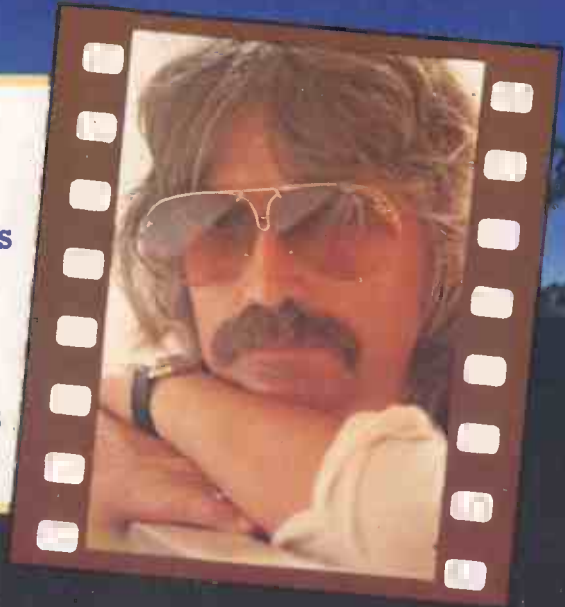


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AUGUST 1982 75p

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- ★ **JON LORD**
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- ★ New Tascam Portastudio Mk II
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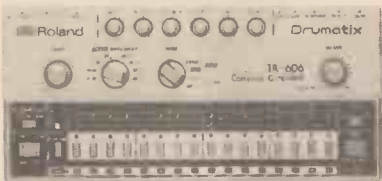
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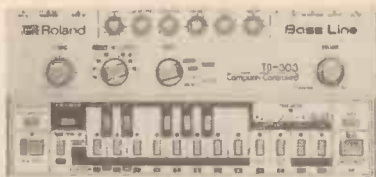
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The 1982 American NAMM Show was held in Atlanta during June and Rocky was there, of course, checking out all the new goodies for you! In the past it has been frustrating to see new items demonstrated at trade shows and then have to wait six months for them to arrive in the shops in the UK; however as the ever-expanding micro-computing controlled instrument market develops it is good to see these delays being reduced and the more competitive companies coming up with the goodies sooner. Two hand-held, electronic drunkits were the talk of the NAMM Show; "the kit" (made in the U.K.) and the Mattel "Synsonics Drums". Both will be selling for under £200 and we expect to have stocks of "the kit" in August. Whatever the musicians' union say, most new electronic musical instruments are adding to musicians' creativity; we welcome this at the London Rock Shop and hope that our industry does not become stifled by not accepting the latest technology.

P.S. Rocky for P.M.!

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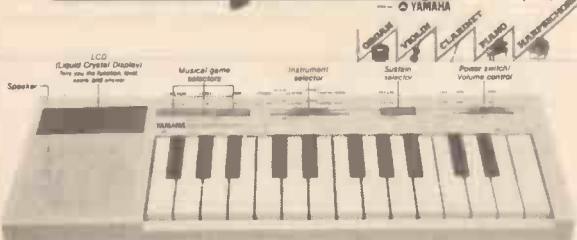
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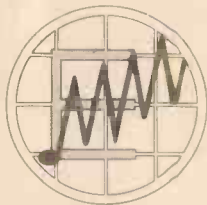


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Electronics & Music Maker

VOLUME 2 Number 6
August 1982

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Electronic v Acoustic?

The success and importance of E&MM as a publication has always been mainly due to a big change of attitude towards the use of electronic instruments in making music.

The media of film, television and radio have contributed greatly to the often unknowing acceptance of electronic string orchestras, brass bands, organs, drums and a vast range of keyboard equivalents of lute, harpsichord, mandolin, piano, accordion, harmonica — almost every traditional acoustic instrument has been imitated to some degree.

Whether you accept the electronic or acoustic version of an instrument usually depends on 4 basic factors: practicalities, cost, quality and skills; the practicality, say, of using a large orchestra on tour, the financial cost of producing music live or on record, the choice of an instrument or ensemble that is of sufficiently good quality for the performance, and the skills of the players involved.

Ultimately, the decision to use, for example, an electronic string machine instead of a live string orchestra is the artist's (or the manager's) decision. This does not mean in any way that one is condemning the other. And the position of the working musician still remains the same: his skill will always be needed for manipulating a piano, violin, trumpet, flute, kettledrum, Linn Drum, Vario-phon, synthesiser/organ, Emulator or Fairlight CMI.

The fact that the musician is desperately trying to keep up with today's technology is a reason for E&MM's existence. What is not realised perhaps is that electronics/computer orientated people are finding a new creativity through their understanding of the new musical instruments. They appear to be acquiring musical skills quicker than musicians learning the necessary technical skills.

I, for one, have grown up in the classical and jazz worlds and firmly believe that my enjoyment of electro-music has come from my life-long appreciation of the different aspects of music. Hopefully we'll remain united under one banner — as musicians.

This month you can enjoy trying out Jon Lord's lyrical piece with these thoughts in mind. If I had a grand piano and an orchestra, that's certainly the combination I'd choose, but for now I'll have to content myself with an electric piano, drum machine, and a couple of synthesisers!

We apologise for the delay you have had in receiving this month's issue of E&MM due to a change of ownership. Future issues of this magazine will appear on the bookstalls every 4th Thursday in the month prior to the cover date.

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

MU and Synthesisers

Following the recent motion passed by the Musicians' Union aiming to restrict the use of synthesisers and other electronic instruments, E&MM has decided to devote part of this month's letters page to correspondence on this subject. Printed in full below are two letters. The first was received by us and forwarded on to Maurice Jennings, London District Organiser of the Musicians' Union. The second is his reply.

Dear Sir,
As a keen synthesist, I was horrified to read about the idiotic proposals of the Musicians' Union to ban the use of synthesisers and any electronic aids on all live recordings and performances.

The implications of such a move are terrible and quite typical of the "self interested" unions whose members are blind to technological progress. Surely they realise that such a controversial proposal is likely to cause a major split in the subscription paying ranks.

Would E&MM be prepared to organise a petition of all its readers, to be presented to the Musicians' Union, against this terrible motion?

M. S. Cockings
Tyne and Wear

Dear Sir,
Mr Cocking's letter provokes me to respond more in sorrow than in anger. His wild shooting from the hip misses all possible targets, and his bracketing of the Musicians' Union with all other unidentified, supposedly 'self interested' unions is clearly, to use his own word, idiotic.

There is no point in being too hard on him as his reaction to the Central London Branch resolution is a gut reaction; the same kind of gut reaction felt by the members of the Union present at the May meeting, who saw their livelihoods threatened. They were seeking to prohibit electronic devices which simulate conventional instruments. Their motion said nothing about proscribing synthesisers per se. This important point seems to have escaped the attention of most of those who attack the Union. Unfortunately the great synthesiser debate has been conducted in the media at the superficial level of UNION TO PULL PLUGS ON TOP OF THE POPS. No doubt this approach to a serious problem has prodded Mr Cocking and others to write their anguished but often ill-informed letters.

Any member of the Musicians' Union can table a motion at a meeting of his or her branch. If it is passed it is then considered by the District Council, which can accept, modify or reject it. If it is not rejected it will be passed to the top body of the Union, the Executive Committee, which will have to decide what action if any should be taken. My view is that present Union policy will not be radically changed on this issue. It can be summed up in the following sentences extracted from last year's Conference Report. "It (the Executive Committee) recognised that threats to employment can

arise from a variety of causes and may take many forms including the replacement of musicians by other musicians performing on instruments and devices producing similar sounds by electronic or other technological means. It is also recognised, however, that new and different instruments will continue to be developed and used for their characteristics and considered that it would be impracticable to ban specific instruments on the grounds that they were potentially capable of reducing employment."

Now I ask you Mr Cocking, does that sound like the lunatic policies of a 'self interested union ... blind to technological progress'?

The synthesiser in the right hands can be a wonderful instrument for producing new and exciting sounds. In fact, the Chairman of the Union's Executive Committee, John Patrick, recently wrote the music for a television play which featured a synthesiser and electric piano — no Ludism here. However, what Mr Cocking does not know or does not care to admit is that this new marvel of technology in the wrong hands has put musicians out of work. A recent Barry Manilow tour is an obvious example. Instead of the usual fairly large orchestra, a small group which included three synthesisers was used. This group attempted to simulate Manilow's recorded arrangements.

To conclude, the Union's job is, as far as is possible, to look after the interests of its members whether they play the violin or the synthesiser.

Maurice Jennings
London District Organiser
Musicians' Union

In answer to Mr Cocking's suggestion of a petition, E&MM would advise readers to contact the newly formed Union of Sound Synthesists. Coverage of this organisation and a contact address are given in this month's News page.

Mis-spent youth?

Dear Sir,
I thought you might like to know that six months ago, when I first spotted your mag our local shelves did not support your worthy cause, with the largest store in town having only two copies every other month. This month there were ten copies visible when I collected my copy. Our numbers are growing!

My main point of writing is to say that money is a scarce enough commodity nowadays — less and less available for electronic delights, more being needed for general irritations such as food or a roof for the night — so your monthly mag is a steal at the price. Home projects, new instruments reviews, interviews and ideas for your own home studio (even if you can't afford it). In short, it's packed out with all the necessary info that us struggling, unrecognised, unsatisfied (and sometimes threatened) musicians crave for.

I've read many arguments in the home-projects versus instrument reviews line, and personally I think the balance is fine as it is (I don't understand the electronics and I can't afford the instruments!)

When we're all grey-haired, or even worse, bald, and thinking back to the good ol' days, E&MM will be one of my memories of a mis-spent youth of music, work, music, rest, music, music, collapse.
Cheers!

Jimmy Munro
Beds.

Stereo drum sound

Dear Sir,
I don't know whether or not your readers are aware of this practice but for the past few months I've been obtaining a passable "stereo" drum sound on a 4-track Teac, using the essentially "mono" output Roland TR606.

Using the excellent MF1 sync unit and the volume outputs of the TR606, it's possible to put, say, 3 drum signals on one track and 2 drum signals on another, with separate EQ perfectly in sync.

The MF1 unit needed a small modification (a stop/start button) which I have had installed.

A small tip if using this method, is to place your recordings thus, "Pulse" from sync unit on track 1, initial drum track on track 3, subsequent synchronised drum signal on track 4.

The reason for this placement is so that any possible cross talk does not interrupt the returning pulse signal to the TR606 and cause a loss of "sync".

The MF1 sync unit matches the TR606 perfectly and has certainly opened up the possibility of a better electronic percussion sound than I had previously hoped for.

K. Stacey
London

Vocoders

Dear Sir,
Firstly, may I be allowed to express my gratitude for your superb E&MM magazine. As an electronics engineer with an interest in music I find it far superior for value and content to other magazines covering this field. Secondly, I would like to write about a recent idea in electronic music for your consideration...

I've built a 10 channel vocoder, with V-UV detection, as a second year university project. The point is, once operational, I found that it had far more uses than its standard role as a 'voice-coder'. That is, why not use it with other types of sound source and for general sound instruments? Maybe I'm preaching to the converted, but in all the articles I've read concerning the vocoder in music no mention has been made of the possibility of using it with 'non-speech' sounds.

For example, suppose we replace the normal speech input with an electric guitar and apply an electronic synthesiser to the excitation input. Improvising with this arrangement with a friend, playing both instruments sim-

ultaneously, some amazing 'electro-acoustic' sounds were produced — from a grumbling, distorted Pink Floyd electric bass to mandolin/banjo type sounds! Noise and filter resonance yield interesting special effects. This idea could clearly be applied to any combination of instruments, transferring the dynamic frequency characteristics from one to the other, resulting in a different sound. Cross-modulation between filter channels allows further sound mutation — all good stuff for spontaneous electronic music!

Extending this idea, it's possible to envisage an all-electronic system using 10 ADSR's, all triggered at once, routed to the ten vocoder channel control voltages. This might be described as the poor man's Fairlight CM! Harmonic control is very crude and all possible modulation voltages cannot be catered for. An electronic synthesiser would provide either harmonic or non-harmonic material for shaping by the vocoder. Thus, complete dynamic filtering and timbral-sequencing can be performed by the vocoder, providing one has enough control voltages.

I've even treated my rhythm generator with the vocoder, re-constituting the rhythm on another more interesting electronic sound.

So there are endless possibilities here, or if it all seems a little extreme you can always go back to talking guitars and mass chorus!

Keep up the good work with E&MM.
David Farrall
Hants.

CB or not CB

I read with interest your mention of the Fidelity CB 3000 base station CB rig, and the suggestion that it could be used to communicate between computers. It is an admirable idea, and would probably work, but I would just like to point out that it is ever-so-slightly illegal. Before CB was legalised, there was some debate about the possibility of getting round the law by transmitting digitally encoded speech using legally licenced RC equipment. However, ironically, CB is now legal but the licence specifically forbids anything other than plain speech, except for a calling signal (which presumably is widely interpreted as including a "roger bleep"). Incidentally, many working musicians have found CB to be far more useful in a far more practical way, i.e. keeping in touch on the road to that gig in the unknown village hall in the middle of nowhere!

Roland Williams
Wilts

Demo cassettes

Dear Sir,
Oi! Why aren't you producing those excellent demo cassettes anymore?
George Forrester
Worcs.

