0
2130 NEXT I
2135 IF M=1 THEN GOTO 2300
2140 IF C$="R" THEN GOTO 2400
2145 IF C$="F" THEN GOTO 2500
2150 IF C$="J" THEN GOTO 2600
2155 IF C$="K" THEN GOTO 2700
2160 IF C$="B" THEN GOTO 2800
2165 IF C$(1)="V" THEN GOTO 3100
2170 IF C$="D" THEN GOTO 2550
2190 GOTO 310
2300 LET A$(L,Z)=CHR$ (VAL C$+12
8)
2310 GOTO 2720
2400 IF L=1 THEN GOTO 2450
2410 IF A$(L-1,Z)<"RND" THEN LET
 A$(L,Z)=A$(L-1,Z)
2420 IF CODE A$(L-1,Z)>127 THEN
LET A$(L,Z)=CHR$ (CODE A$(L-1,Z)
-128)
2430 GOTO 2720
2500 LET A$(L,1)=CHR$ 227
2510 GOTO 2720
2550 LET A$(L,1)=CHR$ 236
2560 GOTO 2720
2600 LET A$(L,Z)=A$(L-1,Z)
2610 GOTO 2720
2700 FOR I=1 TO V
2710 LET A$(L,I)=A$(L-1,I)
2715 NEXT I
2720 PRINT AT 21,0;"
                   "
2730 PRINT AT 21,0;
2740 GOSUB 9500
2750 GOTO 3040
2800 PRINT AT 21,0;"BLOCK SHIFT:
ENTER START,FINISH"
2810 INPUT S
2820 INPUT F
2830 IF S=L OR F<=S THEN GOTO 28
00
2840 IF S<L THEN FOR I=F-S TO 0
STEP -1
2850 IF S>L THEN FOR I=0 TO F-S
2860 FOR J=1 TO V
2870 LET A$(L+I,J)=A$(S+I,J)
2890 NEXT J
2900 NEXT I
2910 LET L=L+1+F-S
2920 GOTO 2020
3040 LET L=L+1
3050 IF L<=N THEN GOTO 2020
3060 SCROLL
3070 PRINT "END OF ARRAY"
3080 GOTO 300
3100 LET Z=VAL C$(2)
3110 GOTO 2060
7000 REM PLAY
7090 FAST
7100 LET Q=USR 16640
7130 SLOW
7140 GOTO 100
8000 REM TUNE
8010 LET Q=USR 16536
8020 GOTO 100
9500 FAST
9501 PRINT L;
9505 IF A$(L,1)=CHR$ 227 OR A$(L
,1)=CHR$ 236 THEN GOTO 9590
9510 FOR I=1 TO V
9520 LET T=CODE A$(L,I)
9530 LET O$=STR$ (T-128)
9540 IF T<64 THEN LET O$="R "
9555 IF T=0 THEN LET O$="- "
9560 PRINT TAB 3+3*I;O$;
9570 NEXT I
9575 SLOW
9580 RETURN
9590 PRINT TAB 6;A$(L,1)
9595 SLOW
9600 RETURN
9990 SAVE "POLYSEQ"
9995 GOTO 100
```

Table 1. BASIC music entry program.

voice 2. A letter V at the top of the display points to the voice in use.

New line allows you to skip on to the next event without entering any data.

R enters a rest.

J repeats the previous entry.

K repeats the previous event, but on all voices at once; for sustaining a chord, for instance.

B repeats a whole block of several events. This is also useful for moving the data around — so that you can insert new material, for instance.

F (for fine) signals the end of the piece.

D (for da capo) also signifies the end, but makes the piece repeat until BREAK is pressed.

A Musical Example

Figure 1 is an extract from a piece by yours truly, written so that it uses the maximum of seven voices. The shortest note is a quaver, so you might expect the extract to need 8 events per bar, 16 altogether. In fact, in some places notes are repeated, but not "tied"; a musician playing these would automatically insert a small rest between them, even though one is not written. The computer has to be told about these rests explicitly, and so we allow 32 events to give room for the rests.

Table 2 shows how the piece would appear programmed in "linear" code — for feeding D to A converters for instance — and Table 3 gives the same thing in Wasp code; hopefully these examples will clarify any minor points I haven't explained.

As you will see, a certain amount of effort (not to say tedium) is involved in entering a lengthy piece of music; this is the price you pay for such a good value system. How much would a 12 000 note sequencer cost from a commercial manufacturer, if such a machine were available? For the sake of a day's work slaving over a hot TV set, my ZX81 can play nearly any music I choose, as many times as I like, and much better than I ever could! (My chess computer keeps beating me too.)

Peter Maydew **E&MM**

CASSETTE REVIEW

This is the first of Electronics & Music Maker's CASSETTE REVIEWS, in which we hope to give an indication of what readers are up to musically, and also print 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.
As you can see from the first selection listed below, the recording method used is, of course, entirely up to you. The range we seem to be getting at the moment 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.

Tape Of The Month

MARTIN LLOYD '3 Electronic Dance Tunes' ('First Steps', 'Cocktail Party', 'Mobile'). No instrumental or recording information given. TDK SA, Dolby, stereo.
This month's best, and this month's least informative! We must stress that you should send some information on instrumentation and recording methods with your cassette. The music '3 Electronic Dance Tunes' is contemporary and well-crafted — some obvious Casio keyboards are used for some of the melody lines, and a vocoder pops up toward the close of 'First Steps'. The first two tunes are sequencer-based — the sequencer together with a three-element drum machine (bass drum/hi-hat/handclaps) creates the pulse for these tunes. Some live 'party'FX open 'Cocktail Party', although stereo would have been more effective than the panned mono used (we suspect track limitations). 'Mobile' is the most interesting of the three pieces — looser and less rhythmically limited than the others — and features lower bass sounds and response. There are few chords, but again the arrangement is well put together, and Martin has used his resources well. Presentation to us was minimal — just the cassette, nothing else — but musical content and production, coupled with some good ideas, get Martin Lloyd E&MM's first *Tape Of The Month* tag.
Music: 8 Production: 6 Presentation: 2 Tape: 5

ADRIAN KIRK (Syd Nairda). Seven pieces selected from previous cassette-only releases. F B Lambert acoustic piano, Roland SH2 synth, Korg Delta string synth. Sound-on-sound on Teac A3300SX stereo reel-to-reel, mix plus extra input to Sony cassette deck, mix back to Teac. Hitachi UD, Dolby.
13-year-old Adrian Kirk is to be congratulated on his recordings on the evidence he's presented us here. His pieces are mostly piano-based in composition and performance, and the piano is, of course, one of the most difficult instruments to record well — sound-on-sound doesn't do much for the piano's range or dynamics. His other keyboard work is often interesting, although again sound-on-sound can lead to some clumsy-sounding instrumental entrances. Only one piece, 'Telephone' from Adrian's 'Synthetic Suite No 1', sounded ill-balanced and rather hesitant — others, like 'Autumn Comes' with its long Korg string tones or the more ambitiously composed 'Dance Of The Octopus', fare better. A new 'Syd Nairda' tape comes out soon — watch E&MM's classified pages.
Music: 5 Production: 4 Presentation: 4 Tape: 4

TONY COTTRELL Extracts from 'Another Dream' cassette-only release, plus recent material (untitled as yet). 'Another Dream' extracts: Electric guitar, bass guitar, metronome, treated percussion, voice. Recent material: Mono synth, organ, metronome, rhythm machine, bass guitar. Recorded between two stereo tape decks. TDK D.
Both sections of Mr Cottrell's tape are interesting, and the music is varied and well contrived. Some superb rhythmic bass playing ensues on 'Hazard: Second Impression', perfectly balancing the echoey, treated rhythm machine, and 'Another Dream, Hiatus II', also from the 'Another Dream' release, is a high-spot, a soft, flowing piece with an almost choir-like sound in the distance, cleverly layered together. The recent material is more introspective and, we suspect, more experimental, but some good ideas are in evidence. Balance can be a bit haphazard with the recording method employed.
Music: 6 Production: 5 Presentation: 4 Tape: 4


Best of the Rest

GEOFF McCANN Six songs. Gibson Les Paul, Fender Mustang bass, Eko acoustic, Roland SH09 keyboard, Boss DM100 delay, Boss Overdrive, Roland CSQ600 sequencer, Roland CR78 rhythm machine, E-H Smallstone phaser, E-H flanger. Teac A3440 4-track reel-to-reel plus RX9 noise reduction, Teac 2A mixer plus MB20, Teac and JVC cassette decks. TDX AD.
Six basic, guitar-based songs from Geoff. A rather dull, 'constricted' sound on our tape, and some balance oddities.
Music: 5 Production: 3 Presentation: 4 Tape: 3

R J CURD 'Incidental Music volume one' Electrosound Cassette ES001 cassette-only release. R J Curd synthesisers, sequencers, etc, plus K Manson guitar on one track. Recorded live in home studio on stereo tape recorder. More releases planned for 1982.
Electronic/synthesiser music. Long, often flowing pieces — some melodic ideas hidden within.
Music: 5 Production: 6 Presentation: 6 Tape: 4

JONATHAN RUSH 'Maze' Rush Clan Recordings cassette-only release. Roland SH1000, Roland RS101 string synth, Cramer baby grand piano, acoustic guitars, Hohner Pianet, phaser, flanger. Plus David Crigger drums, Susan Rush flute, David Rush remix. Akai GX260D reel-to-reel, Akai 4000B reel-to-reel, Teac AN80 noise reduction, Teac A3440S 4-track reel-to-reel (for two pieces, recent acquisition). Also recently acquired Soundmaster drum machine (since the Trigger additions, we hope), Casio MT20, E&MM Noisegate.

Considering that most of this tape was recorded with a combination of sound-on-sound and stereo bouncing, the quality is admirable and a very good job has been done. Naturally, clarity is lost occasionally and balance can sometimes be difficult to control accurately, but the results are generally good and the music is varied enough to maintain interest throughout both sides. An E&MM Gold Star for Effort.
Music: 6 Production: 5 Presentation: 6 Tape: 4

CYRILLE VERDEAUX and BERNARD XOLOTL 'Prophecy' Fortuna Records (San Francisco) cassette-only release. Prophet-5 and Zeta guitar synthesiser. Teac 3440 4-track reel-to-reel.
A very professional-sounding release, with the two instruments basking in a sea of sound processing. Melodic, modal music.
Music: 5 Production: 7 Presentation: 6 Tape: 4
Tony Bacon

ELECTRONIC SYNTHESISER SOUND PRODUCTIONS 'Synthesis Volumes 2 & 3'. ESSP obviously believe in hiding behind a mask of anonymity — it would be somewhat reassuring to know that there's some human guidance behind ESSP — and I don't really go for all this pretentious badinage about "Experiment 144". Fortunately, though, this facade encloses some pretty impressive music and the quality of these two cassettes is remarkable considering they were assembled on a Teac Porta-Studio with just two Wasps, a Spider and a Dr Rhythm. Volume 2 is more successful in that most of the tracks make their point with wit and invention and without taking the use of chunk-chunka-chunk sequencer bass lines into overtime. The same isn't so true of Volume 3, where tunes take more of a backseat over some rather long and repetitive doodlings. "In Tune with a Yawn" is good, classic stuff, though.
David Ellis

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PREVIEW

A NEW KIND OF MUSIC SHOW FOR THE U.K.!

INTERNATIONAL MUSIC SHOW

MARCH 13-18, 1982

Put all aspects of the music industry under one roof, from instrument manufacturers to record companies and from studio to PA, lighting and general merchandising companies, and you have one of the innovative ideas behind this exciting new show. Originally planned for Olympia, its venue is now set for the huge Wembley Conference Centre, London, which is fully equipped with theatres (including the main Auditorium seating 2,700), bars, restaurants, and thousands of square feet of exhibition space. Access to the centre is via buses, tubes and main line trains with ample car parking available.

The show is unique because it is open to the general public as well as the trade. Even the opening times are longer than usual, extending into the late evening, so that, besides visiting stands you can be enjoying concert and disco activities. Top artists are being selected for the concerts and a host of competitions are already arranged to take place with prizes ranging from musical instruments to a VW Beetle.

There should be something of interest for all our readers with such musical aspects as synthesisers, organs, guitars, disco and PA gear, studio equipment from mixers to tape recorders, records, tapes, hi-fi, video, music publishers, promoters and press, and radio stations. As well as this, there will be plenty of demonstration clinics taking place, and opportunity for visitors to try out instruments for themselves. You will even be able to buy gear on the spot if you wish.

Comments from the trade have been good and Kane Kramer, whose Beatstar Ltd is promoting the event, is anticipating that huge crowds will attend. E&MM has prepared the list below of dealers who will be there — let's hope the IMS gets the full support it deserves so that it may become a regular annual event for every musician's calendar.

Casio Electronics,
28, Scrutton Street, London,
EC2A.
01 377 9087.

Casio will be showing revolutionary new models that can read music (including the CT701 reviewed in E&MM) as well as their full range of electronic keyboards. They'll also be running a competition from their stand.

CBS/Arbiter Ltd.,
Vendon House,
Centenary Estate,
Jefferies Road, Grimstown,
Middlesex.
01 805 8555.

This large music company will be showing its newest and most interesting lines. The emphasis on their Fender stand will be for Vintage Telecasters, Stratocasters and Precision basses, and the Fender Bullet guitar which is the lowest priced Fender available. You'll find plenty of new model variations to choose as well as the full range of Fender amplification. Instruments include the Rhodes Pianos, with a new 'home' version, and the new Rhodes Chroma synthesiser - a 16 channel programmable polyphonic with dynamic keyboard, 50 user presets and 100 presets on tape (plus cassette interface, pedals and case). Also on display will be the new XP8 Rogers drums, Paiste cymbals and Gemeinhardt flutes.

City Electronics,
14a, Broad Walk,
Pinner Road, London.
01 863 1841

City Electronics Organ Centres will be featuring displays and demonstrations of electronic organs from the exciting Yamaha and Lowrey ranges, plus a large section devoted to the latest Yamaha professional keyboards and synthesisers. This company has 13 branches in the U.K. and during the show their staff will be announcing special offers and giving helpful advice.

Daily Mirror,
Holborn Circus, London EC1.
01 353 0246.

The Daily Mirror will be running a special competition with their Pop Club. Prizes are being donated by Casio including full size keyboards, mini-keyboards, calculators and watches.

Dance Centre,
11/14, Floral Street, London.
01 836 6544.

For groups with a theatrical stage presentation, the Dance Centre offers plenty of ideas with their fashion shows at IMS. These will feature much of their latest dancewear.

E&MM

Quite a few publishers will have their magazines on display - including E&MM of course! We'll be showing many of our past projects (and some new ones too). Besides having all our magazines available, we'll be getting you to make some music with E&MM instruments and our staff obviously look forward to meeting many of our readers.

On Sunday, 14th March, at 2 p.m., our Editor, Mike Beecher, will be giving a lecture on 'The World of Electro-Music', using E&MM projects and latest commercial instruments and computers.

Fraser Peacock Associates,
94, High Street, Wimbledon
Village, London, SW19.
01 947 7551.

Showing multi duplication cassette machines and various audio visual products, including equipment for sale and hire.

Future Music,
10, Baddow Road, Chelmsford,
Essex.
0245 352490.

This relatively new music company has just established Future Video and Future Management, handling bands and promotion through their own recording studio and record label. They'll be showing various music products.

Gulbransen,
CBS/Arbiter Ltd.

Gulbransen will be showing for the first time their new range of Equinox organs that consist of 6 models, including 2 new low cost instruments. They incorporate latest computer technology and have proved very popular in America.

Keith Hand Musical Supplies,
219, Walmersley Road, Bury,
Manchester.
061 764 1792.

Keith Hand will be featuring a wide range of equipment including Gordon Smith's hand made electric guitars, acoustic hand made guitars, Little Rock and White Rock amplification, Canary mixing desks and accessories, mikes, connectors, flight cases, cymbal and guitar cases, speaker cabs, stands, stools and leads. Also on show for the first time will be the new Hartley-Thompson 50W amplifiers.

Lewisham Organ Centre Ltd.,
Keyboard House,
324-328, Lewisham High Street,
London, SE13 6LD.
01 690 2161.

Lewisham Organ Centre will be featuring the Kawai and Elka Orla Electronic Organs and the Casio range of keyboards in their large display. Britain's finest organist, Brian Sharp, will be demonstrating the Kawai range of organs, hopefully to include the Kawai T.30. Demonstrations of the Elka Orla and Casio keyboards will also be taking place during the days.

M.T.R.,
Board House, 58, Cross Road,
Bushey, Herts.
92 34050.

This brand new distribution company will be displaying its PA equipment, including Aces mixer console, power amps and a new 16 track 2" pro recorder; McGregor mos-fet power amps, lighting units and back-line combos; Shino 19" rack mounted effects; and Cutec low cost 12 channel stereo mixing desks.

Marshalls Amplification,
First Avenue, Denbigh Road,
Bletchley, Milton Keynes,
MK1 1DY.
0908 75411.

Marshalls are the largest manufacturer of valve amps and speaker cabinets in the U.K. and have been established for 20 years. All models on display will be demonstrated and a new range of transistor combos and valve amps will also be shown.

Mayfair Recording Studios,
11a, Sharpleshall Street,
London, NW1.
01 586 7746.

This independent 48 track studio has recorded such groups as Visage, B. A. Robertson, Bucks Fizz, Orchestral Manoeuvres in the Dark, Bow-wow-Wow, Lonnie Donegan and Brown Sauce.

Melanie Drums,
28, Woodville House,
1, Runswick Road, Sutton.
01 642 1764.

Their stand will have demonstrations by well known artists using Melanie drums which include a range of 10", 12", 14" and 16" acoustic types. One band attending will be the reggae style 'Aswad'.

Minns Music Ltd.,
5/7, Gervis Place,
Bournemouth.
0202 ~91277/8.

Minns Music has 45 branches throughout the country. A wide variety of organs, synthesisers and pianos will be on show during the IMS featuring the Siel Cruise, LX.61 and the Siel Mono and many more from William Steinmann Pianos to Fuchs and Mohr Pianos.

Musimex
Axess Electronics Ltd.,
33, Church Crescent,
London N20 0JR.
01 368 2716.

This enterprising company will be showing their range of 'Session' low cost solid state amplifiers, including the new Sessionette 75, as well as a wide range of valve amps and monitor systems.

Musonic
S&B Trading, Stylus House, 34-38, Verulam Road, St. Albans.
01 565 0611.

This company will be selling a full range of record, tape and video care products as well as replacement stylii.

National Music Council,
10, Stratford Place, London, W1.
01 499 8567

Plenty of advice will be available from National Music Council staff on musical matters.

Paul Cadde Pianos

Paul Cadde of Derek Cadde Pianos is hoping to present a range of different manufacturers' pianos in a special acoustic keyboard suite.

Professional Percussion,
2, Highgate Road, Kentish Town,
London, NW5.
01 485 4434.

A major percussion hire company for U.K. and Europe. Their Managing Director, Duncan Kinnell, is well known internationally for his percussion playing and is currently rehearsing with Elkie Brooks for her next tour. A wide range of drums and percussion equipment will be available from Gretch, Ludwig, Premier, Zildjian, Paiste, Bergerault (tuned percussion) to Supercussion, Gope and Regal Tip.

Continued on page 80

POWER 200 SPEAKERS

Here's the ideal stereo speaker system for the budget-conscious electro-musician - small enough for the home studio yet with plenty of power for the gig, and designed in conjunction with Fane Acoustics Ltd., to give top quality sound.

There's been quite a big swing in the music industry away from the traditional 4 x 12 cabinet stacks that have dominated the PA market in past years towards smaller cabinets that are easier to carry around. Today, it is more usual to hire the extra high power stacks for large halls so that the musicians cab for the small gig can be of the best quality relating to size, price, power and suitable response. With the increasing use of synthesisers and sound effects that utilise virtually the whole audio frequency range, it is also becoming more important to use a speaker system with a sufficiently wide response.

When E&MM visited the large factories of Fane Acoustics Ltd, last year (see March 1981 issue), we were privileged to see Fane speakers in production and soon after, the company kindly agreed to co-operate in the design of this speaker system. The speakers recommended for the project were the new 12" and bullet units, suitable for professional monitoring. The requirements for the cabinet were to make it as small as possible for the best frequency response over the speakers' range up to 200 watts.

The resulting design has proved to be one of the smallest high power systems for its price, with a considerable cost saving if you build the cabinet yourself. However, so that even the busiest electro-musician can take advantage of this superb system, E&MM can supply ready-made cabinets that simply require speakers and crossover to be fastened in place.

The Speakers

Fane Acoustics Limited was founded in 1958 as a manufacturer of hi-fi cabinet speakers. In the early sixties the company specialised in high power loudspeaker manufacture and now more than 75% of all speakers used by U.K. manufacturers are supplied by Fane. One of the reasons for their success has been due to the development of the glass fibre voice coil which enabled them to more than double the power output of their speakers.

Each Power 200 Speaker cabinet contains a Studio 12L, 12 inch speaker, an HF250 Bullet Tweeter and an HPX4 crossover unit.

The Studio 12L has a power rating of 200W before distortion begins to appear, a frequency response of 45Hz to 7kHz and an average sensitivity of 101dB (1W@1m). The sensitivity parameter is a measure of loudness level of which the speaker is capable of at a distance of 1m from the speaker with a power input of 1W.

The HF250 tweeter has a power rating of 250W, a frequency range of 5kHz to 20kHz and sensitivity of 105dB (1W@1m). To protect this unit from the low frequencies a crossover must be employed. The one recommended by Fane is the HPX4 which is an 18dB/octave high pass filter operating a 5kHz, i.e. frequencies lower than 5kHz attenuated before being applied to the tweeter.

The Cabinets

The cabinet construction is of the reflex type, i.e. a tuned port or duct is cut into the woodwork to relieve the internal air pressure in the otherwise closed box, and to separate the forward and rearward movements of the cone. The waves produced by these movements are arranged to be in phase, thus boosting the efficiency of the speaker at low frequencies. It also means that the speaker enclosure can be smaller than otherwise required, as illustrated by our cabinet which measures approximately 22 x 16 x 12½ inches. The only drawback with this type of enclosure is that the size and design of the duct is fairly critical. Consequently the measurements given should be adhered to as closely as possible.

The response curve of the speaker units is shown in Figure 1. The curve was obtained from measurements made in an anechoic

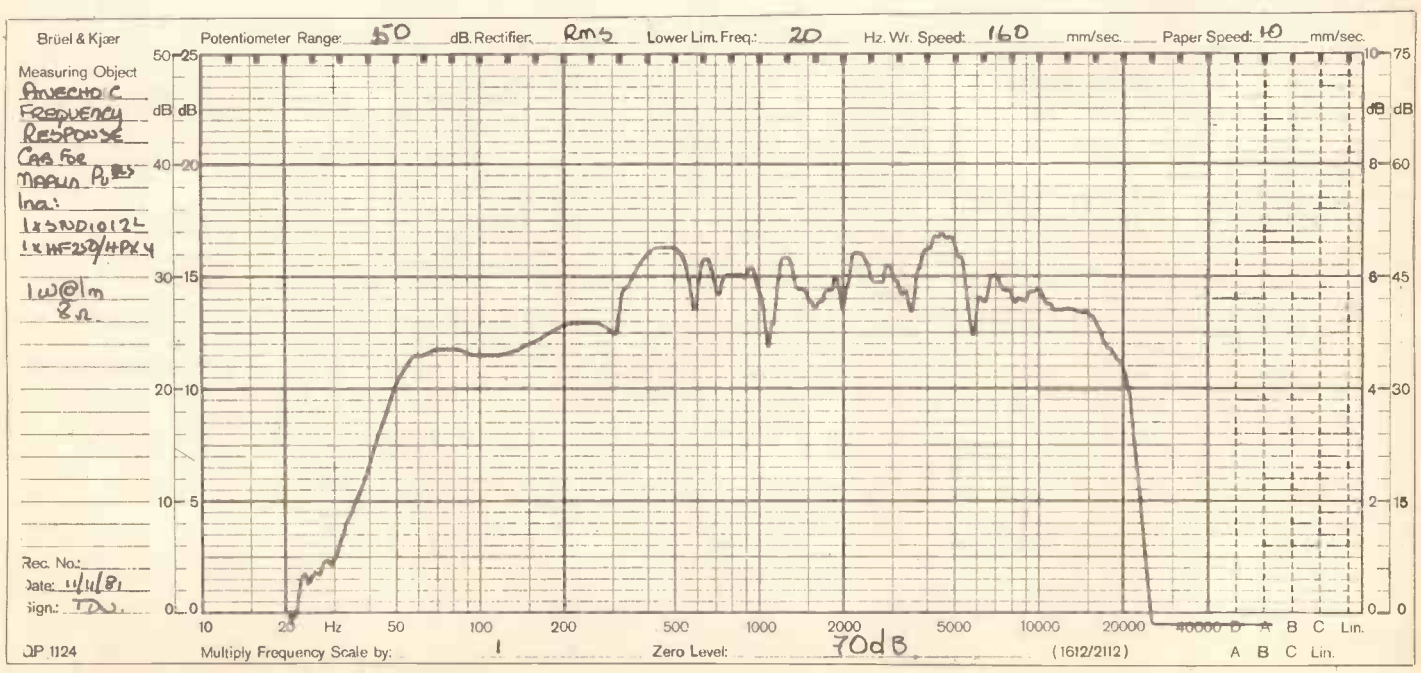

Figure 1. Response curve of the Power 200 Speakers.

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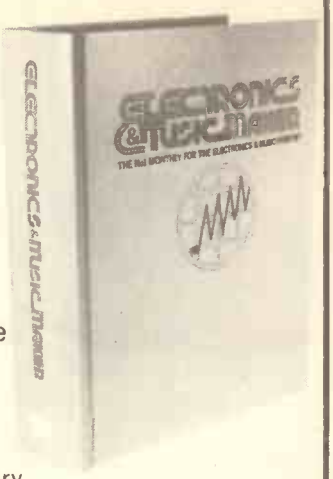

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Power 200 Speakers

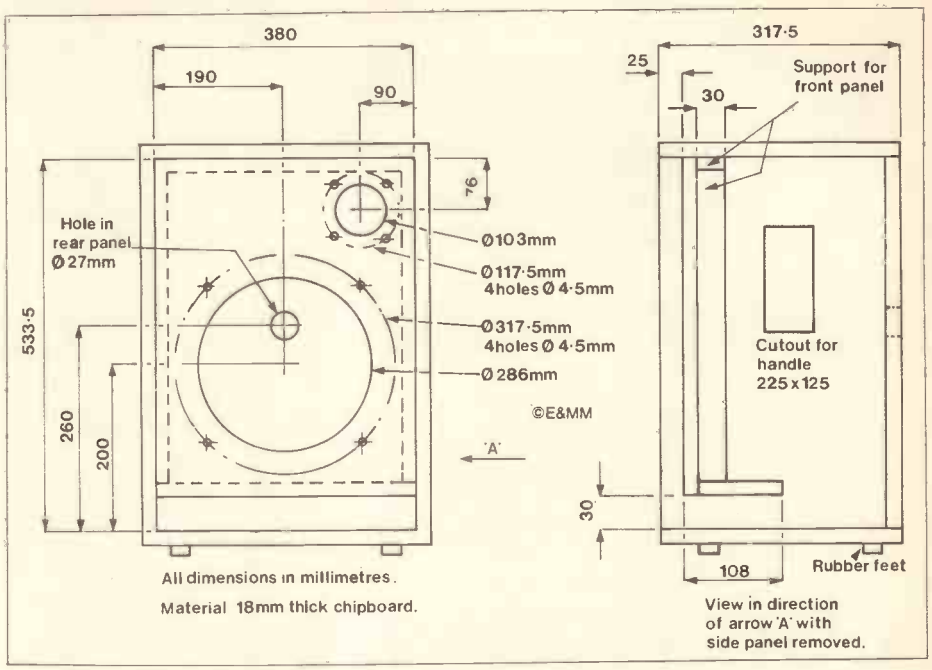

Figure 2. Construction diagram for the Power 200 Speakers.