The good news is that we are planning to start up the cassettes again in the very near future and they will cover items in the last few issues so that your E&MM sound library is continuous.



Union of Sound Synthesists Defy MU

Following the recent motion passed by the Central London branch of the Musicians' Union (see Readers Letters) aiming to restrict the use of synthesisers and other electronic devices in recording and live performance, a Union of Sound Synthesists has been formed. This will initially operate as a communications link and data base for anyone interested in supporting the evolution of sound engineering, including the use of drum machines, computers, synthesisers and other electronic instruments.

The union has been set up by E.S.S.P. (Electronic Synthesiser Sound Projects), an organisation specialising in the research, development and promotion of electronic-computer-synthesiser sound.

In a recent statement E.S.S.P. say that: "Although we feel this particular motion by certain M.U. members is probably based on paranoia of their own musical capabilities and certainly suggests a lack of understanding towards the role of synthesisers in the development of music, we think it is reasonable to prepare to make a stand against the attitudes of members of a union that promotes its activities under the banner 'Advancing Today's Music'.

"We have received much correspondence on this subject over the past fortnight, including M.U. members, expressing concern over the possible implications of action to ban synthesisers, and it was generally suggested that a network be set up, if only to collate and communicate ideas and projects for the future defence and promotion of music and

sound produced with computers and synthesisers."

Anyone interested in joining this network is urged to write to: U.S.S., PO Box 37b, East Molesey, Surrey KT8 9JB.

Contest for Unknown Composers

Britain's largest ever annual song contest begins in London next February. The World Song Festival is organised by The Melkonian Foundation in aid of charity (National Children's Home) and will be staged at The Royal Albert Hall on 15th February 1983.

The evening has been divided into two parts. The first part will be a concert featuring international singers accompanied by the Royal Philharmonic Orchestra and an "ultra-modern rock group". The second part will be a Song Contest featuring unknown composers — also accompanied by the RPO and the rock band. The celebrities from the first half will act as the jury for the actual contest and the winner will be awarded \$10,000 and a recording contract.

The only conditions of entry are a £5 entry fee, a top-line and a cassette of the song. All entries will then be sifted by a panel of 20 professionals from the entertainment industry and a final dozen will be picked for the event. The organisers are not asking for any publishing rights but they would require permission to televise and release a recording of the Festival.

Entries are now being accepted through to November 30th at the Melkonian Foundation, 67/68 New Bond Street, London W1. For entry forms call 01-408 1612.

In Brief

MTR will shortly have a 'portastudio' 4-track cassette system available, without EQ, which it is hoped to retail around £300 . . . Sequential Circuits has now established its own European distribution and service centre in Mijdrecht (near Rotterdam), Holland. Tim Oak is heading the operation with Tim Salthouse as Sales Manager and Steven Garth as Service Manager . . . JVC have developed a compact VHS video cassette system using standard half-inch tape and it has already been adopted by 11 other Japanese companies as an additional standard based on the VHS system. It was released in Japan on 5th July and is scheduled for America later this year. It is due to be launched in Europe in early 1983 . . . Hal Leonard have a new series of books, which they are marketing through Chappell Music, called the *Hal Leonard Electric Bass Method*. The five books in the series are all written by bassist Dan Dean. Book one is in the shops now, books two and three should just be coming available, and books four and five are in advanced stages of production. They all retail at £3.95.

Yamaha Combo Keyboards

We have just received a great little catalogue of Yamaha Combo Keyboards containing their complete range, a section on setting up a keyboard system, and a useful glossary.

Any readers wanting a copy can write to: Yamaha, Kemble (Organ Sales) Ltd., Mount Avenue, Milton Keynes, Bucks MK1 1JE or ring 0908 71771.

No Slump for Songwriters

Noting that their membership increased by 1,253 during 1981 to give a current total of 14,715 the Performing Rights Society have concluded that more people than ever are earning extra income from songwriting.

A breakdown of members earnings showed that 68 per cent of members earned less than £250 last year, 16 per cent earned between £250 and £1,000, 11 per cent earned between £1,000 and £5,000, while 5 per cent earned more than £5,000. Figures are taken from the PRS 1982 Handbook.

Prolific Peavey

The Peavey company have several new products on the way. Peavey's first valve amp head for eight years, the MX contains self-biasing circuitry which automatically compensates for varying valve characteristics and ageing . . . New Scorpion speakers are featured in two new flight cased speaker enclosures. The square frame design allows for very compact cabinets which come complete with transit flight case lids . . . Several other new Peavey speaker enclosures are also being released based on the Black Widow and Scorpion premium transducers. There are also three new extension cabinets and the 1210H PA column . . . The M2600 19" rack mountable power amplifier is a new stereo model, based on the 260 power modules, which features 130 watts RMS per side and Peavey's DDT distortion detection compressor. Peavey will be pleased to provide further details if you write to: Peavey Electronics (UK) Ltd, Unit 8, New Road, Ridgewood, Uckfield, Sussex TN22 5SX. Tel: 0825 5566.

Making Notes

Brenda Hayward, who writes E&MM's Making Notes series, has published two cassettes teaching electronic organ techniques. Each cassette retails at £3.95 (or buy both and pay £7.50).

Details from: Organ Master Publications, 6 Townlane Road, Bury St Edmunds, Suffolk IP33 2TE. Tel: 0284 84588.

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

EVENTS

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

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

September 2-6 16th INTERNATIONAL EXHIBITION OF MUSIC AND HI-FI. Milan Fair, Milan, Italy. Held, for the first time this year, in conjunction with the 'International Video and Consumer Electronics Show' the Milanese September expo takes on an even larger perspective becoming the most extensive trade-fair dedicated to audio, video and telecommunications. 100,000 square metres, nine pavilions, 32 participant countries. Details from Sim-Hi. Fi-lves, Via Domenichino 11, 20149 Milano, Italy. Tel: (02) 46 97 519.

November 25-27 THE NORTHERN COMPUTER FAIR. Belle Vue, Manchester. Following the success of their London show at Earls Court in April the sponsors have decided to hold a similar exhibition in Manchester. It will follow the same for-

mat as the London show with 'Club Avenue' for the specialist user groups, a Sinclair Village and sections devoted to the business applications of personal computers. Details on 01-643 8040.

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

CORRIGENDA

Jan '82

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

Spectrum Synthesiser. Page 90, Fig. 9, VCO diagram; and Feb '82, page 69, VCO parts list: All references to both C38 and C39 refer solely to C39, which is 100n polycarbonate (WW41U).

Feb '82

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

April '82

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



KITARO — Nature is of the Mind, and Music is of the Nature

... On the other side of the world forty million people are watching a small man crouched over a huge battery of electronic instruments. The venue is a thatched cottage in a disused village in the mountains two hundred miles from Tokyo. The man is at home. Japanese national TV has chosen this bizarre scene as its way of ushering in the New Year. In sixteen million homes the sweeping sounds of synthesisers 'ring in the New!' No bells — just Korg, Roland and Yamaha.

Masanori Takashi (KITARO) until now has been the least heralded in the West of the top electro-musicians from Japan. To many ears, his work leaves the soul-less and raucous work of such derivative artists as Tomita and Y.M.O. for dead.

This twenty-eight year old first came to national prominence through his membership of the Far Eastern Family Band. The FEFB had a Japanese hit with 'Theory of Hollow Earth' in 1974, and enjoyed a cult following on the West Coast of the States. In the U.K. their champion was the then adventurous John Peel who droned lyrically about their talents. They were very good indeed and certainly showed up their English counterparts Pink Floyd, whose music by this time was starting to grow the aural equivalent of a beer gut. Like the early Pink Floyd, FEFB seemed to

appeal to the ageing flower children.

As a rock musician Kitaro travelled a good deal and it was on a visit to Europe that he met the German musicians who were to have a profound influence upon him. Schulze and Deuter, for example, impressed Kitaro particularly and not for the most obvious reason. In essence, he discovered that these men interpreted their art in a spiritual way, and that their approach was one which instinctively struck a chord in him.

At about that time a poll in Japan had shown that in spite of the national religion of Shinto; the strong cultural presence of Zen Buddhism and the aggressive drive of Christianity in Southern Japan — that in spite of all this, an incredible ninety per cent of Japanese University students claimed to be atheists. Furthermore, they also claimed to be totally satisfied with a purely materialistic interpretation of life. So Kitaro's fascination with the complex nature of mysticism that makes up Shinto, and his study of Zen Buddhism was very unusual for a young Japanese intellectual. In Schulze and others he had found a Western reverence and enthusiasm for what was downright unfashionable amongst his own young countrymen. This led to the inevitable spiritual pilgrimage to India and Nepal. The unity behind the mind, the external world and the sound vibra-

tion organised into music is expressed by Kitaro as: 'Nature is of the mind, and music is of nature'.

These journeys led to a complete renunciation of the nightmarish quality of Japanese urban life. A short stay at the foot of Mount Fuji was followed by a period of intense meditation in a cave overlooking the Pacific. Until 1980 Kitaro stayed in a fishing village close to 'his' cave. The presence of electricity meant a ceaseless attempt to match the output of his synthesisers with the sounds and pulses of nature.

In 1978 'Tenkai' or 'Astral Trip' was released by Victor Records and already displayed a distinctive and natural compositional talent at work. Neither this or 'Daichi' released early in 1979 caused great ripples at the time. But by the end of 1979 a change of record labels (to Canyon) and the release of the phenomenally successful 'Oasis' had established him in the second biggest record market in the world.

With the flair of a good management company, Canyon had preceded the LP with a concert in August — several hundred people rapturously received that first major concert. At this stage a high percentage of Kitaro's fans were yoga students and trainee Buddhist monks — the auditorium at the concert had been dominated by the vast influx of saffron coloured monks' robes.

Early in 1980 he was commissioned by NHK TV to produce the soundtracks for their proposed epic series about the trade route from China to Rome... 'Silk Road'. His music for the first three programmes was to become known on disc as 'Silk Roads Volume One'. To seek inspiration worthy of that commissioned work, Kitaro decided to travel once again. His itinerary included Asia and Europe — the Austrian and Swiss Alps proving particularly stimulating to his senses. Like many a creative artist before him, Kitaro finds in the transcendence of the mountains the inspiration of nature's power to move the heart.

On his return to Japan he discovered the atelier in the disused village. A quick decision to move there was made, and the now famous studio planned and built. Even from the first days in his new home Kitaro expressed his fundamental belief in unity by his insistence that all tilling of the soil; growing of the crops and practical maintenance should be done by him. That policy is still followed.

In September '80 Kitaro performed for three consecutive nights at the highly influential Parco Seibu Theatre. These highly successful concerts were recorded for posterity and subsequently released as 'Kitaro In Person'. This JVC digitally produced recording has just been released by Kuckuck Records in Europe and features Kitaro with four other musicians. Generally the album stands up very well as a live performance — though slight blemishes include an over obvious backing drum in places and a violinist with the faintest hint of a pitching problem. However, these are very minor criticisms and do nothing to diminish the achievement of this LP.

When 'Silk Road' was finally screened, the NHK telephone switchboard was jammed with enquiries about the music. Naturally enough Kitaro was asked to produce music for the rest of the series... hence Volumes 2 and 3 of 'Silk Road'.

Following up the great success of 'Silk Road', Kitaro was flown into England to record with the LSO. Just as Mike Oldfield had produced an orchestral 'Tubular Bells', so Kitaro was required to do the same for 'Silk Road'. On this record the numerous multi-tracks were replaced by fully orchestrated scores. To my ears nothing was added to the music by this expensive exercise; indeed there comes a point at which a subtle tone created by a synth is destroyed by the emphatic 'definiteness' of an oboe or violin. Too much is stated. In the main, the LSO rendition serves to show how strong the melodies really are, and even more markedly the similarities between the 'Silk Road' theme and Iain Sutherland's 'Sailing' — quite uncanny!

The music of Kitaro is not conceived in an intellectual way and nor should it be listened to in that way. The compositions come as an outpouring of a man's religious experience, and he makes it clear that his own inner condition plays a crucial role in the musical creativity: "My music is some-



what different from the sound of nature's movements for it has positive love added. Furthermore, there is no self oblivion or self-intoxication incorporated in my music, as is the case of Indian music as represented by the sitar."

There is a feeling that the newest records produced by Kitaro are a reiteration of what has already been available from him and that he is falling into the trap of producing too much with too little new inspiration. Maybe with an artist like Kitaro we should not expect development or a continual stream of electronic novelty. After all, his creativity is not based upon an urge to sell a lot of records. Be that as it may, nobody with an interest in electro-music can afford not to pay the closest attention to 'Silk Road'; 'Oasis' and 'In Person'. All three of these records are now distributed in the U.K. by Making Waves Record Distribution so hopefully they will find their way into record shops up and down the land. The music of Kitaro could be massively popular in Britain... perhaps the BBC could follow up the success of 'The Water Margin' with 'Silk Road'.

E&MM

Available in Europe
Ten Kai.
Silk Road Vol. 1 and 2.
In Person.
Oasis.

Available only as Japanese imports
Silk Road Vol. 3.
Daichi.
Tao.
Ki.

If you have difficulty in obtaining these records, contact Making Waves, 10 Selfwick Mews, London W2 1JG. Tel. 01-262 7377.