chamber, which is an acoustically 'dead' room. The curve is reasonably uniform over the complete audible range, i.e. 50Hz to 15kHz.

Construction

The material used for the cabinets is 18mm chipboard and for both cabinets one 8' x 4' sheet (2438 x 1219mm) will be required. Cut the pieces to size according to the plan on Figure 2. (If you are not particularly adept at sawing ask your local carpenter since the measurements should be adhered to as closely as possible. The wood for our 2 cabinets cost £7). Cut the holes for the handles in the side panel and the speakers in the front panels using a jig saw. (Drill a hole to insert the saw blade to begin.) Drill a 27mm diameter hole in the centre of the back panels to accommodate the jack socket recess plate. Drill the screw holes for the speaker units in the front panel.

Using one of the impact adhesives or Evostick Resin W, glue the upright pieces to the side panels. Use clamps to hold these in the correct position and leave to dry.

When these are firmly fixed glue the top, bottom, side and back panels of each cabinet together. Remember that airtight seals should be formed at each join so apply liberal amounts of glue along the edge. Also glue the bottom piece of the front panel which forms the duct to each of the front panels and set aside to dry.

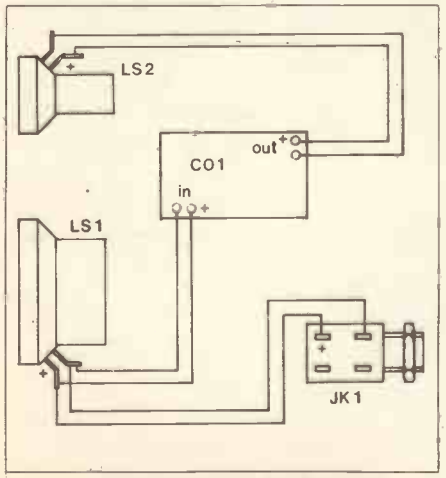

Figure 3. Wiring diagram of the Power 200 Speakers.

When firmly fixed, round off all the outside edges of the cabinet. Cut two strips of cabinet cloth 380mm wide, 1880mm long. Glue these around the top, sides and bottom panels arranging so that the join is on the bottom panel and that approximately 45mm overlaps the front edges. This should leave approximately 16mm overlapping the rear edges. By making cuts at the corners bend the material round the edges. At the front, the cloth should cover the inside faces of these panels by approximately 25mm. Cut two pieces of cloth for the back panels measuring 550 by 400mm and glue these in place. Finally cut two further pieces for the front panel; 530 by 390mm. When positioning these pieces over the front panel allow approximately 5mm overlap at the top and side edges and bend the excess cloth at the bottom around the duct panel.

With a modelling knife remove all the material covering the holes previously made. Fix the metal corner protectors using chrome nails or self tapping screws (no. 6 ½ inch). Also mount the handles, recess plate and rubber feet using the following screws: two no. 6 ½ inch for the recess plate; six no. 4 ½ inch for the handles and one no. 4 ½ inch for each foot. Mount the crossover PCB just below the jack socket plate using two no. 6 ½ inch self tapping screws with ¼ inch 4BA spacers as stand-offs. Fix the speaker units in place using four 2BA nuts, bolts and washers per speaker.

Wire the cabinets according to Figure 3 using heavy duty loudspeaker cable. Note the jack socket must be left floating until the connections are made.

Finally glue the front panels in place, making a neat finish with the excess cloth, turn them on their backs and allow to dry.

E&MM

POWER 200 SPEAKER PARTS LIST

LS1	Studio 12L loudspeaker			Recess plate	2 off (HH23A)
LS2	HF250 Bullet tweeter			Heavy duty speaker cable	3m (XR60Q)
CO1	HPX4 crossover unit			Bolts 2BA 1in	16 off (BF01B)
JK1	¼ inch moulded mono socket	2 off	(HF90X)	Nuts 2BA	16 off (BF16S)
	Grille (Studio 12L)	2 off		Washers 2BA	16 off (BF20W)
	Chipboard	8' x 4' sheet		Screws No. 6 ½ inch	52 off (BF67X)
	Cabinet cloth	5.5m	(RY05F)	Screws No. 4 ½ inch	32 off (BF66W)
	Heavy duty handles	4 off	(LH11M)	Spacers 4BA ¼ inch	4 off (FW31J)
	Metal corner protectors	16 off	(FX95D)	Glue	
	Heavy duty feet	8 off	(FW39N)		

All the parts for this project are available in kit form at special offer prices as follows:

Power 200 Speaker Kit
Comprising: 1 Fane Studio 12L Loudspeaker
1 Fane HF250 Bullet Tweeter
1 Fane HPX4 Crossover
1 Fane Grille (as shown on front of loudspeaker)
Special Offer Price - £93.94 (including VAT and U.K. carriage).

Ready-Made Cabinet (excluding speaker kit) with all fittings as stated in parts list.
Special Offer Price £59.50 (including VAT and U.K. carriage).

Set of Cabinet Parts for one cabinet, excluding wood and glue.
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All orders should be sent to E&MM, 282 London Road, Westcliff-on-Sea, Essex SS0 7JG.

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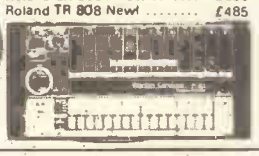

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JC 120	£425
JC 160	£475
GA 60 R+P	POA
GA 120	£225
Spirit-30	£115
Spirit 50	£249
Bolt 30	£195
Bolt 60	£275
Cube 20	£99
Cube 40	£125
Cube 40k Newl	£145
Cube 60k Newl	£225
Cube 100	£225
Cube 60B	£185

YAMAHA	
J x 20	£199
J x 30	£149
J x 40	£175
J x 50	£215
J x 30B	£159
J x 50B	£225
CARLSBRO	
Stingray Bass Combo	£290
Wedge Monitor	£190
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Marshall 100 Tranny	£115
Roland PA 60	£195
Burman Bass Head	£375
Traynor Lead Combo	£95
Marshall 100 Valve	£195
Park Practice Amp	£40
Roland Bolt 60	£245

GUITARS

WASHBURN	
Raven	£125
Hawk	£195
Falcon	£225
Eagle	£275
Scavenger	£115
8 String Bass	£295
Condor Bass	£195
Vulture Bass	£150
Electro-Acoustic	
Woodstock	£150
Montary	£220
Montary 12	£230
Tanglewood	£225
Tanglewood 12	£230

YAMAHA	
SC 800	£245
SC 1000	£255
SG 2000	£430
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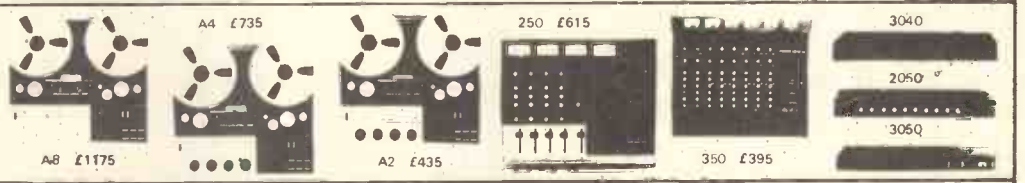

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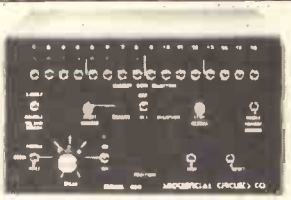

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Part 2 concludes the project with full constructional details.

Circuit Description

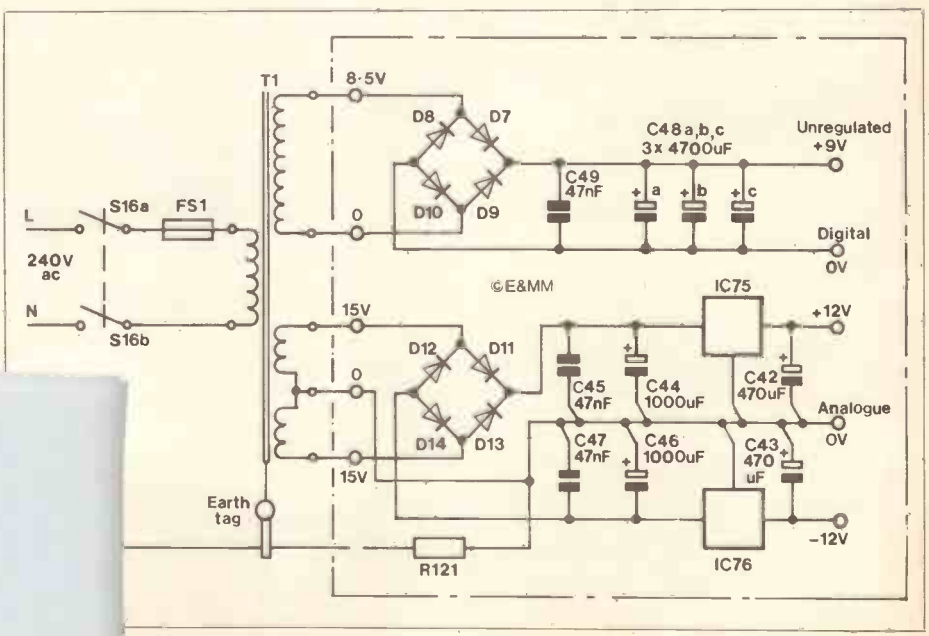
The complete circuit of the unit is shown in Figures 3 and 4, and operation may be clearer if the block diagram (Figure 2, published last month) is studied at the same time.

The input signal is amplified by the input amplifier IC21, to bring the signal up to a suitable operating level. Next the signal is filtered by two low pass filters, one of which has a 4kHz cut-off, and the other a 10kHz cut-off. The 4kHz or 10kHz operation is selected by S16. These are known as anti-aliasing filters; aliasing is an effect that sounds like ring modulation and is caused by harmonics of the input signal interacting with the analogue to digital conversion. If these harmonics are greater in frequency than ½ of the conversion frequency, then side bands will be generated that will fall within the audio spectrum: to prevent this from happening, the input signal is low-pass filtered to remove these high frequency harmonics.

The signal is then fed into the ADC (analogue to digital converter). This section continuously samples the analogue waveform, and measures the instantaneous amplitude which it describes with an 8-bit digital word. This word is then stored in the digital memory. In order to convert the analogue waveform into a digital word it must be 'frozen' long enough to allow the ADC to perform the measurement. The Their purpose in life is to measure the input voltage and to describe it with an 8-bit digital word. The SAR produces a binary code which it sends to the DAC; this generates an output voltage which the comparator compares with the input signal. The result of the comparison determines whether the MSB of the digital word is a 1 or a 0. The SAR then tests the next bit of the code, and then the next, until all 8 bits have been determined; the conversion is then complete. The 8-bit word causes the DAC to produce a voltage equal in magnitude to the input signal, therefore the word is a measurement of the input sample.

The DAC is in fact a companding DAC, and not a linear one; it can be operated in both compression and expansion modes. In the ADC (IC13) it compresses the signal, and in the DAC (IC33) it expands the signal thus giving an overall linear transfer function. The performance of the DAC and ADC can be described in several ways. First, the dynamic range: this is the ratio between the largest signal that the system can handle and the smallest. The dynamic range is 72dB which is quite good.

The signal to noise ratio is the ratio between the largest signal that the system can handle, and the output noise with no input signal. This may be better than 72dB, but it is not that important, because the system only generates digital noise (quantisation noise) when it is converting signals. The noise only appears when a signal output is being generated; this noise is related to the



rcuit diagram of PSU.

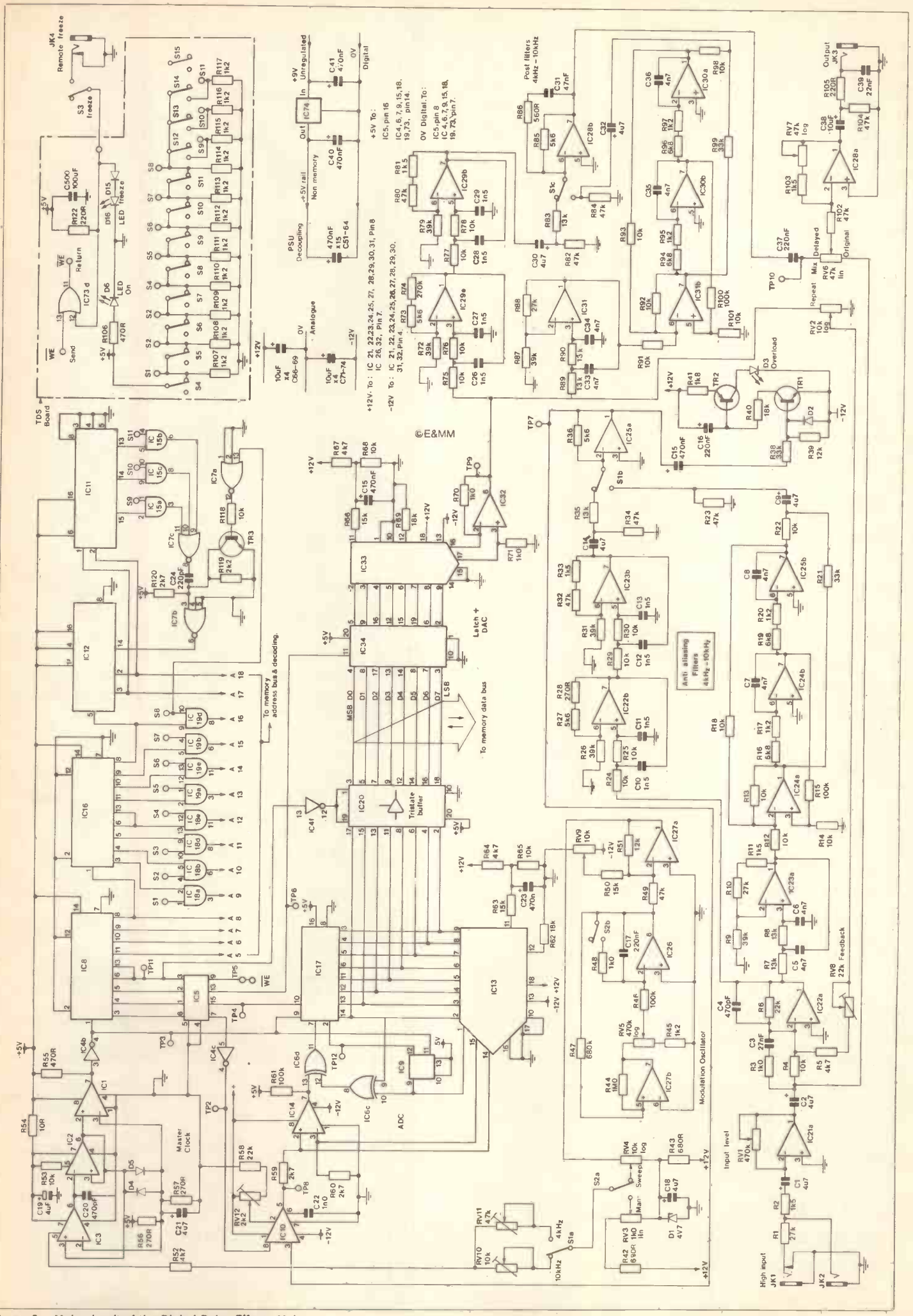


Figure 3. Main circuit of the Digital Delay Effects Unit.

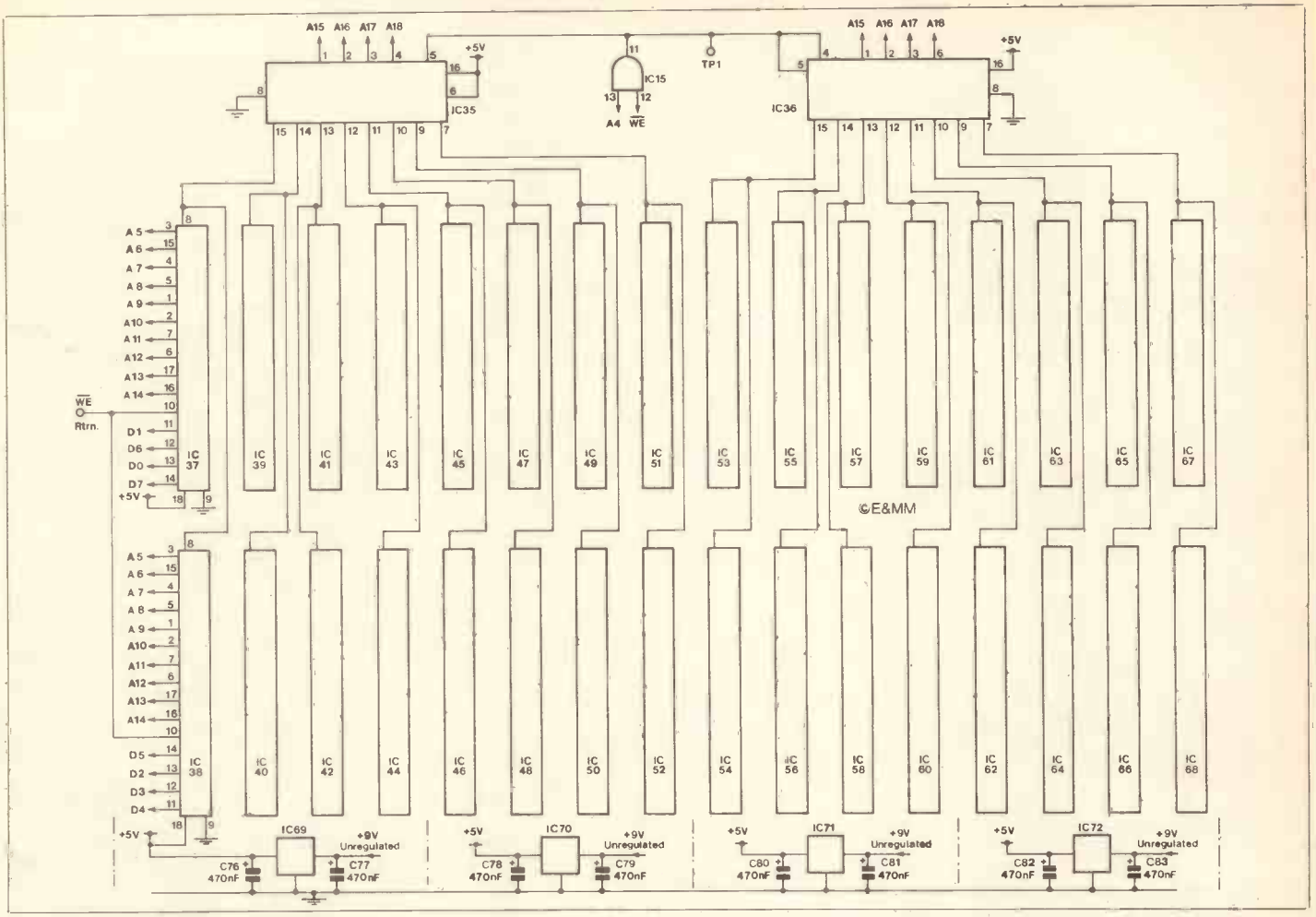


Figure 4. Circuit of the memory section.

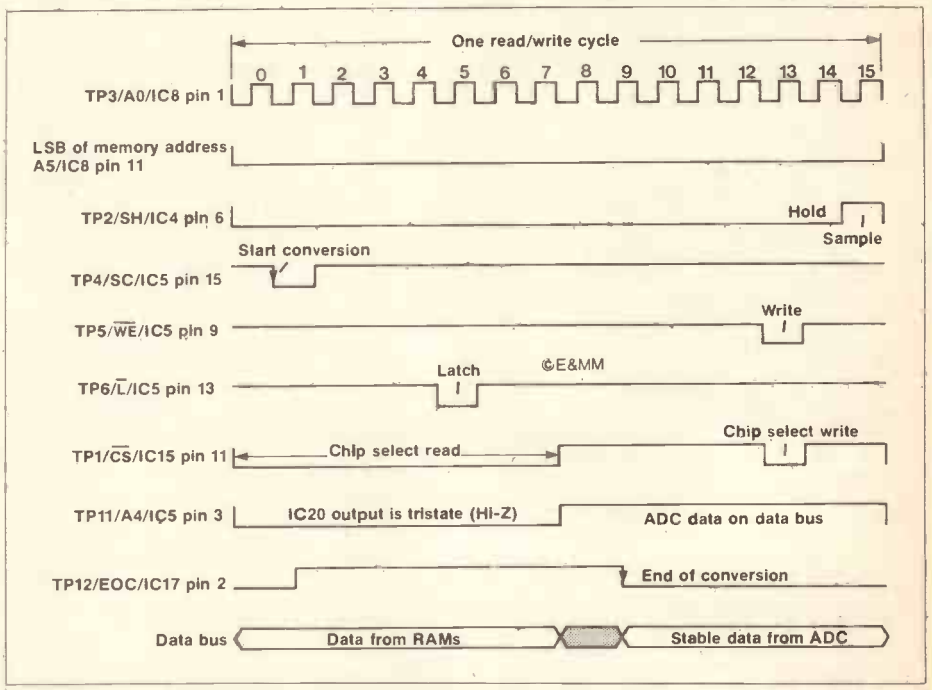


Figure 5. Timing diagram for one read/write cycle.

amplitude and spectrum of the input signal.

Now consider the signal to quantisation noise ratio. If the delay line is processing speech, then the quantisation noise is hardly noticeable; the noise is masked by the rapidly changing information in the speech. If the input signal is high in frequency compared to the selected bandwidth, then again the quantisation noise is lost, this time having been removed by the output filters. However, if the input signal is a low frequency pure tone then quantisation noise can be heard sizzling away in the background! This problem is overcome by giving the input signal a treble lift from 600Hz up to 6kHz (R3 and C3 give pre-emphasis) and by providing a treble cut at those same frequencies on the output signal (R86 and C31 give de-emphasis). The overall frequency response is flat, and the quantisation noise is selectively filtered out. The energy spectrum of most natural sounds falls off with increasing frequency, and so the pre-emphasis does not produce any signal overload problems.

The memory is 16K bytes long, being constructed from 2114L static RAMs (4 bits by 1K). The read/write cycle is as follows: the memory address is set up, and data is read from that memory location by being clocked into a latch (IC34) that drives the DAC (IC33). Next, data is written into the same memory location, the data being obtained from the ADC. The address is then incremented by one bit. If the full memory length were being used, then the address would have to count in a full circle (16K) to retrieve the data that had just been entered.

The output data is converted to an analogue voltage by the DAC (IC33). This voltage is quantised into steps, and it needs filtering to remove the unwanted harmonics that constitute these steps. Again a 4kHz and a 10kHz low pass filter (IC28, 29, 30, 31) are used.

The master clock for the system is generated by a high frequency voltage controlled oscillator, IC1,2 and 3. IC2 and 3 form a standard Schmitt trigger/integrator oscillator, the frequency of which is controlled by the current into pin 5 of IC3. IC1 is used as a buffer to drive the subsequent TTL stage.

IC8, 12 and 16 are binary dividers which generate the memory addresses A0 to A18.

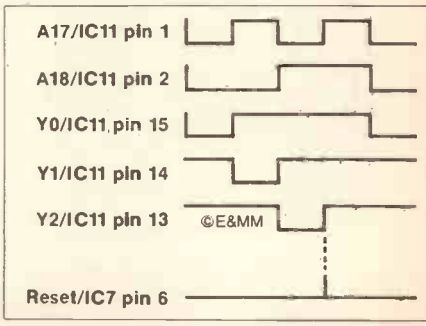


Figure 6. Memory reset timing, shown with ¾ memory selected.

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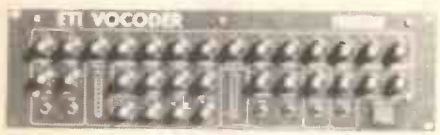

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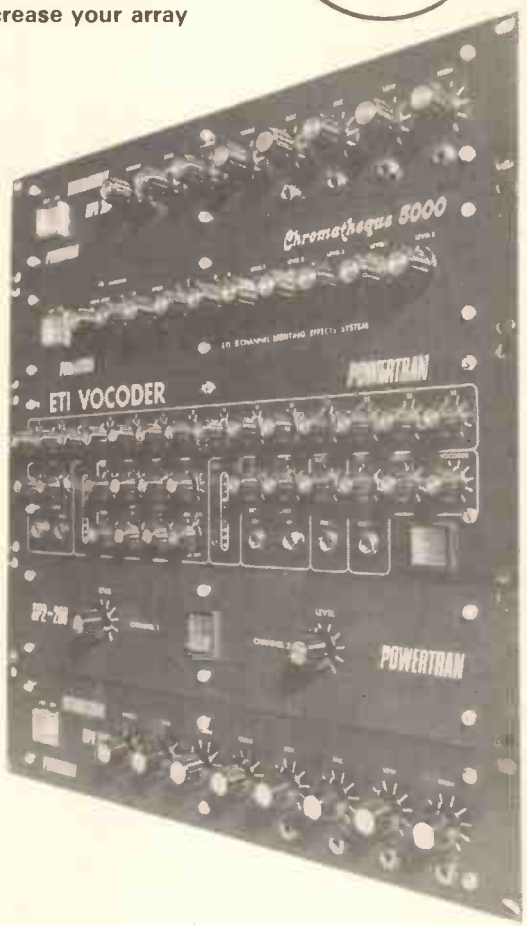

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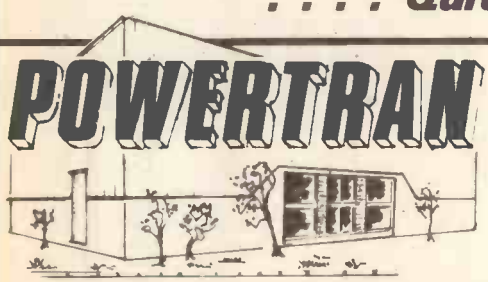

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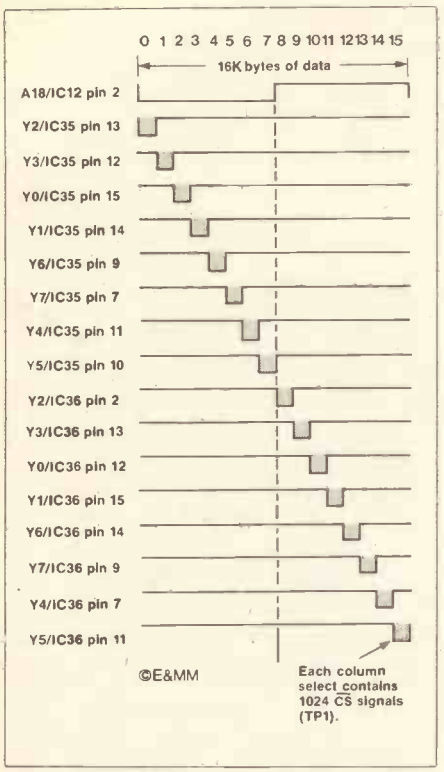


Figure 7. Memory column select timing, with full memory.