The Synergy

The Synergy is a fully digital polyphonic synthesiser that in many ways represents the state of the art at the present time. Designed by Digital Keyboards Incorporated in the U.S.A., it offers the musician a wide range of expression through its touch-sensitive 74-note keyboard and its analogue style controls.

Its sleek black 'ivory' finish package is complete in itself, holding a computer system with memory and the digital equivalent of 32 voltage controlled oscillators, which provide sounds for 24 preset and 24 interchangeable cartridge voices. The system layout makes it a versatile and portable 48 preset performance instrument and the all too common complaint of 'synths lacking expression' is easily overcome by its dynamic keyboard control that can actually increase the expressive technique of an acoustic pianist. It was also one of the first instruments to set the trend for sequencers to be included on polyphonics - the Synergy has a 4-track sequencer that can utilise the different voices available in a variety of ways.

Layout and Voices

All the synth controls are situated on the sloping front panel above the keyboard, with vertical white legends dividing them into the following groups, from left to right: Volume, Pitch bend, Sequencer, Portamento, Vibrato, Amplitude and Timbre, Program settings, Transpose, Voice Assign, Restore, Voices, Channel Assign, Tuning and Cartridge (with the cartridge socket at the far right). The switches are all light touch momentary types with an LED indicator built in (except the Channel Assign). Incidentally, an internal electric fan cools the micro chips during operation.

Apart from the 4-way joystick, all the controls are rotary types. 24 individual voices are stored in the Synergy and are selected from the two horizontal rows of 12 switches. The voices can be used in either 'Single Voice' mode using one voice on the keyboard at a time, or 'Multi-Voice' mode, where up to 4 voices can be used together. A voice is selected by pressing one of the 24 switches and its red LED indicator will then remain on unless you are playing on the keyboard. Pressing the switch again turns off the voice (and LED). Most of the switches work in this touch on - touch off way.

On power-up of the instrument, the Single Voice mode is selected and consequently, if you choose another preset, the first voice will be turned off automatically. Because the Synergy is under the control of a micro, it is possible to offer performance variations through its switching arrangements that would be uneconomic and complex in normal analogue synthesisers. For example, pressing a new voice switch, while still holding a chord on the keyboard, allows the original preset to continue sounding to the end of its release. The new voice then takes over. On the other hand, if you select a new voice after you've released keys playing the original voice, any note still sounding will be cut off immediately and the new voice will take over on the next new key(s).

Since 32 oscillators are available, it may be assumed that up to 32 notes can be played at once in single voice mode. Actually, this is not the case, as some voices need more than one oscillator to make the sound required. Organ, for example, is touch sensitive programmed to increase its 'stops' to full organ, implying the use of 16', 8', 5½', 4' etc. oscillator pitches.

But generally, there's more than enough to go around, unless the sequencer is using voices as well as you playing several others at the same time. The foot switches can also have you running out of oscillators quickly as well.

One of the main features of the Synergy is its ability to play up to 4 voices at once (each polyphonically). By pressing the Save switch once, the Multi-Voice mode is selected. Up to four voices



can be chosen and their LEDs will light up. Any other voice switches pressed will be ignored and, incidentally, modulation effects like vibrato will only occur on the last voice selected.

Performance Controls

A dual pedal is provided with the instrument, with the left-hand pedal acting like a middle pedal on a grand piano and sustaining keys held at the time of switching, but not further keys played after. This is an interesting musical aid that, for example, could sustain a chord while staccato sounds are played over it. The right hand pedal gives the familiar sustain on every note played when depressed.

A Tuning knob effects all voices on the keyboard and sequencer, and will alter pitch ± 1 semitone from A440 standard pitch. Deviation from the standard is shown by the tuning LED indicator lighting up.

It is important to note that, in common with other digital synths using analogue type controls (e.g. PPG wave II), knob settings are not actually changed until the knob has been turned fully left or right and to the position of the current setting. The LED above the knob then turns on to show the control is active. Often, many of the knobs will automatically be de-activated during program and voice changes where it is more logical for the settings to be initially the programmed ones.

The Joystick enables two modulation effects to be achieved simultaneously if desired, with horizontal movement controlling Pitch Bend and vertical controlling Vibrato Depth. The actual pitch bend (pitch deviation) made by a left and right movement of the joystick can be easily set to any interval up to a perfect 5th up or down. This is done in conjunction with the Restore switch (for a 5th) and the Sustain foot pedal and Set switch for any other interval. On power-up the bend is set to \pm whole tone.

Voice Controls

Polyphonic portamento is always an impressive effect and the Synergy has some interesting possibilities. Here, the computer system scores again, as it keeps track of complicated portamentos. Pressing the Portamento Quantisation

switch once turns the effect on or off. The various results are produced by sustaining left and right hands at slide start and finish points in conjunction with the Sustain pedal. These include portamento crossing through a chord, crossing another portamento, expanding and contracting chords, and (apparent) random slides around the keyboard. The portamento rate can be changed from a very slow movement to instantaneous jump. Incidentally, movement time for any portamento interval is always the same for the particular rate set.

The Quantisation switch can be pressed again (and its LED flashes slowly) for retaining the initial envelope on the final finish note of the portamento. One more press, to complete the cycle, (with the LED flashing quickly) gives semitone glissandos and new triggering on each note.

Occasionally it's possible to reach a point in tailoring a preset voice with the various controls when you decide to start again and a Restore switch is provided to do this. The original preset or cartridge preset cannot be destroyed and even restoring can only be done by following the correct sequence: after pressing Restore switch, press either a single voice switch, or the Cartridge switch (for restoring all the voices), or the same switch for clearing the entire Synergy to its original factory state.

Vibrato is a well known effect that can be added to a voice using the Vibrato Depth knob. It usefully provides increasing pitch change to the right of centre and interesting random pitch jumps in an anticlockwise direction, (the random effect is not available from the joystick). Vibrato Rate can also be changed with an adjustable Delay. In order to achieve the precise sound for a preset, the Synergy puts either periodic (i.e. all notes with synchronised vibrato, for vibraphone) or aperiodic (random sounding changes suitable for flute).

Transposition can be done on the last voice selected and it's easily set by selecting a note below middle C - the interval formed by this note and the second C above the lowest note sets the transposition interval up (12 semitones) or down (20 semitones).

Because the Synergy has left and right outputs available, each with their own volume control, it is possible to independently assign voices to them.

**...IT'S SAD TO THINK
THAT PEOPLE EVEN CONSIDER
OTHER SYNTHESISERS...**



**THE PPG.
CATCH UP
WITH
TECHNOLOGY**

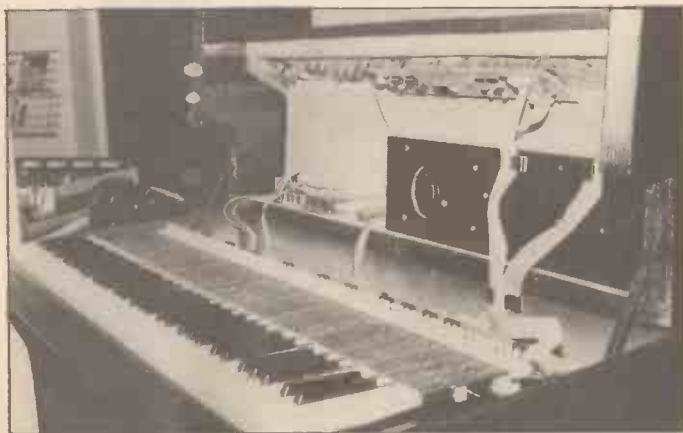
The PPG is a new generation synthesiser that combines the merits of both analog and digital technology. In fact it's the only synthesiser which, by offering this combination, allows you to quickly and effectively change the sound whether in-studio or on-stage. The PPG has 64 waveforms in each of its 32 wavetables making a total of approximately 2000 complex waveforms. Each voice has a 24db/oct filter and so completely new sound variations are possible as well as the conventional analog and purely digital sounds. Every sound you make on the PPG can be easily altered or updated. Over



100 sounds can be stored in non-volatile memory and it makes its own memory check when switched on. The advanced digital recording system allows eight tracks to be recorded, either in real time or step by step. These tracks can then be edited and the sounds altered during playback. The recording system also has a polyphonic arpeggiator. So before you consider an ordinary synthesiser consider the extra ordinary PPG and catch up with technology.

Syco Systems 20 Conduit Place London W2. Phone 01-723 3844 for an appointment.

The Synergy



The Synergy opened up.



Right hand controls and cartridge.

The **Channel Assign** switch sets the 4 options shown by the state of its 2 built-in LEDs and will set the last selected voice to centre, left, right or alternating right and left on successive notes. Needless to say, the latter is most effective with a single voice in use and since each voice can be assigned differently, some superb stereo mixes can be obtained in Multi-Voice mode. Many voices already have some kind of key control present but you can override this.

The keyboard is one of the most dramatic in its control of **amplitude** and **timbre**. Sounds are changed by striking the keys faster or slower. The degree of control you have over volume is set by the Amplitude Sensitivity knob and an Amplitude Centre knob will emphasise a part of the dynamic range.

The **Timbre** (or tone) of various voices can also be changed. Instead of a smooth tonal change, some voices actually jump from one timbre to another which lets you highlight individual notes, (sounding as if they come from another instrument). A Timbre Sensitivity control selects 'smooth' or 'jump' transitions of tone and Timbre Centre shifts the emphasis from one timbre to the other.

Voice Assignments

There are 7 different ways in which voices can be played in Multi-Voice mode. Normally, voices will sound in unison with each other (polyphonically). The other options are 'Rolling', where each new key is assigned to a new voice - a fairly frantic effect; 'First Available' is similar to rolling but holds the new key notes to the same voice, e.g. holding a 3-note chord in the left allows a single note melody to sound on the same voice in the right hand; 'Key Split' works on 2 voices only and puts them in selectable portions of the lower and upper keyboard by means of the Set key and a quick tap of the chosen split note. Unlike other instruments, this one note will not sound during your performance. 'Float Split' is another clever assignment from the Crumar GDS Digital Synthesiser. It lets the keyboard follow the player's hands and keeps the voices tracking up and down. Provided each hand spread is within a tenth, the micro will nearly always get it right! 'Compound Split' offers left hand single voice with either Rolling or First Available in the right. Finally, transposition used in Float Split mode can even have your hands playing the same pitch ranges in different parts of the keyboard!

Programmes

Eight programmes can be stored (and kept indefinitely by the internal battery back-up) - four for the internal voices and four for the cartridge

voices. The Synergy has at least 3 cartridges available to date as extra voice sounds. 24 more voices are supplied on each cartridge and that should be more than enough for most musicians (with the 24 internal voices as well). One advantage of the cartridge I heard was the addition of percussive type sounds, but these cartridges do rely on GDS owners to submit new material and after trying the first cartridge, further voices tended to sound somewhat similar. All the voice controls will change the cartridge sounds exactly like the other internal presets, but the sequencer only works properly on cartridge or preset.

Sequencer

It is basically capable of recording 4 tracks of music in a polyphonic (more than one note per track) and polytimbral (more than one voice per track) to a total of approximately 1,860 notes. This will enable complete pieces of varying lengths to be recorded - a logical approach has to be made here for best results with some calculating of numbers of voices, notes per voice, and total tracks to ensure you don't run out of events (and oscillators)!

One big drawback from the performance point of view is that the sequence is lost when power is turned off - but of course, it's not too difficult to pre-record on stage beforehand.

Anything played on the keyboard can be recorded by the Sequencer and it will accommodate any combination of voices, voice assignment modes, portamento, pitch bend, modulation, joystick and footswitch control as well.

The sequencer controls set Tracks 1 to 4, Record, On/Off and variable speed playback. Once

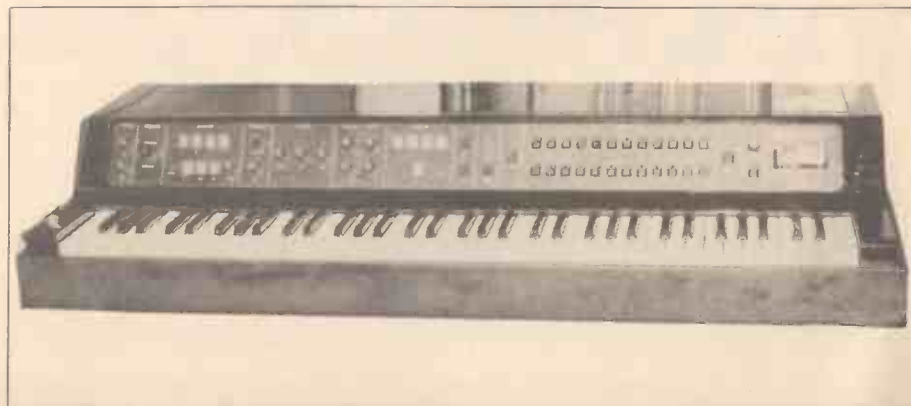
a track is recorded, you can play the keyboard along with the sequence in another voice if you wish. Individual tracks can be erased and an LED starts to flash progressively quicker as your memory space runs out. Each of the 1860 digital events is in fact not just recording a key note, but includes name of key, voice used, key velocity and key duration (sustain time). Initial rests can be 'forced' by moving say, the joystick, and repeats can be specified for single track or whole sequence. Playback speed can be adjusted from its LED indicator to be exactly twice or four times normal speed. Transposition can also be done on the whole sequence as it plays by selecting notes below middle C on the keyboard in real time. Editing is restricted to re-recording a whole track to get your piece right.