A0 to A4 are used to generate timing signals, such as read, write, start conversion, sample, and A5 to A18 are used as the memory address. Shorter time delays are obtained by using smaller sections of the memory, by progressively disabling the memory addresses using IC15, 18 and 19, The memory is sectioned into four quarters (see memory options in parts list) and so the top four time delay selections have equal time increments, but the lower eight selections provide time delays in octave increments. The master clock oscillator frequency may be manually controlled by RV3, or modulated by the low frequency triangle oscillator IC26, 27.

Test points

The timing diagram for one conversion read/write cycle is shown in Figure 5. All the waveforms will be clearly visible at the indicated test points (TP1-12). The memory reset timing is shown in Figure 6. A18 has a period of 1.6 seconds or 0.64 seconds, depending on the selected bandwidth. The reset pulse has a period of less than one micro-second, so don't be surprised if you cannot see it! Figure 7 shows the memory column select decoding. The number of columns selected will depend on the time delay selected by SW12, 13, 14, 15.

Construction

Most of the components, including con-

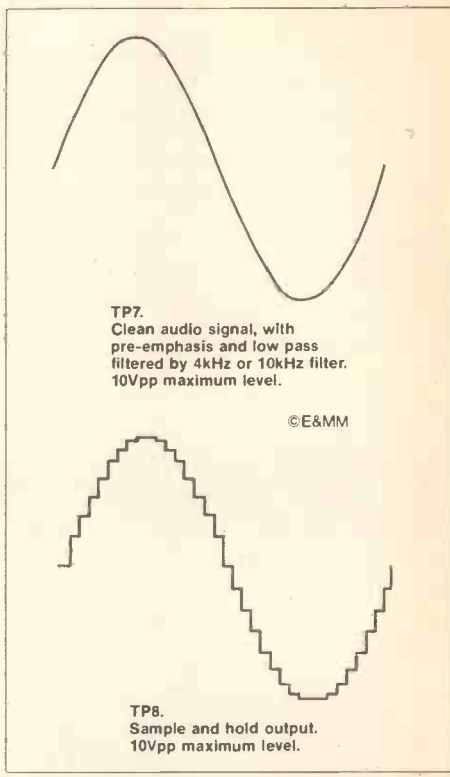


Figure 8. Waveforms for TP7-10, showing ADC and DAC operation.

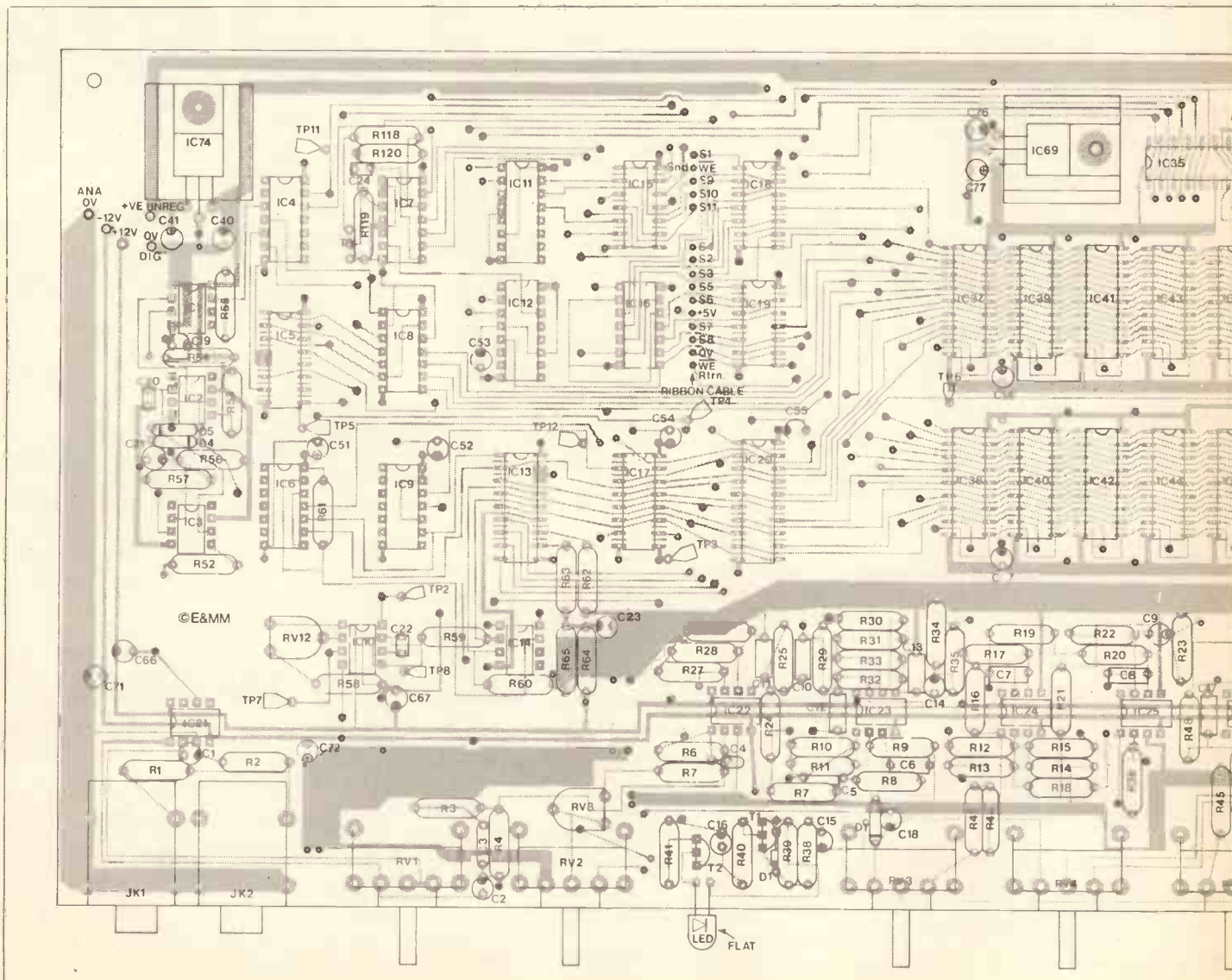
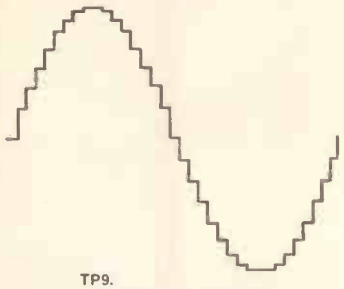


Figure 9. Component layout for the main PCB.



TP9.
DAC output same as TP8 but delayed in time.
3.5Vpp maximum level.

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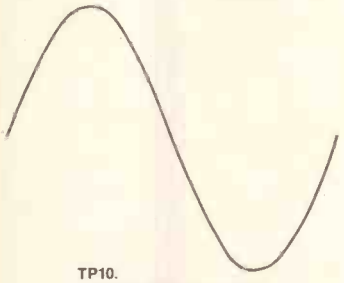


TP10.
Filtered audio output with pre-emphasis removed.
3.0Vpp maximum level.

trols, are mounted on one large double sided PCB, whilst two smaller single sided boards carry the time delay selector switches and the power supply components (with the exception of the transformer). Powertran's PCBs will not carry a printed component legend, but all the component positions are identified in Figures 9, 10 and 11 and construction should be straightforward. Before mounting any components on the large PCB, the tracks on the top of the board should be linked through with pins (special through-pins are supplied in the kit) and soldered top and bottom. Sockets are recommended for the ICs, and again, these are provided in the kit. As always, take special care with the soldering, and check for dry joints, solder splashes and correct component orientation before switching on.

There is very little wiring to be done. The switch board is linked to the main board with two lengths of ribbon cable, as shown on the component overlays; the PSU board and transformer wiring is shown in Figure 12. The connections to the freeze switch and footswitch socket are on the switch board diagram.

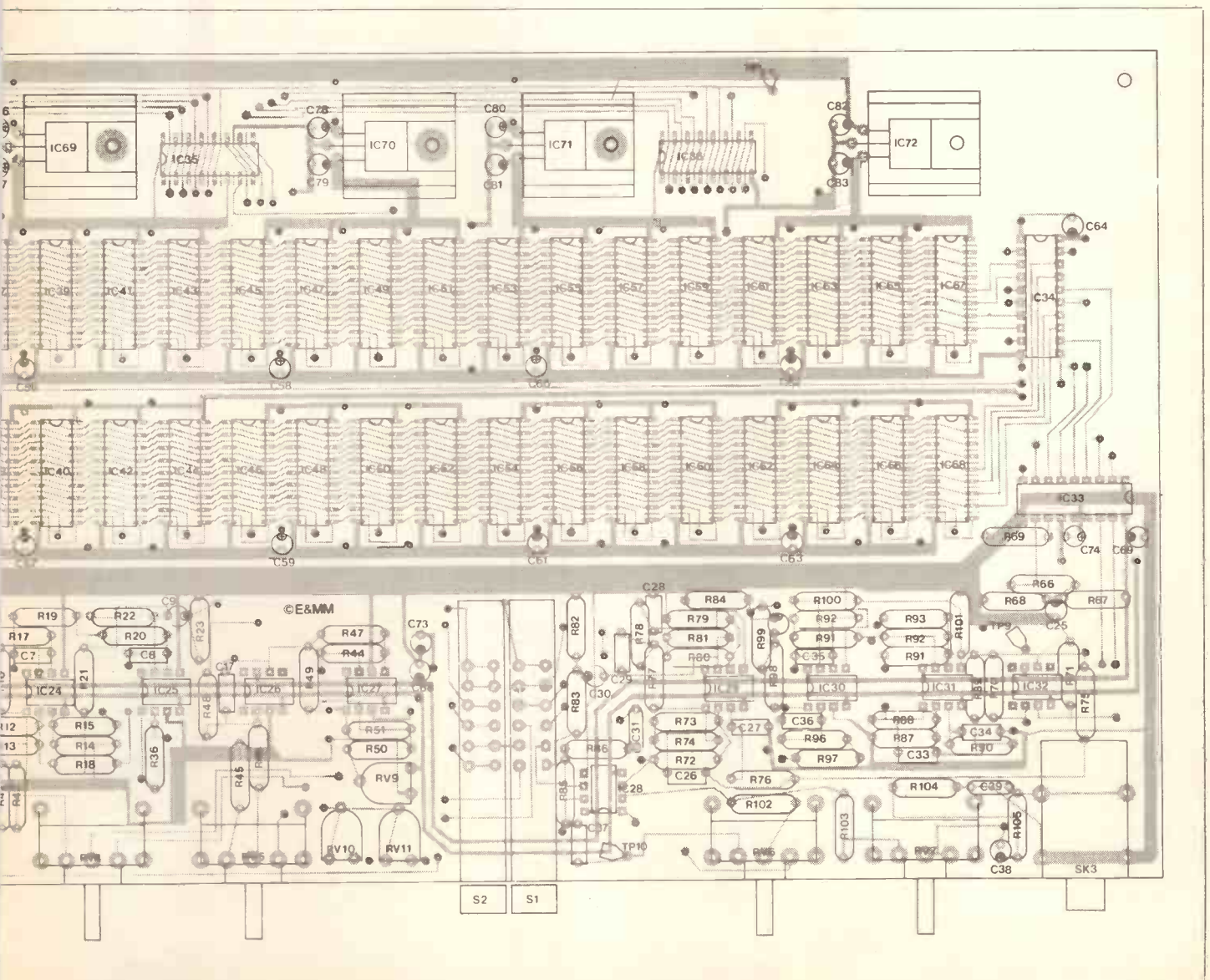
If required, the delay unit may be built with ¼, ½ or ¾ memory to begin with, and this is simply a matter of omitting some of the components: the parts list gives details.

Once all the soldering is done, do not insert any ICs except those in the power supply. Power up and test the regulated supply rails (the unregulated rail voltages only refer to a fully loaded power supply). Insert the ICs, in lots of 10, and then power up and check the regulated supply rails. Do this until all the ICs are inserted. Don't forget to turn off the power when you are putting them in! Having completed a successful power up you can now test the unit.

Connect a signal and check all is functional. If not, then check to see if all the TP waveforms are being generated correctly. Also look at all 19 address lines. If you experience a regular repeating fault in the memory section then you may have a non-functional area of memory. Check out the address lines, the data bus and the column decoding. If these are all OK then it is probable that a memory chip is faulty. This can be located by a process of substitution. Finally, set up the presets as follows:

1) Set up the unit for a long echo, and set REPEAT to maximum. Adjust RV8 so that repeats continue for a long time, but not so that they grow in amplitude.

2) Measure the voltage on the positive end of D1; it should be +4.7V. Monitor IC27 pin 1, and adjust RV9 so that the triangle waveform is offset so that its bottom point is at +4.7V. If you don't have a 'scope, a voltmeter may be used, but turn down the



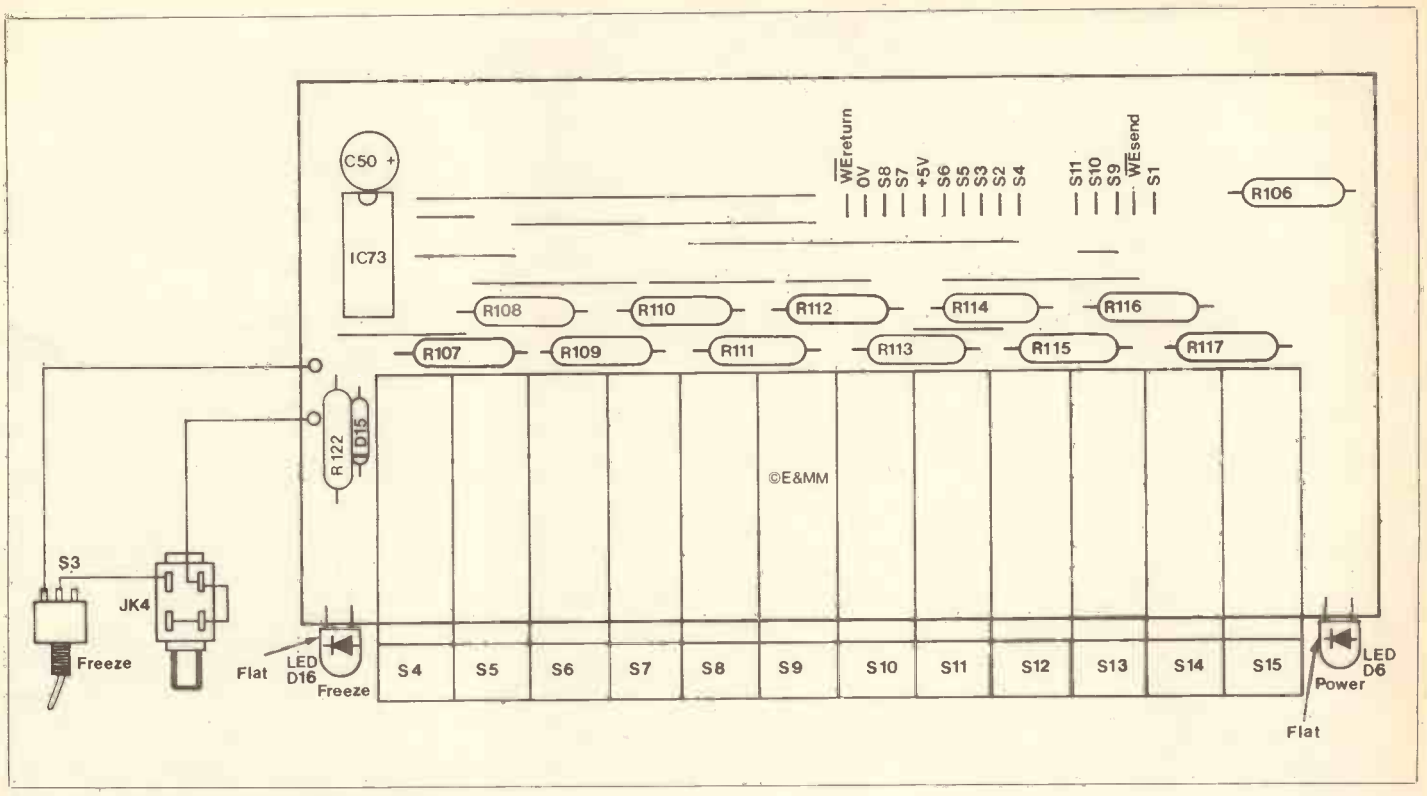


Figure 10. Component layout for the switch PCB.

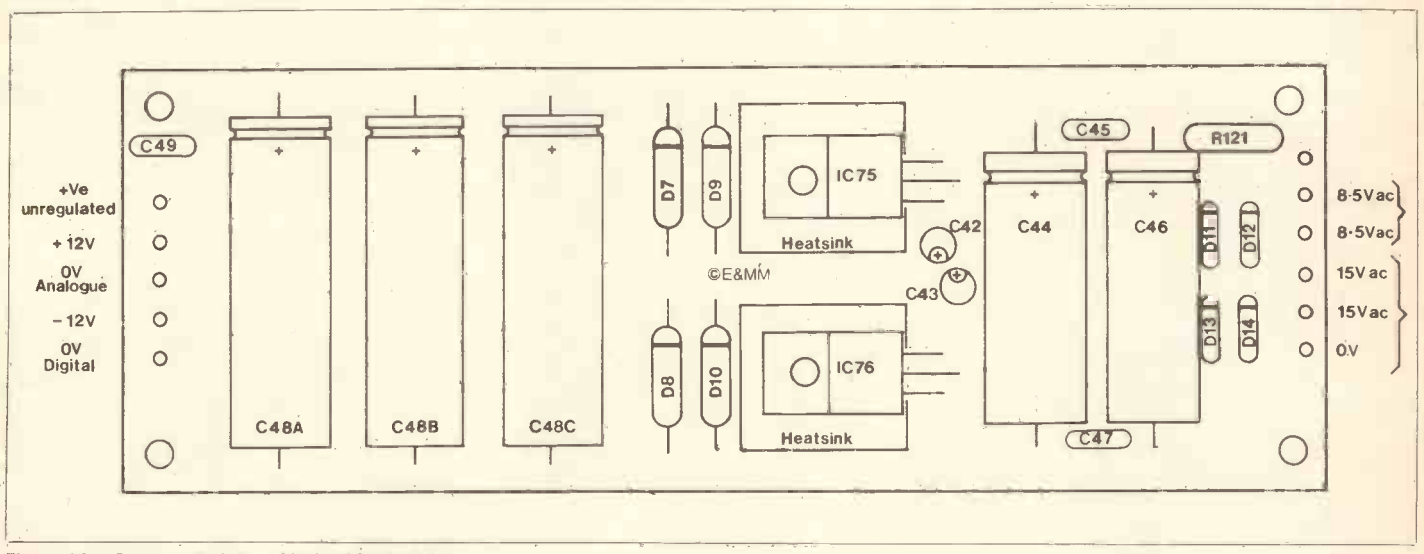


Figure 11. Component layout for the PSU board.

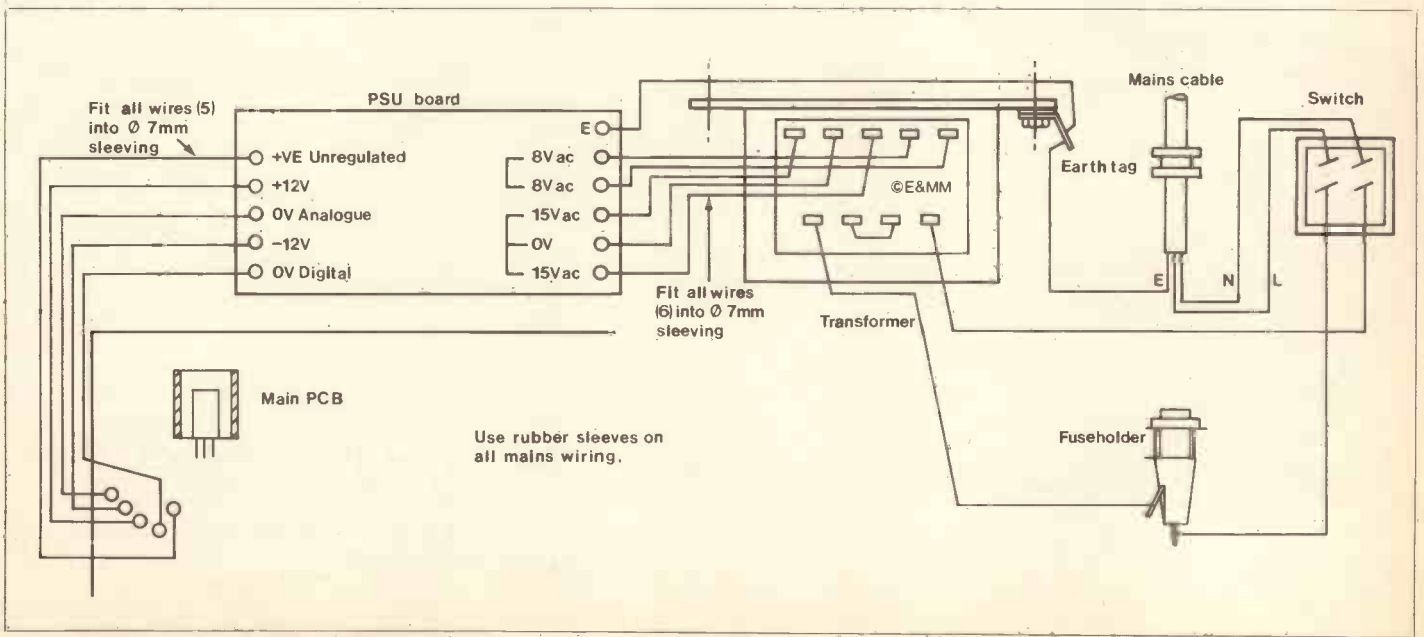
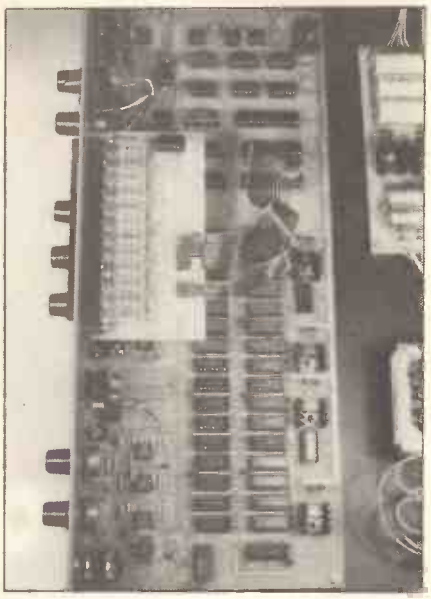


Figure 12. Wiring to the PSU board and transformer.

sweep speed to avoid misleading readings.

3) Turn the time delay pot anti-clockwise, and select manual control of time delay. Select 10kHz bandwidth, and measure the frequency at test point 3 (TP3). Adjust RV10 so that the frequency is about 40kHz. Now select 4kHz bandwidth, and adjust RV11 so that the frequency is about 160kHz. These frequencies can be set without instruments by entering a short signal, freezing it and setting the pre-sets so that the delay times on the longest setting are 0.64 secs and 1.6 secs (time 10 repeats, i.e. 6.4 secs and 16 secs).

4) The sample and hold offset adjustment RV12 only produces a small DC shift, which when compared to the 10Vp-p audio signal level at this point is not significant. However, if the ADC is dithering between two quantised states (and hence producing 1 LSB of dithering noise) then the DC offset can be used to shift the analogue voltage by just enough to prevent this. Listen to the delayed output, and adjust RV12 for minimum noise. Find the best pre-set position by manually adjusting the delay time. The delay effects unit is now ready for use. **E&MM**



The E&MM Digital Delay Line is obtainable as a complete kit of parts from Powertran Electronics, Portway Industrial Estate, Andover, Hants SP10 3WW. With ¼ memory, i.e. 400ms maximum delay, the kit costs £130 + VAT. Extra memory parts are £9.50 + VAT per 400ms, so the full 1.6s delay would cost £158.50 + VAT.

DIGITAL DELAY UNIT PARTS LIST

Resistors — 5% ⅓W carbon unless specified

R1,10,88	27k	3 off
R2,11,33,81,103	1k5	5 off
R3,48	1k0	2 off
R4,12-14,18, 22,24,25.29, 30,53,65,68, 75-78,91-93, 98,101,118	10k	23 off
R5,52,64,67,121	4k7	5 off
R6,58	22k	2 off
R7,8,35,83,89,90	13k	6 off
R9,26,31,72, 79,87	39k	6 off
R15,46,61,100	100k	4 off
R16,19,94,96	6k8	4 off
R17,20,45,95,97, 107-117	1k2	16 off
R21,38,99	33k	3 off
R23,32,34,49,80, 82,84,102,104	47k	9 off
R27,36,73,85	5k6	4 off
R28,56,57,74	270R	4 off
R39,51	12k	2 off
R40,62,69	18k	3 off
R41	1k8	
R42,43	680R	2 off
R44	1M0	
R47	680k	
R50,63,66	15k	3 off
R54	10R	
R55,106	470R	2 off
R59,60	2k7 1%	2 off
R70,71	1k0 1%	2 off
R86	560R	
R105,122	220R	2 off
R119	2k2	
R120	2k7	
RV1,5	470k log pot PCB mounting	2 off
RV2	10k reverse log pot PCB mounting	
RV3	1k lin pot PCB mounting	
RV4	10k log pot PCB mounting	
RV6	47k lin pot (with central 'click') PCB mounting	
RV7	47k log pot PCB mounting	
RV8	22k min horiz preset	
RV9,10	10k min horiz preset	2 off
RV11	47k min horiz preset	
RV12	2k2 min horiz preset	

Capacitors

C1,2,9,14,18,19, 21,30,32	4u7 15V tantalum	9 off
C3	27nF polycarb	
C4,20	470pF ceramic	2 off
C5-8,33-36	4n7 polycarb	8 off
C10-13,26-29	1n5 polycarb	8 off
C15,23,25,40-43, 51-64,76-83	470nF 15V tantalum	30 off
C16	220nF 25V tantalum	
C17,37	220nF polycarb	2 off
C22	1n0 ceramic	
C24	220pF ceramic	
C31	47nF polycarb	
C38,66-69,71-74	10uF 15V tantalum	9 off
C39	22nF polycarb	
C44,46	1000uF 25V electrolytic	2 off
C45,47,49	47nF ceramic	3 off
C48a,48b,48c	4700uF 16V electrolytic	3 off
C50	100uF 10V electrolytic	

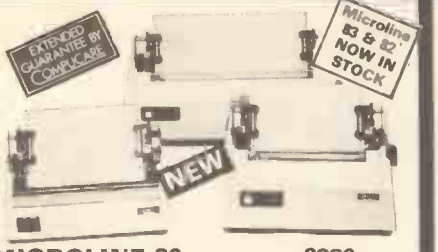
Semiconductors

TR1,3	BC182L	2 off
TR2	BC212L	
D1	4V7 zener	
D2,4,5,15	1N4148	4 off
D3,16	Red LED	2 off
D6	Green LED	
D7-10	1N5402	4 off
D11-14	1N4002	4 off
IC1,14	LM311	2 off
IC2,3	CA3080	2 off
IC4	74LS04	
IC5,11,35,36	74LS138	4 off (see below)
IC6	74LS86	
IC7	74LS27	
IC8,16	74LS393	2 off
IC9	74LS74	
IC10	LF398	
IC12	74LS193	
IC13,33	DAC76	2 off
IC15,18,19	74LS08	3 off
IC17	AM2502	
IC20	74LS244	
IC21-25,28-31	RC4558	9 off
IC26,32	TL081	2 off
IC27	1458	
IC34	74LS374	
IC37-68	2114L	32 off (see below)
IC69-72,74	7805	5 off (see below)
IC73	74LS32	
IC75	7812	
IC76	7912	

For ¾ memory omit IC61-68,72
For ½ memory omit IC53-68,71,72,36
For ¼ memory omit IC45-68,70,71,72,36

Miscellaneous

JK1-4	¼" mono jack socket, switched	4 off
S1,2	4P2W latching push switch	2 off
S3	SPST mini toggle switch	
S4-15	12 x 4 P2W interdependant switch bank	
S16	DP mains rocker switch	
T1	Transformer 15-0-15V, 8.5V	
	TO220 heatsink	7 off { omit 1 for each ¼ memory not fitted
	8 pin DIL socket	17 off
	14 pin DIL socket	10 off
	16 pin DIL socket	6 off { omit 1 for ½ or ¼ memory
	18 pin DIL socket	34 off { omit 8 for each ¼ memory not fitted
	20 pin DIL socket	2 off
	3 PCBs — main, switch and PSU	
	Knobs	7 off
	Case and hardware	
	Mains lead, plug and grommet	
	10-way ribbon cable — 8" length	
	5-way ribbon cable — 8" length	



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MICROLINE 82 £449 + VAT

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MICROLINE 83 £649 + VAT

● 120 cps bi-directional logic seeking ● 136 column printing on up to 15in forms ● Small size: 512 (W) x 328 (D) x 130 (H) mm. ● 160 characters, 96 ASCII and 64 graphics with 10 National character-set variants ● 3 Character spacings: 5, 10 and 16.5 Chars/in. ● Built-in parallel and serial Interfaces ● Friction and Pin Feed ● Low noise 65dB ● Low weight: 13 kg

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739 as above with special feature of Dot Resolution Graphics.