Various possibilities exist in playback of tracks separately or together, stopping or starting, using one track to control other tracks and re-orchestrating. Lastly, there is an 'Even' switch which effectively tidies up chords and notes, pulling them to the nearest main pulses in the recorded bar.

In conclusion, it simply remains to say that it is hard to fault this instrument, provided you like its wide range of presets available, and its comprehensive manual contains all the instructions you will need. Priced at under £3,000, it represents good value considering its high technology and will offer many musicians the kind of keyboard and analogue control they've been looking for in a digital instrument - with the bonus of a sophisticated sequencer!

E&MM

The Synergy is available in the U.K. from Syco Systems Ltd., 20 Conduit Place, London W2. Tel: 01-723 3844.



TASCAM 244

PORTASTUDIO REVIEW

FREE COMPETITION
FOR 244 USERS

In May 1980 Tascam introduced a completely new concept of 'creative recording' equipment with their M144 Portastudio, a cassette based 4-channel recording/mixer package for the electro-musician. Over £2 million worth of these units have been sold in the U.K. alone, although a number of other companies, including Fostex and Recording Studio Design, have also moved into this important product area for musicians.

On 5th May this year, Harman (Audio) U.K. Ltd launched the successor of the first Portastudio, the Tascam 244. Tascam is, of course, the brand name for Teac's production lines that includes their wide range of professional recording equipment. The basic style and presentation of the instrument has been retained — angled meters, colour-coded controls and compact size — but Tascam have made significant additions and improvements with only a slight increase in price. The most noticeable change is the addition of dbx II noise reduction instead of Dolby B which improves significantly the playback quality. Other features, such as the new transport system with optional remote punch-in, parametric EQ, stereo sends and 4-channel simultaneous record will appeal to many musicians eager to create their own multi-track recordings at low cost.

Layout

The Portastudio is basically a 4-channel cassette recorder with DBX noise reduction processors and 4-channel mixer in one portable package. The outer casing is a dark grey plastic two-part moulding, enclosing a rigid metal frame that supports the VU meters, circuitry panels, knobs, switches and cassette mechanics, and measuring 455(W)x120(H)x370(D)mm.

The whole instrument weighs a sturdy 9kg and is very well finished throughout. The left hand mixer section has smart colour coded knobs and both sliders and switches are quiet and smooth in operation. The VU meters are scaled from -20dB to +3dB, with all connection sockets and secured mains cable located behind these on the rear panel. Sockets are all RCA phono types except for the four input jacks and remote punch in/out jack which are standard mono.

The right hand cassette section incorporates a 3-motor transport system with FG servo-controlled DC Capstan motor, DC reel motor and (unique to Tascam) a DC control motor that gently moves the head assembly in and out of the tape path, originally designed for the Teac V9 cassette deck. This puts much less force on the heads and associated components than the direct mechanical linkage or electrical solenoid systems and reduces the need for azimuth adjustment. Tape heads are Ferrite for erase and Permalloy for combined record/playback. Teac's superior Cobalt Amorphous heads (on the V-3RX and V-5RX) have not been considered suitable at present for 4-channel.

The switch buttons for the recorder are neatly moulded from one plastic strip attached to the main plastic top. These make individual contact with calculator style switches on the main chassis. A cassette is inserted by pressing the door button to release the spring loaded clear plastic lid and placing it directly downwards. A four digit fluorescent (green) tape counter is provided and two parallel stereo headphone sockets are now positioned sensibly on the left of the front panel for easy access.

Servicing has been carefully considered since, once the rear cover is unscrewed, all the necessary adjustment presets are imme-

diately accessible. The large amount of circuitry is contained on separate PCBs that are removed by simply unscrewing and disconnecting cable connectors. The front cover needs a magnetised screwdriver (and some care and patience) to lift it away from the control knobs, but all major servicing can be done from the rear of the chassis. The transformer is air vented through the plastic case and is well rated for its application. All the DBX electronics are on one PCB that is removed to access the mixer input stages.

Circuitry

The control circuitry is divided into 3 main sections: a basic mechanism control circuit for the tape transport, an additional function control circuit for accessories such as the punch in/out and the zero return facilities; and an amplifier circuit that controls switching operations for the record and playback heads, amplifier muting, and VU meters.

Interesting circuit features include a single system control IC that controls all the transport functions of Play, Record/Play, Fast Fwd, Rwd, Pause, Stop, Memory rewind for Zero return. An auto stop circuit uses a Hall effect IC that turns off about a second after the tape stops running. There is also a power mute circuit for power on/off. Tape track connections are wired in opposite phase to reduce crosstalk and various test tapes are available from Teac for setting up head azimuth and wow and flutter. The reference input used in setting up is 400Hz, -10dB (0.3V), with playback output levels within ± 3 dB over the frequency range of 40Hz to 14kHz. Actual recorder frequency response is 20Hz to 18kHz. The signal to noise ratio is quoted to be better than 70 dB for each channel, with wow and flutter



IT WOULD TAKE A PRET TO IMPROVE ON THE MO

The Revolution.

It would be fair to say that the introduction of the Model 144 Portastudio marked a revolution in recording technology. For the first time, it became possible for both beginners and hardened professionals to enjoy the benefits of multitrack recording techniques in one complete, fully portable package.

A Developing Picture.

It wasn't a revolution that happened overnight; at TASCAM, we've spent twenty years making it our business to develop recording equipment that combines technical excellence and real value for money with the versatility that creative people need.

With an attitude like that, it would be only logical to expect us to continue developing the Portastudio concept, both in the lab and by listening to the comments of working musicians in order to produce a significantly better unit.

That's exactly what we've done.

Inside and Out.

The new Model 244 Portastudio isn't just a tarted up version of the Model 144 - it embodies a number of new features which make it even more flexible and easy to use. For example, the Model 244 now lets you record on **all four channels simultaneously** with **full mix and overdub facilities** including a two band **parametric equaliser on each channel**.

Naturally, the heart of the machine is still the special multitrack cassette system with our 'Simul-Sync' record/playback head, which allows you to record up to ten tracks with a



AND
THE NEW TASCAM MO

TY AMAZING COMPANY DEL 144 PORTASTUDIO.



minimum of transfers and maximum sound quality. Now though, that sound quality is even better, thanks to the addition of the remarkable **DBX Noise Reduction System**, which dramatically reduces noise and crosstalk between tracks, giving you fresh, clean results – even after a number of overdubs. As you can see, the outside's had a lot of work done on it, but that's more than matched by the goodies inside.

What Price Progress?

The best news of all, perhaps, is that adding a lot to the Portastudio hasn't added a lot to its price. As we've already said technical superiority needn't carry a heavy price tag.

Your local dealer has the full low down on the Model 244 and, if you ask him nicely, he'll also let you have a copy of our invaluable booklet, *The Multitrack Primer*. In it, you'll find all you need to know about modern recording techniques in a simple, logical form.

It's the sort of thing that most people wouldn't bother producing for their customers, but we're not most people.

We're TASCAM. That's all there is to it.

Tascam make a range of equipment from the Model 244 to 16-track recording machines. For further information on the complete range of Tascam equipment, write to:
Harman UK (Dept. 12), Mill St., Slough, Berks. SL2 5DD.



TASCAM

TEAC PRODUCTION PRODUCTS

T DID. L 244 PORTASTUDIO.

TASCAM 244

PORTASTUDIO REVIEW

$\pm 0.06\%$ peak (DIN/IEC/ANSI, weighted). 0.04% RMS (JIS/NAB weighted). Fast wind time is under 2 minutes for a C90 tape, with normal play speed of 3 $\frac{3}{4}$ i.p.s. for the 4-track, one direction recording system (15 minutes on C-60 tape).

The DBX circuitry employed is the type II (type I being used for reel to reel Teac decks), with 4-channel encode/decode in continuous use.

The Mixer

Four identical mixer inputs are provided that will accommodate a wide range of signals, from Mic to Line (1mV to 0.3V, max. 5.6V). That virtually covers every kind of signal that the musician would be using from mics (unbalanced 10k or less), electric guitars to electronic percussion and keyboards.

The controls in each vertical module from top to bottom start with a 3-way input selector switch for Mic/Line, Off and Tape. The Mic/Line signal is inserted at the appropriate jack socket (inputs 1-4 on the rear panel); Off is used to mute the channel when not in use and Tape selects the playback signal from the built-in cassette deck. Tape signals are always allocated to the same input, e.g. track 1 goes to input 1, etc.

Next, a Trim control knob sets the Mic/Line level over a wide 50 dB range and near it is a red overload LED that switches on at 22dB above nominal input level.

At this point in the signal chain, there is access via two phono jacks (normally linked by a removable angled metal rod) for inserting external signal processing equipment into individual channels. It's useful for patching low level signals (which are now at line level to compressor/limiters, phasers, flangers, graphic EQ etc., or receiving line signals that need no Trim adjustment, e.g. from another tape deck for copying purposes.

The signal is then split to Aux and an EQ section for tonal modification. The latter follows the trend of using dual parametric equalisers instead of traditional treble and bass controls. Two dual concentric knobs

are provided with variable centre frequencies (outer knob) 1kHz to 8kHz and 62Hz to 1.5kHz, and the boost and cut is adjusted by the inner knob for ± 15 dB (some 3dB more than its competitors). Here, I would have liked a centre click-stop to ensure no equalising is taking place. Even so, if you're not used to parametrics, you'll be pleased how easy it is to tailor your sound to your taste as well as removing 'peak spots' that produce hum or hiss.

The Aux (auxiliary) sub-system takes the mono input signal from each mixer and directs it to left and right Aux Send phono sockets at the rear. An Aux switch selects Pre, Off, or Post, for receiving the signal prior to EQ, muting, and for receiving the signal after EQ and the channel input fader.

The Aux mix facilities on this Mark II version are a big improvement over the 144, not only here, but for Tape Cue as well. They offer the possibilities of 4 distinct sends (by panning full left or right) or two stereo mixes for general echo, reverb and effects. Two



Rear connection panel.

controls set Aux gain and pan, with 'Pre' setting useful for performers' headphone monitoring when you're recording with other musicians (an input cue mix) and 'Post' more suitable for echo/effects as it will proportion the amount of send with the output signal.

A Pan control next positions the main input signal in the stereo buss. These left and right signals from all 4 inputs are sent to the Line Out and Aux Out phono sockets at the rear through the Master Fader located to the right of the inputs. The master fader is a dual stereo type that also sets the VU meter and tape recording levels as well as the

monitor levels (if the monitor is set to Cue or Remix).

Incidentally, Line Out and Aux Out are simply ganged sockets, with nominal level at -10dB. The master fader has its own LED overload indicator, set to switch on at +10dB above nominal level. Provision of LEDs on both input and output ends of the mixer obviously helps a great deal in maintaining maximum levels without distortion for recording. (I am convinced that many recordings we receive at E&MM for our cassette review pages suffer from tape hiss simply because attention has not been paid to levels). VU meters in general are not the most accurate of measuring devices, especially on fast transients, and these meters utilise simple averaging circuitry (with an AC bridge rectifier).

Above the master fader is an Aux Receive control knob that sets the level of both left and right Aux return sockets at the rear.

Monitoring

The two stereo headphone sockets will drive phones of 8 ohms or more and are fed via the Monitor buss in three ways, with a single control provided for setting listening levels. Quality is good here and no extra hiss is noticeable except above 3/4 setting. The three modes selectable are Remix, Cue and Aux. Remix gives you direct monitoring of both left and right buss output signals separately or in stereo and is generally used,

as the name suggests, for remixing. Cue puts both Buss and Tape Cue signals in mono mode that's ideal for all recording situations. Aux monitors the actual output to the Aux Send sockets.

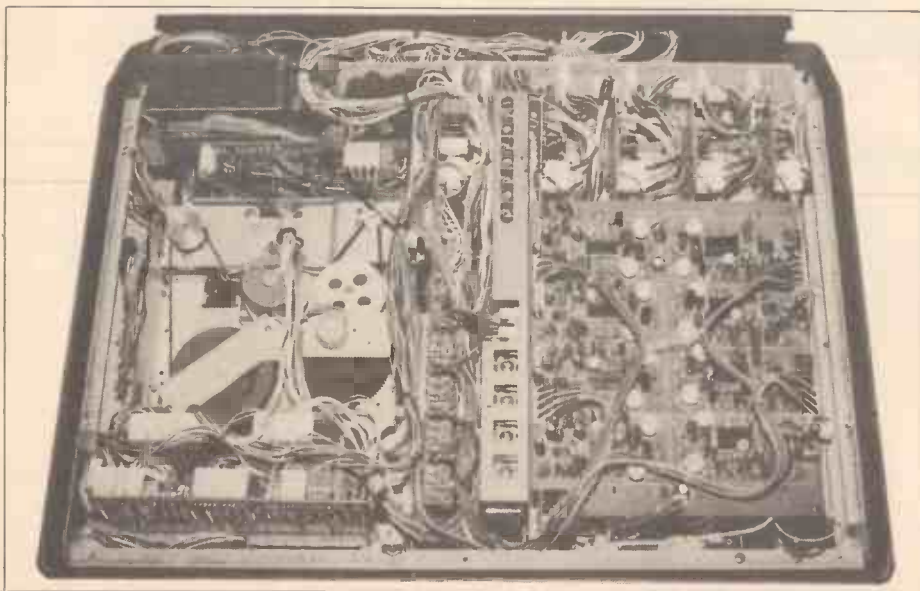
The Tape Cue dual concentric controls above the cassette section enable an independent stereo mix (or two mono mixes) to be made from the tape tracks on replay. With Monitor set to Cue, this can be used for headphone monitoring of any tape tracks plus incoming input signals. In Remix mode, Tape Cue outputs provide an extra stereo effects send, via two phono sockets at the rear.