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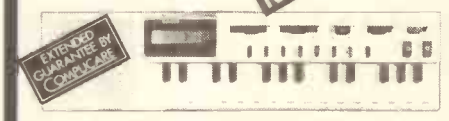

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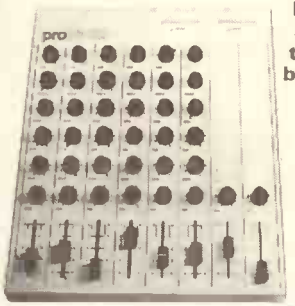

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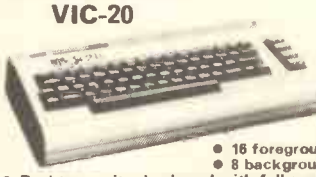

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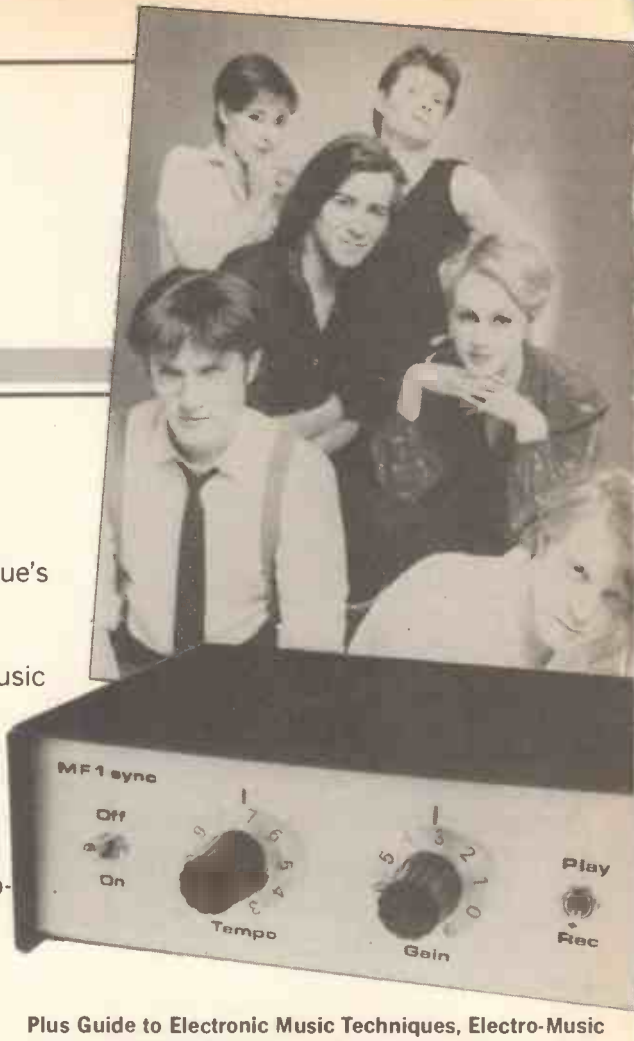


In the April issue of E&MM, on sale from the second week of March:

★ **Human League**
Don't miss our journey into deepest Oxfordshire to see Martin Rushent's Genetic Sound Studio where Human League's latest recordings of electro-pop were produced.

★ **Cardiff University Electronic Music Studio**
We continue our look at universities providing electronic music facilities and courses.

★ **Reviews**
There'll be plenty of instrument reviews hot from the Frankfurt Fair.

★ **Reverberation**
One of the most important sound treatments for the electro-musician is discussed in Advanced Music Synthesis.

★ **Two low cost projects**
Synchronise your triggers on your tape recorder with our MF1 Sync Unit. Also our new multiway spring-line stereo reverberation system that has separate EQ for each line. You'll also find some interesting additions to the E&MM Percussion Sound Generator (Electric Drummer).

Plus Guide to Electronic Music Techniques, Electro-Music Engineer, Making Notes and all our regular features and workshop articles which make Electronics and Music Maker the top selling U.K. music monthly!

STOCKHAUSEN

"Metamorphosis needs new training in music. . ."

Venue: National Theatre, London
Date: Thursday, 14th January 1982. 6 pm.
Lecture-Demonstration: Karlheinz Stockhausen, assisted by Markus Stockhausen.

For the first time in five years, Karlheinz Stockhausen made a brief appearance in London at the National Theatre where he gave a lecture-demonstration to a packed audience for just over an hour. The subject was 'Musical Metamorphosis', with examples taken from Aries (Spring), a section of his 96-minute long composition 'Sirius' for electronic music, trumpet, soprano, bass clarinet and bass, composed between 1975-77.

With Karlheinz was his son Markus, who played the demanding trumpet part for Aries, which has now become a solo in itself for trumpet and electronic music. The latter was performed from a 2-track tape version which was controlled by the composer sitting at a Revox B77 tape desk and small stereo mixer. During the playing of the tape, Karlheinz made adjustments to volume and panning between the large (but not over-powerful) monitors on the stage. (The piece is normally performed using 8-channel tape 'in the round', with eight speakers in a circle around the audience.)

The theme of the lecture, Metamorphosis, focused on the very important changes that have taken place during the last ten years in the process of composing and realising music. Stockhausen pointed out that "new means have become available which not only, as in all traditional music, include variations and developments, but real transformations and different kinds of metamorphosis".

"Traditional music was in its structural aspect mainly based on one theme, sometimes two, but I have never studied anywhere a transformation from one precisely given form into another precisely defined form in one given composition."

Stockhausen related metamorphosis to nature's change of a caterpillar into a butterfly and introduced his concept of 'formulae' which have occupied his work in the last few years. Transformations in nature, of course, relate to the seasons of the year, and his interest resulted in him composing a whole cycle of the twelve signs of the Zodiac, where each formula represents one month or a human type.

The lecture presented fascinating new concepts for *all composers* to consider, from zero melodies, timbre melody, to formula composition. Markus Stockhausen performed his examples and Aries immaculately, despite the tremendous demands imposed by the (written) music which he had memorised and which utilised the full trumpet range, mutes, long sustains and fluttertongueing. Stockhausen concluded that "metamorphosis presents a new era not only for composers, but also for listeners as well".

Mike Beecher

[See Stockhausen 'Sirius' and 'Sternklang' record reviews in E&MM May 1981].

NEW PRODUCTS

MUSIK MESSE FRANKFURT

This month we are devoting the new products and news page to a brief look at some of the exciting musical items at the Frankfurt Music Fair, held from 13th-17th February. We shall of course be reviewing in detail specific equipment and instruments in forthcoming issues.

Rose-Morris will be showing the new range of Vox guitars and amplifiers. There are eight guitars in the range from the low priced Standards to the Customs (two of which were reviewed in the December issue of E&MM, the Custom 25 and Custom Bass) and two long scale basses. These guitars feature Di Marzio pick-ups and are available in both popular scale lengths, 24¾" and 25½".

Along with the existing range of Vox amps and pedal effects devices there will be some new products at the show. In addition to the AC30 (also reviewed in the December issue of E&MM) will be the V15 15W, all valve combo which has two 10" speakers, the 20W Micro-combo, the Escort Supertwin reverb, the Escort 50W bass combo, and the 125W lead and bass stacks featuring all valve construction and active equalisation.

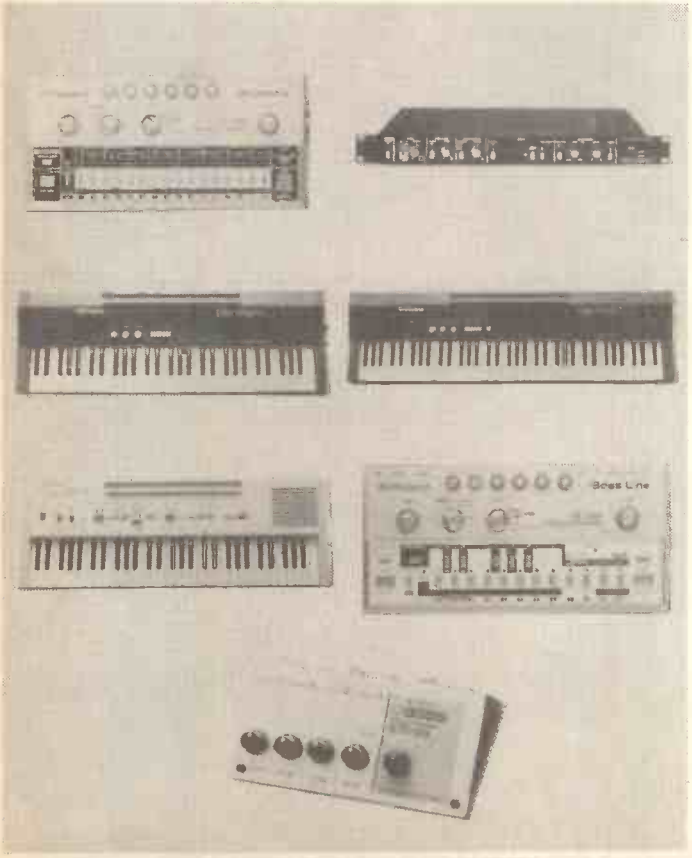
For further information contact: Gwen Alexander, Rose-Morris & Co Ltd, 32 Gordon House Road, London NW5. Tel: 01-267 5151.

Roland will be exhibiting a large number of new products including the TR606 Drumatix Compu Rhythm machine reviewed in last month's E&MM. Other newly released items are: the SDE-2000 Digital Delay which has a 0-640ms delay time allowing many delay effects, e.g. flanger, chorus, echo etc; the HP60 'Piano Plus' five octave keyboard which has a touch control for piano or organ reaction, a sustain control, and tone selections for piano and harpsichord; the HP70 'Piano Plus' six octave version of the HP60 plus a chorus effect; the EP11 'Piano Plus' five octave keyboard with auto play and rhythm sections.

Scheduled for release during March are the TR303 'Bassline' programmable bass machine; the Spirit 10, Spirit 30 Bass and Spirit 50 Bass amplifiers rated at 10W for guitar, 30W for bass guitar and 50W also for bass guitar respectively; the KM-04 Boss compact 4 channel mixer.

In addition there will be three prototypes on show: a Bolt-10C Tube Guitar amplifier; Juno-6 six voice polyphonic synthesiser; and the SCC-700 Compu Patch Memory for the Boss compact pedal range.

Roland (UK) Ltd, Great West Trading Estate, 983 Great West Road, Brentford TW8 9DN, U.K. Tel: 01-568 4578. Telex 934470 Roland G.



Fane Acoustic Ltd, will be introducing some additions to their Studio Professional series of hand built speakers. Included will be 10", 12" and 15" instrument models, a 10" mid range and a new horn drive unit. All models are 200W rating and complement the existing Studio 12 and 15 and the HF250 Bullet tweeters used in E&MMs Power 200 Speakers project this month.

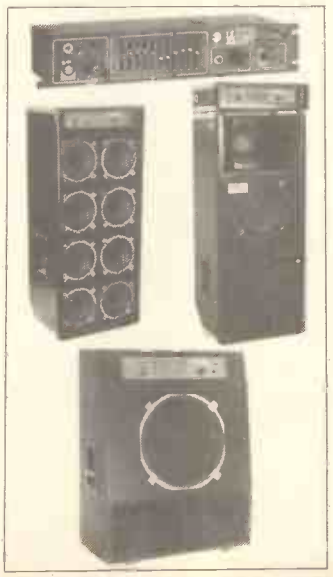
Also on view will be examples from the Crescendo, Classic and Specialist ranges. All models are available in Germany from Adam Hall GMBH, Hessenstrasse 21, 6395 Weilrod. Tel. 06083/832.

For further information contact: Fane Acoustics Ltd., 286, Bradford Road, Battery WF 17 SPW, U.K. Tel: 0924 476431. Telex 556498 Audio G.

The remaining items mentioned here are all handled by **Musimex** and if any further information is required contact: Tony Morris, Musimex, 33, Church Crescent, London N20 0JR. Tel: 01-368 2716. Telex 262284 ref 582.

John Burns guitars will be showing the re-designed Marvin and Bison plus the budget Magpie II and bass and Steer semi-solid.

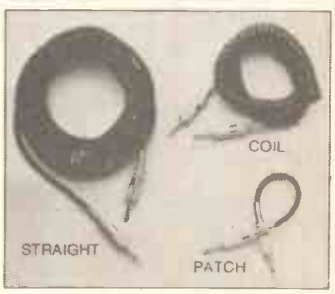
Trace Elliot, the bass amplification people, will be present with their full range of pre-amps, amps, speaker cabinets and combo amps. Two pre-amps are available, the GP11 Graphic and the PP33 Parametric. Two amplifiers with the choice of either pre-amp built-in; the AH250 giving a single channel 250W RMS into 4 ohms and the AH500 giving two channels of 250W RMS into 4 ohms. A variety of speaker cabinets and three combo amps which may have either of the pre-amps fitted; the 1501 which delivers 150W in a single 15" speaker, the 1008, 250W into eight 10" speakers, and the 1812 Stack delivering a total of 400W into a three speaker system.



Coles Electroacustics Ltd will be at Frankfurt for the first time showing the 4160 Cardioid Dynamic Microphone.

Session Amplification will be unveiling two new models, the Sessionette 75 and 125 as well as showing the Session 15:30 Deluxe Studio Combo, an entirely valve amp. They will also have the PM:120/A and PM: 120/S Guitar Monitor Systems which are solid state power amps. They plug into the 0dB record socket on the 15:30 and re-amplify the sound of the valve amp. Session claim that there is virtually no limit to the number that can be connected and as an example are about to supply Jethro Tull's Martin Barre with an 870W system.

The Music People Inc. will be announcing some new items at the fair as well as showing their Tune-Up stroboscopic tuning device for stringed instruments, wide range of high quality cables, Headgear HG101 headphones, and the Network system of add-on units which boost and treat the output of any normal electric guitar.



Alembic will be exhibiting their 'Distillate' bass guitars and the Custom 8 String (built for John Paul Jones of Led Zepplin) which have battery powered active mono pick-ups.

Tubby Drums will be showing their drum microphone pickup concept at Frankfurt for the first time. The system comprises a pickup and pre-amp/power supply to give good separation between drums, high immunity to feedback, ambient sound, no awkward mic stands and, of course, that Tubby Drum sound.

CLASSIFIED

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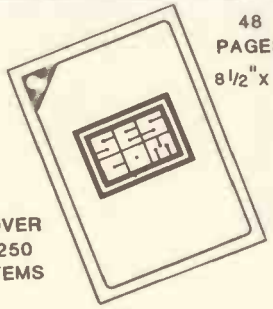

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WANTED: Tangerine Dream Bootlegs. **(BUY/EXCHANGE).** I have various 1975-1981 tapes. Also Schulze, Kraftwerk. **DETAILS:** A. Prema, 7, Padua Road, London.
WANTED: Regular drummer. Tel. Michael 0692 403758.

CORRIGENDA

August 81: Powercomp. TR2 & TR3 should be transposed on the component overlay.
Nov. 81: Figure 1. R3 should be 47k, not 270k.
Dec. 81: Synclock. JK1-7 not identified. JK1-Clock IN, JK2-Clock OUT, JK3-Trigger IN, JK4-Trigger OUT, JK5-Parallel/Serial IN, JK6-Serial OUT, JK7-Parallel OUT.
Jan. 82: Micromusic. Figure 1. 81LS95 & 74LS244 not pin compatible. IC2 & 4 both shown as 74LS244. For 81LS95, change pin nos. 18 to 3/16 to 5/14 to 7/12 to 9/3 to 11/7 to 13/5 to 15/3 to 17/11 to 12/13 to 14/15 to 16/17 to 18/ rest stay the same.

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.
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Kev Tweedy, Woolwich, SE London, 01-854 4033, K, M, BERG, -.
David Jones, Bangor on Dee, Clwyd, 0978 780762, K, B, E, -.
Paul Williams, Stevenage, Herts, 0438 50471, K, B, E, -.
Keith Bottomley, Oldham, Lancs, 061-624 6343, G, B, E, -.
David Steel, Leeds, Yorks, 0532-673251, KOGE, B, V, -.
Peter Dome, Sheffield, Yorks, 0909 567151, KO, M, V, -.
Frank Warby, Rainham, Essex, 04027 53873, KEGV, M, V, -.
David Hunt, Sheffield, S. Yorks, 0742 307949, K, M, EV, -.
P. Chegwin, Prescot, Merseyside, 430 7312, K, M, ER, -.
Martin Naylor, Wembley, Middx., 01-902 2941, GED, A, E, -.
John Sands, Middlesborough, Cleveland, 0642 211934, K, M, PEV, -.
Gary Masters, Acton, London, 01-993 2894, KW, A, V, -.
Chris Varnham, St. Albans, Herts, 0727 55005, KO, M, R, -.
Peter Musk, Leicester, Leics., 0533 896033, K, B, E, -.
Marvin Wilson, Leeds, Yorks, 0532 864129, K, B, E, -.
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, Westmidlands, 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.

Andrew Hammond, Maidstone, Kent, 0622 677776, GV, M, EV, C.
Allan Bula, Bexhill, E. Sussex, 0424 210410, K, B, V, N.
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, KOGE, A, V, C.
Darren Tansley, Colchester, Essex, 0787 227473, KG, M, E, N.
R. Goodall, Sheffield, Yorks, 0742 348372, KO, A, CRE, N.
Peter Makin, Bolton, Lancs, 0942 892193, GM, M, PREV, C.
Mark Shreeve, Enfield, Middx, 01-363 2589, KG, A, EPCV, N.
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.

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COUNTY
TELEPHONE

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O=ORGAN
G=GUITAR
E=ELECTRIC BASS
M=SOUND ENGINEER
D=DRUMS
V=VOCALS
S=STRINGS
W=WOOD
B=BRASS
C=COMPOSER

LEVEL
B=BEGINNER
M=AVERAGE
A=ADVANCED

TYPE OF MUSIC
C=CLASSICAL
J=JAZZ
P=PROGRESSIVE
R=ROCK
E=EXPERIMENTAL
B=BEAT
G=REGGAE
V=VARIOUS

ELECTRONICS
D=DESIGNER
C=CONSTRUCTOR
N=NEITHER

(Fictitious example)

NAME	TOWN
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COUNTY	TELEPHONE
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INSTRUMENT	LEVEL
K	M
MUSIC	ELECTRONICS
E	C

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The PFA is perhaps the perfect realisation of the classic powerfet amp design. The superb PCB allows the use of either one or two pairs of output devices, providing easy expandability for those starting with the smaller system. (The extra output pair of the PFA120 results in lower distortion and improved efficiency, particularly into low impedance loads).

The components used in the PFA have been chosen with extreme care. The lowest noise input devices and lowest distortion gain stage devices were selected regardless of cost. 140V powerfets were chosen against the more usual 120V to give improved safety margins.

Specification	PFA80	PFA120	
Bandwith	10hz —	100KHz± 1dB	
Output Power R.M.S. into 8Ω	80W (Vs=± 50V)	120W (Vs=± 55V)	
THD (20Hz—20KHz)	≤0.008%	≤ 0.005%	
(KHz at rated output)	0.004% typ.	0.002% typ.	
SNR	120dB		
Slew Rate	>20V/µS		
Gain	X22		
Rin	30K		
Vs max	±70V		
Cost			
(built)	£17.95	£24.85	P/P 75p
(kit)	£14.95	£21.85	

Power Amp PAN 1397

A high quality 20W power amp board based on the HA1397. Easily modified for bridge operation, providing high powers from low supply voltages.

Specification	
Output power RMS	20W into 8Ω at ± 22V 20W into 4Ω at ± 19V
THD	0.02% at 1KHz 1W to 12W
SNR	90dB
Input	100mV into 50K
Cost (Built)	£5.80 P/P 40p

PAN
1397

PSU
101

PSU 101 Power Supply Board for 1 or 2 PAN 1397s. Provides ±22V at 3A and +27V with 2 second run-up (for anti-thump circuit on PAN 1397). (Built) £3.95. P/P 75p

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The design is unique. Equalisation is applied after a flat gain stage, resulting in one of the best noise performances available. Superb overload figures are ensured by a front end incorporating a special gain/attenuator control (volume control to you!). The inputs are uncommitted and can be used with any combination of signal sources in the 1mV to 10V range. RIAA equalisation is provided for mag PUs and space on the board is available for different equalisations.

Specification	
B.W.	20Hz-30KHz ± 1dB
THD at rated o/p	0.003% typ.
SNR	85dB (ref. 5mV RIAA) 105dB (ref. 100mV flat)
Vs	± 20V
Output	1V (clips at + 20dB)
Cost (built board less controls)	£6.75 2 needed for stereo P/P 40p

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INTERNATIONAL MUSIC SHOW

Continued from page 61

Project Ear,
64, New Cavendish Street, W1.
01 681 4311.

This company aims to bring sound and music to the deaf world by means of an exciting new Electronic Ear, which has been developed with the latest micro technology.

RSD,
Alcock Works, Chawend Lane,
Leigh Groves, Luton, Beds.
0582 570621.

RSD will be showing the range of Studiomaster mixing consoles, including the new Studio 4 mixing console with built-in 4-track cassette.

Records and Recording

A new side to this music show will be the stands from the record industry. These include Big R Records who handle Country and Western music (with 'Peggy Sue' and 'Colarado' on their stand), Ellie Jay Records & Cassettes, Danson Records (dance music), A Side Records (with videos of their new artists), HMV (selling top 60 albums), Carrere Records (videos of artists including Saxon, Sheila B. Devotion and The Buggles), Peter Boosey Records (James Last, easy listening/classical), Island Records (latest LPs and special exhibits) and Expedition Records (caribbean and Reggae). To complement the record companies you'll also find Bixby Management who'll be interested in signing up new acts, Lornishware badges, Delgh Press who produce picture discs, Rorer 714 with American T-shirts, Sacre Bleu T-shirts, etc., and even the famous £25,000 bronze statue of Elvis. Premier Box Office ticket agency will be supplying IMS tickets, including concerts at show from its five West End branches.

Robert Taylor Insurance,
Millard House, Cutler Street,
London, E1 7DG.
01 283 3951.

This company specialises in insurance for the entertainment business. Their policies range from non-appearance insurance to basic general equipment insurance. They cater for a host of people: Video companies, film studios and famous (and not so famous) musicians. In fact, they consider themselves to be THE insurance company for the entertainment world!

Soho Soundhouse,
18a, Soho Square, London, W1V 5FB.
01 434 1365.

A London store displaying leading brands such as Fender, Gibson, Rhodes, Rickenbacker, Prophet Roland, etc., plus many of their own innovations.

Sony (U.K.) Ltd.,
Pyrene House, Sunbury-on-Thames, Middx, TW16 7AT.
09327 81211.

Sony will be exhibiting their new Walkman 2 personal hi-fi player which offers hi-fi stereo sound on the move without disturbing the rest of the family at home. Sony have pioneered products for the personal audio market, which is likely to match video as a growth industry.

Stocker Jennings,
6, Holywell Hill, St. Albans,
Herts.
0727 5632765.

A wide range of musical instruments from two shops based in St. Albans and Hitchen, Hertfordshire, will be on display, including keyboards, guitars, amps from Hammond, Casio, Kawai Eminent, Technics and Wurlitzer.

Straight Forwarding/
Rod Argent Keyboards,
20, Denmark Street, London, WC2.
01 240 0084.

Rod Argent's shop imports synthesisers including Roland, Oberheim, Sequential Circuits (Prophet) and the electronic drums from Simmons and Linn (with new crash/ride cymbals on demonstration).

Dragon acoustic drums from Denver, Colorado, will be having their first U.K. showing. Guitar Grapevine branch will display Hamer guitars, Wal basses and instruments from their large range of vintage guitars.

You'll also get a chance to hear the superb keyboard playing of Patrick Moraz and Dave Stuart on this stand.

Take 5,
3-5, Station Road, Edgware, London

Take 5 are specialists in Buffet, Selmer, Yanagisawa and Boosey & Hawkes brass and woodwind instruments. They'll be demonstrating band and orchestral instruments, with daily appearances of 'The Polecats' group.

Tokai (U.K.) Ltd.,
2, Fleet Road, Hampstead,
London NW3 2QS.
01 267 9229.

Established some 30 years ago, Tokai are now Japan's third major musical instrument manufacturer. This will be the first public showing of their new range of piano in the U.K. and on display will be six upright models and two grand pianos which are available in a variety of interesting and attractive finishes. These pianos incorporate an acute-angled stringing system for a slimmer shape plus a third practice pedal.

Turbosound,
1a, Dorset Street, London, W1H 3FB.
01 486 5252.

Turbosound are featuring their wide range of loudspeaker enclosures and a miniature PA system. Their equipment is available for hire as well as general sale.

Turnkey,
8, East Barnet Road, New Barnet, Herts, EN4 8RW.
01 440 9221.

This fast growing company supplies and installs recording equipment from the smallest home demo facility to the latest 24 track professional studio. The equipment on show will include AKG mics, the new range of low cost Fostex Personal Multi-track (including the outstanding new 4 track cassette and 8 track ¼" recorders reviewed in E&MM), MXR Signal Processors, Otari tape recorders, Roland systems, Teac Multitrack equipment and Soundcraft studio multitrack recorders and mixing consoles. Their expert staff will be on hand to advise you on your studio problems.

Wave Studios,
London.
01 729 2476.

Peter Inds, the virtuoso double-bass player, will be promoting his new Wave studio opening up at 1, Hoxton Square, London, N.1, which will feature a 24 track studio, tape copying, teaching facilities, restaurant and a bar. A recital room has been planned to seat 90.

THE SHARP MZ-80K HAS GOT IT ALL

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If there is no dealer in your area, or if you require any further information write to:- Computer Division, Sharp Electronics (UK) Ltd., Sharp House, Thorp Road, Newton Heath, Manchester M10 9BE.

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