The additional Aux Out lines enable a separate stereo amplifier/speaker monitor system to be connected, with Line Out still available for stereo mixdown.

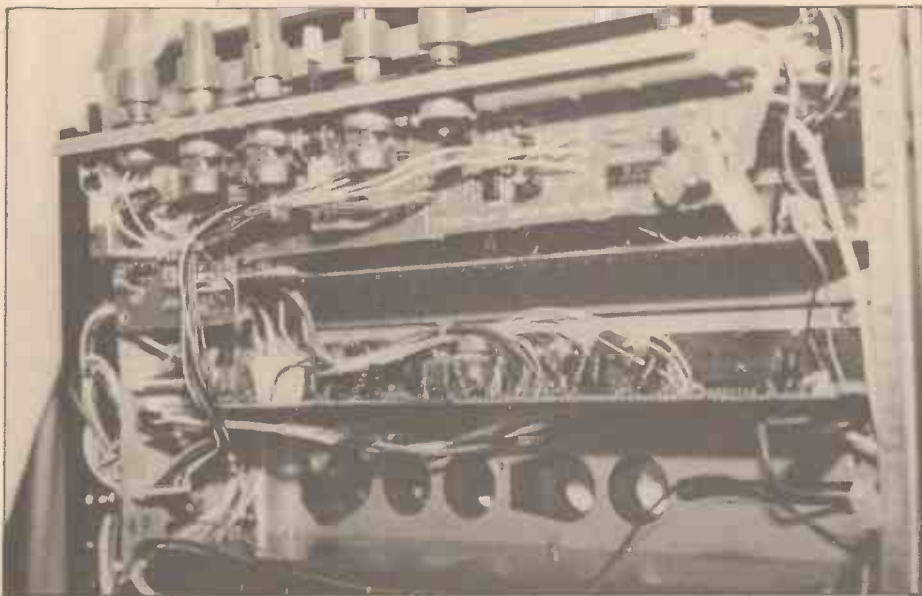
Cassette Recorder

The new transport system is efficient and easy to use and will take the slightest pressure from your fingers to operate. You can select modes in any order, although for accurate tracking of the four digit fluorescent counter, it's best to use Stop between hectic Fast Forward, Reverse and Play previewing and dubbing sessions. All the standard controls are provided: Record, Play, Rewind, Fast Forward, Stop and Pause. Pressing the door button accesses the cassette (without ejecting it) and the heads are easily cleaned through the opening.

A Pitch control knob (with centre click-stop) adjusts tape speed (and thus overall pitch) $\pm 15\%$ which in musical terms is a little more than a semitone up or down. This can be used for effects and for playing fast passages at slow speed, although the built-in DBX system may produce undesirable re-



Underside view with back cover removed.



Mixer boards (after DBX PCB is removed).

sults on playback at another pitch control setting.

A Zero Return button with LED indicator is another new addition that saves a lot of time watching the counter during repeated multitracking from the same point. A Reset button sets the counter to zero.

The recorder works best with high bias, 70ms EQ (type II) tapes. The TDK SA tape was used during testing satisfactorily. An interesting feature of the capstan motor is that it turns on only when the cassette is in place.

The processes of recording and playback are lucidly explained in a large manual supplied with the instrument. The Teac designers have tried to produce a fool-proof system, but needless to say, you have to be prepared to learn how to use it! Most of your initial thinking time will be spent in acquiring the knowledge of the recording — multitracking, overdubbing, ping-ponging — and safe playback procedures.

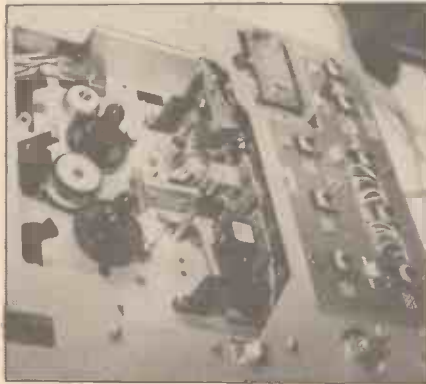
Besides the usual 'press Record and Play buttons to Record' before actual recording can take place (apart from Punch-In), a Record Function group of three switches and LED provides the necessary control routing for all your recording. When each switch is set at centre 'Safe' position you cannot inadvertently record at any time, even if you press Record/Play buttons. The first switch selects the type of recording mode — either Sync or 4-Channel. In the latter position, the red LED nearby will flash along with the tape Record button red LED. Once the Record/Play or Pause buttons are pressed, the recording mode is engaged, both LEDs will stay lit and all meters will illuminate

showing that four channels are being used. This type of recording is suitable for copying purposes and live recording using all four channels at once.

The more usual record mode is Sync, and this enables you to select channels 1 or 3, and/or 2 or 4 using the other two Record Function switches. Thus, only two channels can be multitracked at any time in this mode and the VU meters will illuminate the selected channels.

Care has to be taken in panning any of the inputs used in recording to the left or right for 1 or 3, 2 or 4 respectively. Confirmation of this is easily visible in practice, as you will see a signal appearing on a non-illuminated meter and will know you've not set a pan pot correctly. On playback, the VU meters will illuminate and always show their correct track 1-4 (from left to right).

An important addition to the 244 is the



Cassette transport.

Major changes between the M244 and M144:

M144

Dolby (-63dB S/Noise)
Mono, stereo recording
Treble, bass control
Mechanical 3 digit counter
Mono auxiliary circuit post
equalisation/fader
Mono tape cue circuit
Stereo tape output
Single stereo headphone monitor socket at rear
Monitor circuit for cue and remix
Front panel record 'punch-in'
Logic control, 2 motor transport

(M244 cont.)

Stereo auxiliary circuit with pan controls and pre/post EQ and fader select
Stereo tape cue circuit with pan controls
Stereo or 4 channel tape output
2 stereo headphone monitor sockets on front panel
Monitor circuit for cue, remix and auxiliary
Front panel and remote record 'punch-in'
Logic control 'gentle' transport, 3 motors and fast pause

Extra Features

Overload input LEDs
Overload output buss LEDs
Mixer input break-jacks
Improved feel to transport and fader controls
Improved input selects, monitor select, record function switches

M244

DBX (-90 dB S/Noise)
Mono, stereo and 4 channel recording
Parametric 60-1.5 kHz, 1-8kHz EQ control
Electronic fluorescent 4 digit counter with rewind to zero facility

provision of a Punch In/Out facility. By connecting a momentary make switch to the allocated rear panel standard jack socket, a 'punch-in' can be affected from the Play mode (provided you're in Sync Record Function with one or two channels selected). This is a tremendous advantage for the home electro-musician who works alone as it allows building up of tracks whilst your hands remain free to play the instruments. Punch-In will let you instantly insert new material onto a track without any noticeable clicks or break — this is most important for adding to existing music from the point where an error in playing occurs. Like some other punch-in systems, if you try to achieve a punch in and out of a continuous piece of music, the recorder will insert a click and a fractional pause before resuming original playback mode (unless there is a silence at the punch out point). An optional footswitch is available for this facility (Tascam RC-30P).

Conclusions

At a price of around £600 (including VAT), the 244 should be the ideal answer for the musician on a limited budget who wants to enter the world of multitracking. It's an exciting sphere that ultimately every musician with any creative ability will want to try and experiment with.

A big feature of the Portastudio is its almost human insistence in informing you visually whether it is ready to do what you want — meters illuminate, LEDs flash and signals appear — and it's up to you to keep track of all this!

Nothing appears to have been left out except for an optional remote control, and the use of DBX noise reduction instead of Dolby has made a big improvement in reducing tape hiss and holding dynamic range. The only time you'll hear the system working is with, for example, drum taps in a silence bar, and once all the tracks are mixed down you're unlikely to hear it. The claim of -90dB S/N ratio really means that you've got a better playback quality (but not necessarily response) than the 3340 reel to reel (without noise reduction). Crosstalk between channels is certainly better, with none apparent at the Aux Send outputs, and only some very slight breakthrough of high frequencies on Remix and Cue with headphones turned up, but definitely not the problem it can be.

One fault cropped up in the headphone amp — with a strong hf whistle on switch-off audible, but I am assured this is not on production machines!

A further compliment regarding the operating manual is also due, as this is first class reading on the art of multitrack and fancy cueing.

The 244 is highly recommended and makes possible up to 10 tracks with only one transfer for each track. Sounds remain clear and bright, provided you keep your levels high and clean and demagnetise the tape heads regularly.

Competition Offer

If you get a 244, send us a multitracked tape, telling us how you made it and the instruments used, and we'll send the first 20 entries a free electronic music LP (and return your cassette). If we get enough, we'll publish your comments as well.

Mike Beecher

E&MM

The Tascam 244 Portastudio is distributed in the U.K. by Harman (Audio) U.K. Ltd., Mill Street, Slough, Berks SL2 5DD. Tel: 0753 7691.

Virgin Records have kindly donated the records for our tape competition and these will be 10 Tangerine Dream 'White Eagle' (V2226) LPs and 10 Edgar Froese 'Solo 1974-1979' (V2197) LPs.

GUITAR WORKSHOP

Setting Up A Stratocaster

Max Kay

Many of our readers will no doubt at some point or other either have tried or contemplated the job of setting up a Stratocaster. In this the first of E&MM's articles on guitar care, we will attempt to save you both time and money by guiding you through the various steps required to complete this job. Our resident guitar repairman N. J. Charlesworth is the man in the hot seat, and this month he'll show you how to save £15-£30 which is the average price charged for this type of work. The tools for this job are literally all available from Stentor (Blackborough Road, Reigate, Surrey RH2 7EZ) and will cost you about £20. Neal has been a guitar repairman for eight years now and during this time has worked for Rossetti, R. J. Cooper, and John Birch.

To begin, with the aid of a string winder (or 'woggler' in the trade) slacken off the strings, remove them and then proceed to remove the four neck screws which bolt the neck on to the guitar. Now that the neck is off we slacken the truss rod screw situated at the bottom of the neck until this is loose. It should protrude approximately 2mm below the end of the neck.

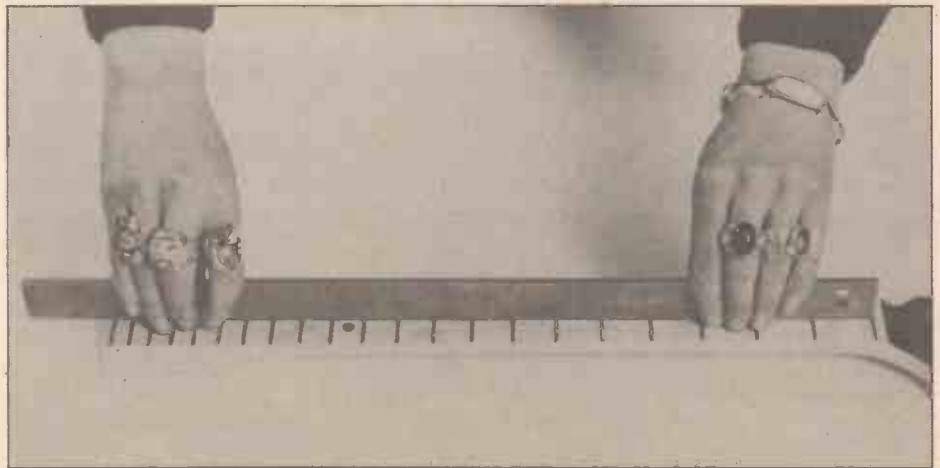
Next, by placing a heavy steel edge (available from Stentor in two sizes) along the length of the fret board, check for fret height irregularity, i.e. frets that sit proud of the others. When you've located these frets, take a single cut 12" file (thus called because it files in one direction only) again available from Stentor, and file down the neck from the top fret to the nut. Before using the file please remember to check with your steel edge to ensure that your file is perfectly flat. If it isn't you are likely to have problems. Whilst filing your frets, it is important to remember to keep checking the fretboard with the steel edge, otherwise you may end up losing more fret than you need to — then you'll need a complete refret!

Assuming that your frets are level, you next need to use a foam rubber sanding block (available in most hardware stores) to round and smooth off the frets. You can use a contour file but Neal does actually recommend the rubber sanding block for a better quality finish.

Next you'll need some carbon rubbing down paper and we recommend you use 3 or 4 gauges from 320 up to 1200 gauge.

And now, after filing, sanding and papering, we give a final touch to the frets by taking a rag soaked in Brasso and rubbing it up and down the frets. Not only will this give your frets a super smooth feel but it will also make the guitar neck faster and easier to play. If you don't believe me, ask Eric Stewart of 10cc who applies it to his frets every time he steps on stage!

With a refurbished fretboard glistening in your hand, tighten up the truss rod just enough to allow your steel edge to rock slightly when placed up the length of the fretboard. This means that you will now have a fine convex curve in your fretboard which will be transformed into a concave curve when you replace the neck and strings. Ignore the people who tell you that a guitar neck should be perfectly straight, they are wrong. If a guitar neck is straight there's a



Checking the fret height irregularities.



Action adjustment using Allen key.

chance it will develop a convex curve and straightening convex necks is a real problem.

The neck is now ready to be bolted back on to the body via the four neck screws, but don't tighten up the screws all the way yet. Replace the strings and check the top end of the fretboard for neck fit. If the neck has been replaced at the wrong angle, one of the two E strings will be literally hanging off the fretboard. As this is obviously undesirable, apply a little pressure in the opposite direction of the offending string (i.e. to the right for bottom E, to the left for top E) and when you're finally satisfied with the angle, finish tightening up the neck screws. When making the final few turns to these screws it is important to keep the screw pressure even for a good neck fit.

Taking the steel edge, place it on the end of the neck so that it comes to rest on each bridge saddle in turn. It should be possible to adjust the saddles either up or down and if this is not the case, the neck will need a couple of shims packed into the neck socket

below or to either side of the neck for correct adjustment

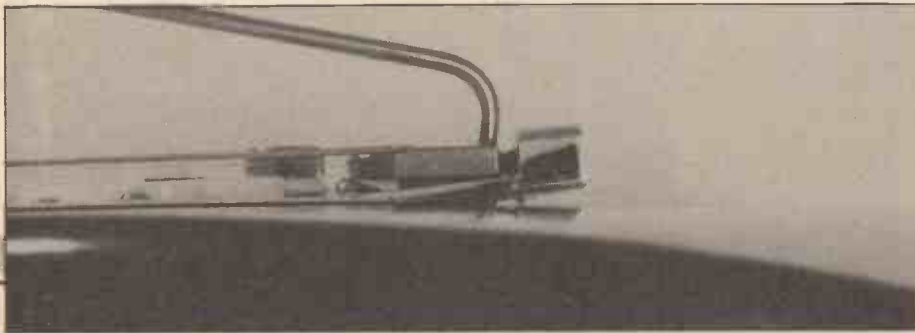
After tuning the guitar to correct pitch it is now time to correct the intonation of the instrument. We do this by placing the steel edge parallel to the top E and marking off the distance between the nut and the centre of the 12th fret. The distance between the centre of the 12th fret (i.e. wire) and the point where the string leaves the bridge saddle should be equi-distant. Repeat this process with each string in turn, staggering the saddles from left to right with an approximate distance of 7mm between the first and last strings.

Checking by ear or preferably via a Korg or Conn tuner, last minute adjustments to the harmonics are made as follows. Play the harmonic on the 12th fret by dampening the string and pulling off as you strike the note. If the note is flat, move the bridge saddle forwards, if the note is sharp move the bridge saddle backwards to the back of the guitar.

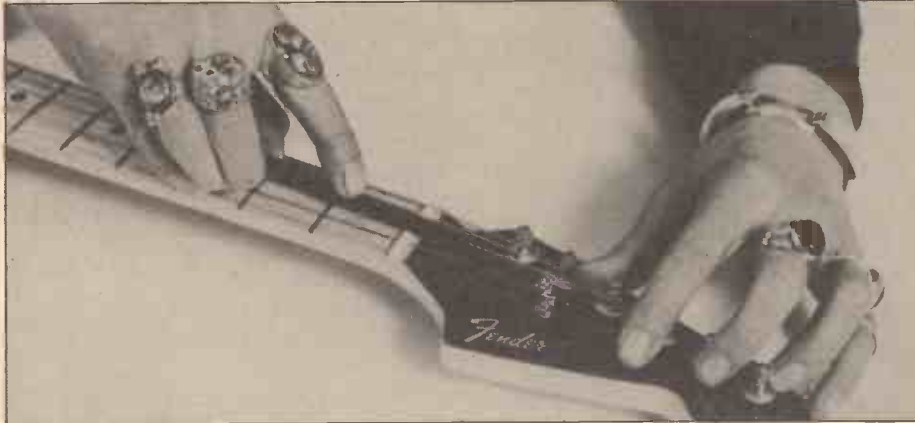
And now for the really interesting part — setting up the tremolo, which is a job that is often either ignored or performed very badly.

First, remove the back plate that conceals the tremolo and then proceed to remove two of the five tremolo springs. We're working on the theory that you use light or medium gauge strings, but if you do use a heavier gauge it is preferable to remove only one of the five springs. When you've done this, turn the guitar over and the bridge/tremolo unit should be sitting approximately 5mm proud of the guitar body. If this is not the case, adjust the two tremolo block securing screws (situated in the tremolo well at the rear of the instrument). Turning to the left will increase the height of the bridge/tremolo unit from the body, and turning to the right will decrease the same.

Action adjustment is effected by taking an Allen Key to each bridge saddle in turn in order to select the desired string action, be it super close or otherwise. Whilst carrying out this job it is worth checking the fretboard for dead spots, i.e. notes that cut out when you bend the strings right across the fretboard à la Eric Clapton. All the notes you play/bend should sustain. Contrary to myth, a lot of people do not go in for string bending, but if you do, this is the trick to follow. Either raise



Bridge/tremolo unit proud of guitar body.



Final action adjustment.

the top E and B strings a little higher than the rest or when you're filing the frets, take more off the centre of the frets. Both processes will effectively cancel the camber of the neck and allow you to bend pure notes *ad infinitum*.

For final action adjustment, depress each string in turn at the first and last fret and tap the string with your thumb in the middle of the neck. This should result in a 'ping' as the string is depressed towards the fretboard and the ideal gap between string and

fretboard is 0.5mm. If your string does not 'ping' it is sitting too close to the fretboard. Slacken off the strings and adjust the truss rod by a quarter anticlockwise. Alternatively, if the string is sitting too high off the fretboard give a quarter turn in a clockwise direction.

Lastly, we check the action at the nut end of the fretboard. If you depress the top E at the third fret, the string should 'kiss' the first fret. Repeat the process on the bottom E and there should be a slight gap at the first fret the thickness of a sheet of heavy paper. The closeness of each string to the first fret should be graduated from the bottom E to the top E. This can be achieved by taking a jewellers saw to the nut for the bottom two strings, and working up to the middle pair with a V-shaped file, to a fine jewellers saw for the top two strings. By careful sawing and filing of the nut with these tools (all available from Stentor) you will achieve the final adjustment to string height at the nut.

One Stratocaster set up. Next? . . .

Our thanks to the Soho Soundhouse for the kind loan of one Fender Stratocaster.

E&MM

CIRCUIT MAKER

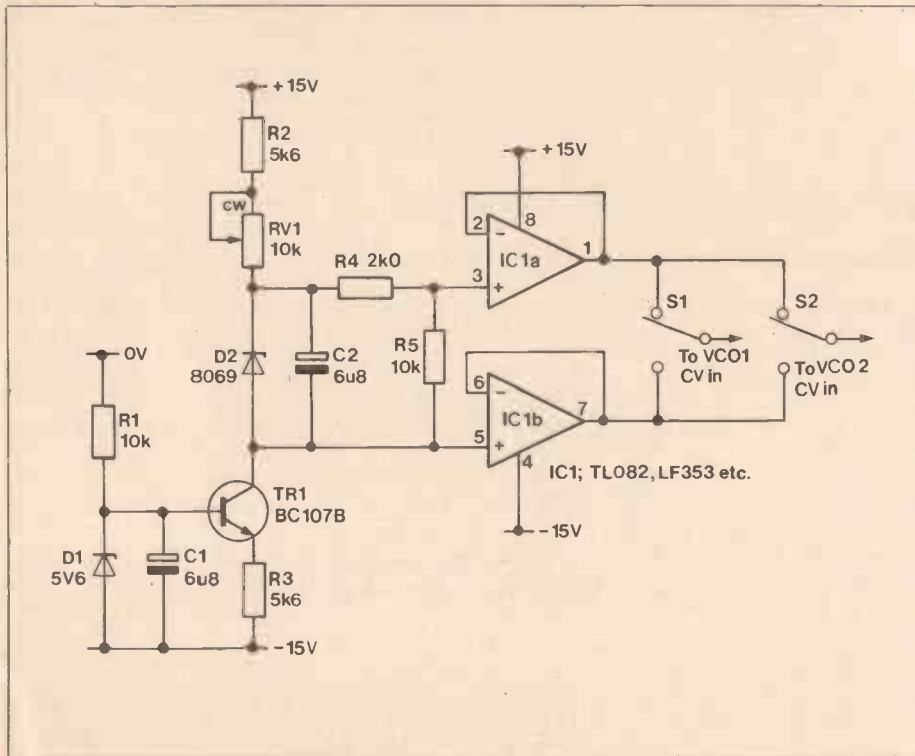
VCO Calibration Aid

For those without access to precision voltmeters and digital frequency meters, calibrating VCO's to the exact 1V per octave ratio can be rather arbitrary. This circuit is an inexpensive way of making the job much easier.

TR1 supplies a constant current of about 0.9mA through the 8069 1.2V precision reference zener (available from Maplin YH39N). An exact 1V is obtained by the potentiometer R4/R5, which should be of best possible tolerance, and RV1 effectively slides this 1V difference between 0V and about 10V. Capacitors C1 and C2 simply suppress noise in the zeners. Voltage followers IC1a and IC1b ensure that the input loadings of the VCO's do not interfere with the rest of the circuit.

If only one VCO is available then the calibration must be done by ear, listening for an accurate octave jump; but the process is much easier with two VCO's. Set both S1 and S2 to the "low" position and tune the VCO's to the same frequency (by beat frequency or Lissajous techniques). Then set S1 to the "high" position and adjust VCO1's control voltage input gain preset to give a one octave difference — by beat or Lissajous — from VCO2's reference frequency. Go back to the "low" position, re-tune, and repeat the process until the octave is accurate. When using VCO's based on the CEM 3340 IC, RV1 can then be taken up to 5kHz or so to calibrate the upper end in a similar way.

The circuit can be made up on a small piece of Veroboard and will probably be able to use the synthesiser's own PSU; the ease with which one can then calibrate VCO's (especially in a polyphonic set-up) adequately repays the £5 or so it costs to build!



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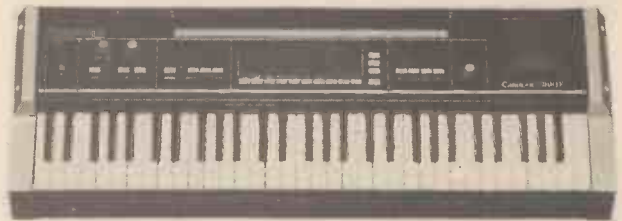
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Spectro Sound Studio

A look at an 'open' access studio in Newcastle which is used for the recording and performance of electronic music.

Spectro Arts Workshop resides in the City of Newcastle-Upon-Tyne and can be found in the City centre, off the high street through an archway.

The Workshop itself consists of many units each housing activities ranging from photography to painting but if you go to the back of the building and walk up a flight of stairs you will find, near to the bar, the Sound Studio.

The Spectro operation was set up originally in Whitley Bay, a few miles away on the coast, about 10 years ago. In 1977 it moved to its present location and has gone from strength to strength. Use of the Workshop is not restricted to university members or students — it is open to all members of the public and such involvement is actively encouraged. Membership of Spectro costs £25 per year (quarterly rates are available) and many departments give discounts to Spectro members from their normal fees. Students and the unemployed are granted special rates too.

The Spectro Sound Studio consists of a performance area/recording studio, 38ft x 18ft, an adjoining control room which can double as a secondary sound studio, and the main sound studio which is where most of the recordings and compositions take place.

The Studio is ultimately responsible to the music department of Northern Arts which supplies most of its money in the form of grants. Smaller amounts also come from the City but their major problem is one of finance. This year their grant was cut by 30%, along with most other grants to the arts but still they carry on, postponing plans, ideas and projects until resources enable them to carry them out.

Head of Department is Peter Burne-Jones, a qualified teacher and composer who has worked at EMS Studios in Stockholm and at the Institute of Sonology at Utrecht.

Paul Gilby is the Department Technician and he studied electronic music at Cardiff University. He produced a soundtrack for his Arts degree and the 17-minute tape took 18 months to produce having over 100 layers of sounds.

Ian Boddy, one of Spectro's more regular users, joined us in conversation and between them they discussed the Studio; its past, present and their plans for the future.

Peter was careful to stress the 'open access' arrangement under which the Studio operated. "It is one of only two studios in Britain," he said, "which allows members of the public to use its facilities without any restrictions regarding the type of music performed or recorded. Northern Arts actively promote 'New Music' such as that written by Stockhausen and John Cage but there are no hard and fast rules. We encourage all Workshop users."

Over 200 people use the Studio every year including rock bands and folk singers. It is a cheap form of recording for them (£6.00 per hour with the first hour free plus a discount for Spectro members) and a useful source of income for the Studio.

The Studio runs courses throughout the year which consist of one session per week for six weeks. They cover the history of electronic music and end by describing how to use various pieces of equipment. The courses attract a wide variety of people from students to interested 'dabblers' in their 40's. Response is encouraging.

Peter explained how the Studio operates: "As well as providing facilities for the man in the street, we have two schemes aimed at encouraging new



Peter Burne-Jones and Paul Gilby.

Ideas. Our Project Support Scheme is offered mainly to local composers. They will approach us with a formal application detailing a project they would like to carry out over a three month period. If their application is accepted they are given £100 of free studio time and £30 worth of material, usually tapes.

"Our Composer in Residence Scheme aims at attracting the more professional composer from home and abroad. We apply to Northern Arts for specific funds with which to offer a bursary to a composer which will pay residence costs etc. Both schemes are intended to culminate in a concert or a number of performances, an exhibition or a series of Workshop lectures."

Peter continued, "Hugh Davies, Director of Music at Goldsmith College, London University did a 'Sound Environment' exhibition in the Spectro Gallery and it has since gone on national tour."

He described some current projects underway. "One local composer is recording natural sounds and combining them with instrumental sounds — very much in the ambient music tradition. Another project involves the use of source tapes: radio sounds, adverts, conversations, all sorts of sounds and these will be combined into a montage or collage. The same composer is working on a project to record 'ghost' voices which are sometimes heard in churches so you can see our activities and involvement are very wide."

The Performance Studio can hold 60 or 70 people and is the scene for about two concerts per week. They vary immensely from folk music to poetry readings, punk music and rock but electronic music concerts are high priority.

Peter explained: "We are probably unique in that we have the facilities to produce the music and to perform it both under one roof. This also enables us to perform works by other studios and composers, especially those works requiring tape machines and we can invite speakers to give talks and supply the equipment they need for demonstrations."

Ian talked about his live concerts: "Some incorporate a recorder and pre-recorded tape, possibly a sequencer but others are 100% live. I try to split the keyboard signal into several paths and process them all differently. I adjust the volume levels on a mixing desk. I am playing electronic equipment rather than just synthesisers. The advantages of having the Performance Studio next to the Workshop are enormous. I can set up very quickly. It might otherwise take all day." He obviously enjoys the concerts very much and intends to give one every few months. There are about 15-20 regular users like Ian but so intense has his involvement been that he is now acting as consultant.

As technician to the Studio, Paul is, perhaps, more deeply involved with the day-to-day running of it and he has a lot of contact with the users. He explained: "All users are given assistance and technical help but only if they require it. We do not wish to produce anyone's work. We show them how to operate the equipment and we can even offer

them artistic advice if necessary."

The Studio is laid out in the most ergonomically and functional way possible. All the equipment is hooked into patch bays and the connections are all colour-coded and numbered. Peter reckons an outsider can come in and learn to operate the Studio within an hour.

They talked about the equipment. "There is a lot of equipment we would like to have," said Peter, "but finance is the main problem. Some companies have been very good to us. Klark Technics supplied us with two graphic equalisers at half price. Roland have given us generous discounts as have Shure and AKG (who help a lot with maintenance). A lot of our resources are swallowed up by the cost of maintaining the equipment which is often in use eight hours a day, five days a week. We would like to explore various methods of recording outside in an open environment but lack of finance means we cannot afford the equipment. We are interested, too, in obtaining a computer for experiments with computer music. It would be a good teaching aid, too. Something like an Apple or a Pet would be very nice. We will be running workshops in computer music using tapes during the festival."

In spite of the financial restrictions, the users obviously derive a lot from use of the Studio. The enthusiasm and involvement of the staff is evident. They have no biases and are as keen to help the poet as they are to help the electronic music enthusiast. The Studio is able to combine audio and visual effects for performances and is involved in almost every area of the creative musical arts that it is possible to think of.

The total conversation with the Studio staff progressed from one aspect of involvement to another. So wide an area is covered by the Workshop that full details of its activities would be very lengthy. The 'open access' arrangement is an idea that should be developed in other parts of the country (should the facilities exist). Anyone can go along and spend an hour at the Workshop with technical assistance from Paul for the nominal sum of £2.50. Rates reduce drastically for Spectro members. This gives everyone the opportunity to find out about electro-music and those who lack recording facilities can find them here at very minimal rates.

In the area of musical development, Spectro is involved on the very frontiers and the Studio can make available to everyone the facilities and assistance to become involved with the 'New Music'.

Further details of the Studio and its schemes can be obtained by ringing 0632 322410 and asking for the Sound Studio or write to Spectro Arts Workshop, Bells Court, Pilgrim Street, Newcastle upon Tyne. Peter or Paul will be glad to help.

Equipment: Teac 4-track recorder x 2; Revox A700 ½-track; Revox A77 ½-track; Teac A170 stereo cassette recorder x 2; Alice 12-48 mixer; Itam 10-4 mixer; VCS 3 synthesiser x 2; AKS synthesiser; Roland SH-09; Klark Technics D27 graphic equaliser x 2; EMS Filter bank; Amcron D75 amplifier x 2; Amcron D150 amplifier; AR 12 Speakers x 2; AR 3 Speakers x 2; Kef Cantata Speakers x 2; Carlsbro PA Speakers x 2; AKG microphone D202 x 4; AKG microphone D140 x 2; Shure SM58 x 2.

Ian Waugh

E&MM

MAKING NOTES

Brenda Hayward

Part 7

When a Scale is formed by a succession of Tones and Semitones according to a set pattern, it is called **DIATONIC**.

The Diatonic Scale formations in my 'Making Notes' Part 3 were formed by a set pattern of Root note, tone, tone, semitone, tone, tone, tone, semitone. The semitone distances occur between the third and fourth degrees and seventh and eighth degrees of the Major Scale:

C Major Scale: C D E F G A B C.

The term Diatonic also applies to MINOR Scales, of which the most modern form is the 'Relative' HARMONIC Minor Scale. The term 'Relative' Minor simply relates the Major and Minor Scales to each other. The last three notes of a Major Scale form the first three notes of its Relative Minor. For example, the last three notes of the C Major Scale: A, B and C, are the first three notes of its Relative A Minor Scale, named by the Root note (first note) of A.

In this Scale the semitone distances will now occur between the second and third degrees, fifth and sixth degrees and seventh and eighth degrees, so the set pattern now reads as Root note, tone, semitone, tone, tone semitone, tone plus semitone, semitone. This formation makes a large step from the sixth to the seventh notes, F natural to G Sharp, but it is necessary in creating the Harmony of A Minor, the reason why this Scale is called 'Harmonic'. The notes are identical in the ascending and descending form as in the Major Scale. See Figure 1.



Figure 1. A Minor Harmonic

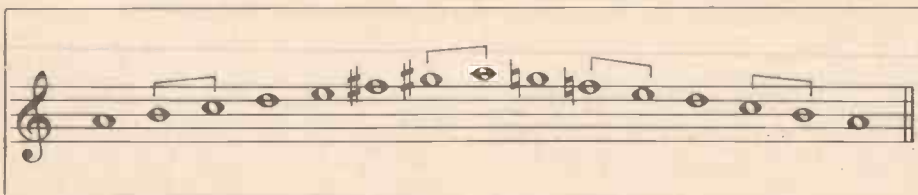


Figure 2. A Minor Melodic.

In the MELODIC Relative Minor Scale, the semitone distances occur between the second and third degrees and the seventh and eighth degrees in the ascending form.

In the descending form, the seventh and eighth notes must be flattened to maintain the sound on pitch particular to this form of Minor Scale. Figure 2.

Compare the two forms of Minor Scales, remembering that in the Melodic form the notes are different when ascending and descending. This scale is also easier to sing and more melodious (hence its name) than the Harmonic Minor Scale.

When the Scale of A Minor is written on the Staff, the sharpened notes are shown by accidentals (#) see Figures 1 and 2, and will not be used as a Key Signature. Therefore, the related C Major and A Minor Scales will show the same key signature with no sharps or flats.

The simple recognition of music written in a Minor Key can be done by examining the beginning and ending Minor chords and the left hand chord progressions. Referring to the Musical Ladder in the June article, it can now be seen that music written in a Minor Key will include left hand chords circling around the Minor keynote, rather than the Major keynote appearing to be indicated by the Major Key Signature. In the arrangement of 'The Green Leaves of Summer', which is written in the key of E Minor with a G Major Key Signature (F Sharp), the left hand chords include Em, B7, Am, F7 and D7 circling around the keynote of E, rather than the keynote of G which was indicated at first glance by the Key Signature:

| E Minor Key | G Major Key |
|-------------|-------------|
| F# | A |
| B | D |
| *E | *G |
| A | C |
| D | F |

Major Keynote i.e. from the C Major Keynote locate the Relative Minor Keynote of A, three steps up the ladder. From the Eb Major Keynote locate the Relative Minor Keynote of C. Music written in the keys of Eb Major and C Minor will share the same Key Signature of Eb Major, (three flats).

A WHOLE TONE scale does not include semitones in its formation. See Figure 3(a). While the PENTATONIC Scale has only five notes. See Figure 3(b).

A CHROMATIC Scale is composed entirely of Semitone distances within the octave from the Root. The Chromatic Scale, when written on the staff, will show the accidentals as sharps in the ascending form and flats in the descending form. See Figure 4.

When the eight notes of the Major and Minor Scales are divided into half, each group of four consecutive notes is known as a TETRACHORD. Tetra is Greek for four; Chord for notes (Four notes):

C D E F G A B C

Technical names apply to each note of a Scale: 1) TONIC, 2) SUPERTONIC, 3) MEDIANT, 4) SUBDOMINANT, 5) DOMINANT, 6) SUBMEDIANT, 7) LEADING NOTE (leads up to the Tonic).

Further scales exist such as Locrian, Aeolian, Mixolydian, Dorian etc., but the most commonly used today are the Diatonic Major and Minor Scales. You can improve your fingering technique and acquire supple fingers by playing the illustrated scales regularly.

The Scale formations will now add to your understanding of more advanced left hand chords and the next part of my article will also contain some helpful hints for musicians playing an instrument with a Bass Pedal Board.

Bass Pedals

Bass Pedal notes are highlighted when playing Diminished Seventh Chords.

To diminish musically means to reduce in terms of intervals between notes. The diminished seventh chord is composed of the Major Chord notes 1-3-5, with the third and fifth notes flattened by a Semitone note i.e. C Diminished Seventh Chord (C-Eb-Gb-A) is in its Root position because of its formation upon the Root note.

A double flat (bb) lowers the sound or pitch of a note by two semitones. When applied to the seventh note of a Scale, it is also in fact the sixth note of scale. The second inversion of the C diminished seventh chord (Gb-A-C-Eb) will position in between the Octave F to F.

The Chord Symbols for these chords will be written as a small circle after the chord name followed by the number seven C^o7 or with 'dim' replacing the small circle: C dim 7. Frequently the seven is omitted from the

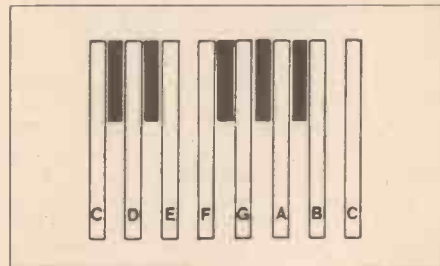
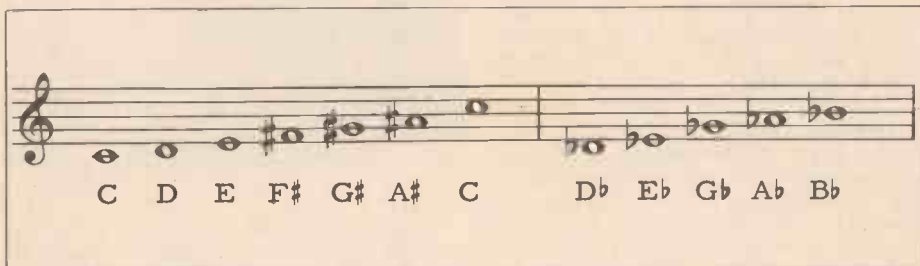


Figure 3(a). Whole Tone Scale. (b) Pentatonic Scale.

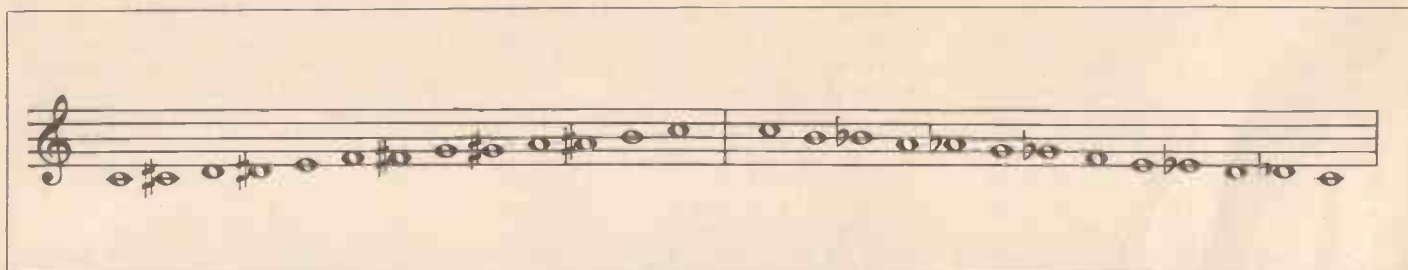


Figure 4. C to C Ascending and Descending.

Chord symbol but this is incorrect as a diminished chord with the seventh omitted is in reality a Minor Triad with a flattened fifth note i.e. C-Eb-Gb.

A Triad is a Chord of three notes. The Major Triad, 1-3-5, of the Major Scale becomes a Minor Triad when the third note is flattened, 1-3b-5.

There are only three sets of diminished seventh chords: C°7, G°7 and F°7. Form the latter two sets G°7, -G-Bb-Db-E and F°7, F-Ab-B-D in their Root position. There is no need to invert these chords to play them between F and F.

As already established in previous months, the Bass Pedal note actually names the chord being played. Sound the C°7 chord and play the C pedal note. Now continue to sustain the left hand chord while playing in turn each of the other three notes of the chord on the Bass Pedals: Eb-Gb-A. Four left hand chords have now been played and the left hand has not moved an inch because the four pedal notes in turn named the C°7, Eb°7, G°7 and A°7 chords.

Repeat this process with the other two

sets of diminished seventh chords by striking each pedal note in turn, while sustaining the left hand chord, and you have added twelve new chords to improve your playing technique!

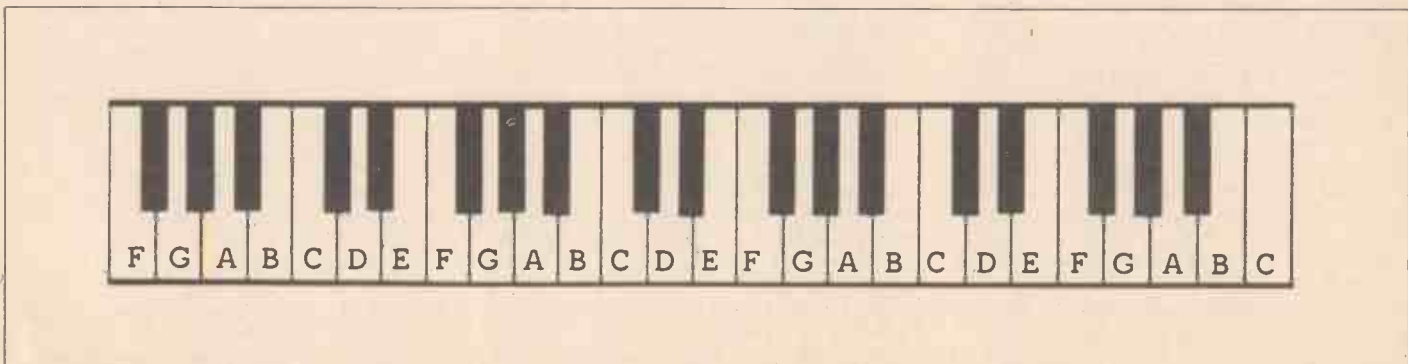
While Diminished is used to reduce an interval, 'Augmented' is used to increase an interval between notes. The 'Augmented Fifth Chord' simply means that the fifth note of the chord is to be sharpened by a semitone, increasing the interval between the third and fifth notes of a Major Chord. The G Major Chord of G-B-D becomes G-B-D# when note number five is sharpened. The F Major Chord F-A-C becomes F-A-C# and the C Major Chord C-E-G becomes C-E-G#. When creating inversions of a chord, it must be remembered that although the notes change their position on the keyboard, the notes themselves are not altered. Therefore, the first inversion of the C augmented fifth chord is E-G#-C and the second inversion G#-C-E. The Chord Symbol will be written as C aug or C+, and when a seventh is added to the Chord Symbol C+7 or C aug 7, the normal

seventh chord is played with the fifth note of G sharpened to G# as before.

The left hand chord of the Suspended Fourth simply indicates that the fourth note of the Scale will replace the third note within the chord, and will be sustained until smoothly being resolved to the third note in the next chord to be played, i.e. the C Suspended Fourth chord C-FG will usually resolve to C-E-G, the normal major chord. These chords will sound restless, although beautiful, and you will hear and feel the need to resolve them. The Chord Symbols will be written as Csus or Csus4. For the Csus7 or C7sus chord, play a normal seventh chord with the fourth note replacing the third note in the chord as before.

These chord formations are really a continuation of my chord structure in a previous month and are still based upon Major Chord formations from the Major Scales, proving that it is not necessary to learn new chords, but simply to adopt the chords we already know and use frequently.

E&MM



HOME ELECTRO-MUSICIAN

I could give you a long account of my chequered musical past but suffice to say that now I am a 32-year-old electronic engineer still gigging regularly and running a home four-track studio based around a Teac 3440 and a Revox A77. Not an entirely original combination but then there aren't that many choices, are there?

When I bought my house four years ago I decided to set aside one room for recordings/band rehearsals and of course the first major problem was soundproofing.

I had the window double glazed and then fitted a detachable fibreboard shutter over the whole window aperture, and covered it with two layers of carpet on the outside and cork tiles on the inside. The door was thickened and again covered with cork tiles. The outside wall in which the window is set is also covered in cork tiles and even after four years the haunting fragrance of charcoal and Thixofix still lingers on.

I haven't had any complaints about noise even though hideous sound pressure levels are occasionally present inside. As the original concept was to rehearse and record my own band in this room, it seemed logical to install all the recording gear in the same room rather than adopt the control room approach, in which case I would have had to get someone to engineer for me and he would then be writing this instead of me. As it turns out I am now doing regular demos for other bands but the arrangements still works OK.

For monitors I have a pair of KEF KIT 3 speakers which are very flat sounding. They are not the most exciting speakers to listen to music on but they always ensure that nothing nasty turns up in the mix when replayed on other speakers of normal hi-fi quality.

Amplification is at present courtesy of Rotel but I intend to change over to a couple of Mosfet modules in the near future. The desk is an MM 8 channel mixer and apart from the high death rate of sliders, I consider it to be well designed, quiet enough when properly used and with bags of headroom to prevent unwanted overloads. Extra FX-Send facilities would be useful though.

For reverberation I am using a Great British Spring stereo unit and for echo, the Roland RE-201 Space Echo, although I have designs (in both senses of the word) on the E&MM digital unit. I also have an E/H Vocoder which works very well but is not used very often. The reverb is fed from the echo-send output and fed back to two channels of the mixer panned left and right when mixing down. The reverb sound of this unit is really very good but even with the input driven fairly hard, the output amps are very noisy! Has anyone else experienced this? The Space Echo on the other hand has a nice quiet built-in reverb but the sound quality of this unit sounds like someone shaking a tin bath full of tambourines. It's really unusable. I don't think this problem is related to my particular Space Echo as I know other owners who have made the same comment. The echo, however, is fine.

For my own music I use two Roland Guitar synths, the GR500 and the GR300. The

GR500 is complemented by a Transcendent 2000 expander unit and I have fitted a vibrato depth pedal to this which I have found invaluable.

No issue is complete without a reference to the omnipresent Steve Howell so I'll make his day by saying that I agree with him on one point at least. The sound from even a polyphonic guitar synth is very dry and I, too, go to any lengths to stir it up a little. Add a little echo and chorus to either guitar synth and you have a huge swirling orchestra — turn them off and you have what sounds like a polyphonic kazoo in a padded cell.

The band consists also of bass provided by a Yamaha CS5 synth and drums supplemented by Syntoms and a Synare 3. But enough of this self-indulgent stuff. "How do I record it?" you ask impatiently.

The guitar is miked up about 9 inches away from the centre of one of the speakers and the mic fed direct to the attenuated input of the 3440. Mics are a collection of Shures and AKGs, all wired low impedance and unbalanced. I have just bought a couple of A & F mikes which seem OK, but it's too early to make any definite comments.

The synths (two Roland GRs and a Yamaha bass synth) are direct injected to the line input of the Teac and processed during mixdown which gives the opportunity for stereo echo, chorus, etc. The drums are miked individually from four to six inches away from the top head with the exception of concert toms which may be miked underneath. For bass drum (front head removed or fitted with a hole) I use a Unidyne 3 fed through an MXR noise gate which cuts off the ringing decay of the drum and gives a much punchier sound. The lower mid control on the mixer is turned well down resulting in a very satisfying bass drum sound.

When close miking, I never use overhead microphones, and the cymbals will come through OK without separate mics if the mic positions are well thought out. The phase addition and cancellation effects caused by adding overhead mics have always caused a deterioration in the overall drum sound, and if anyone has had any experience of this I would be interested to hear about it. Balancing the drums is initially carried out by getting the drummer to pummel each drum at a rate of about 2Hz whilst I set up an equal meter deflection for each drum. A test recording is then made and final adjustments performed. Trial and error has shown that damping must be enough to kill overtones, otherwise the bass drum sets all the toms ringing and gives a very muddy sound. On the other hand, never trust an engineer who damps everything down to sound like suitcases and then says he'll fix it on the desk!

The bass guitar is the most elusive instrument to record, as a DI version always leaves the low notes sounding like a lorry driving past and accentuates finger squeaks. I've settled for straight miking at about twelve inches from the cab and with only a small amount of EQ on mixdown the original charisma of the instrument usually manages to struggle through. Vocals are always done last using a Shure SM58 at a range of twelve



to eighteen inches to minimise popping and breath noises. The singer can either use cans which give better isolation or use the wall monitors at as low a volume as is comfortable.

My opinion of the Teac recorder is that even with new tape and needles peaking at +5VU, the noise level is not really very good, being quoted at -50dB by Teac. If Revox can get -63dB from their four track A77 running at 7½ips then why can't the Japanese? I have used an Accessit compander system for the past two years in the hope of keeping noise at bay but although it does its job very well, it does have an unsettling effect on the final mix. On reflection I think I will be better off using it on the reverb and echo unit. Even the notoriously noisy Clone pedal becomes very quiet using one of these units.

Of course, to wire up all this kind of stuff without going mad requires some sort of patchboard and I settled for a board covered in jack sockets corresponding with all inputs to the tape machines, the mixer and the amplifier with plugs on dangly leads for the outputs. This method prevents leads getting abducted by the band's roadies and saves getting out of the engineer's chair which, incidentally, must be of the type that revolves, just like famous recording engineers use!

On the subject of bouncing tracks, I prefer to mix the first four tracks in stereo on to the Revox and then bounce back to two tracks on the Teac leaving two tracks for vocals and instrumental overdubs. This is then mixed on to the stereo master. The tape normally used is Ampex Grand Master for which I had to reset the Teac biasing as shown in the Teac manual. This has improved the top but the bottom end on source/output test seems very subtly different. Talking of manuals (which I wasn't), I bought a service manual for both the Teac and Revox machines. They are both similarly priced but whereas the Revox handbook is a lavishly produced tome about as thick as a telephone directory, the Teac manual is like a dialling code book, but thinner and with much left unsaid.

Well, that's about all I've got to say in an article of this length except that the old saying "the customer is always right" applies to recording too. I've had several bands here who have previously paid a fortune for sixteen and twenty-four track recording, only to be disappointed because the engineer thought he was above listening to their opinion of what the result ought to sound like. As far as I'm concerned, if they want to play the whole track backwards at half-speed through a flanger whilst Vocoding the results with the squeals of a demented pig, then that's OK by me. After all, they're paying.

Paul White

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STUDIO SOUND TECHNIQUES

Part 2

by P. A. Becque



Mixing Consoles

The mixing console forms the heart of all signal processing in any studio. Specifications and prices vary considerably and an often difficult choice is made more complicated by being unable to make a like for like comparison. Judging whether or not a particular console is suitable for your needs is often only apparent after you have tried it out, by which time it's too late. The type of instruments that have to be recorded should also influence the decision since only the most expensive consoles can handle anything with ease. Figure 3 shows a typical channel in an average console. There are several important parameters common to all consoles which should be examined both at the time of buying and periodically as routine maintenance. The first we will take is the *signal to noise ratio*. This is normally expressed in decibels (dB) which are a convenient way of relating one level to another. Leaving the maths aside for now, here are a few rules of thumb worth memorising. If we double any signal e.g. from 1V to 2V we can say the level has gone up by 6 dB (remember mixing the mics in Part One). This happens every time we double the signal strength, so a rise from 2 to 4, or 4 to 8, is still 6dB. Conversely every time we halve the signal strength we drop 6dB i.e. -6dB. Also, to amplify a signal ten times e.g. from 1V to 10V we would need a gain of 20dB. An amplifier with a gain of 40dB multiplies the signal 100 times and so on adding 20dB for each factor of ten.

Microphone Amps

A mic amp with a gain of 60dB would amplify a 1mV signal to 1V (1000 times) and

we could reasonably expect the output noise to lie between -65dB to -70dB referenced to 0dBV which is 0.775V RMS. One way of looking at this noise is as an equivalent input signal. Because it is 70dB down from our reference and because it has been raised to that point by the 60dB of mic amp gain, we can say it is equivalent to an input of 70dB plus 60dB or -130dBV. Note how this corresponds to the dynamic range in Figure 1, Part One.

At the other end of the dynamic range we have maximum input or output level before distortion (clipping). It's quite easy these days to find condenser mics that give in excess of 1V (+4dBV) when miking up drums for example. This would be a problem for all but the best mic amps. One course of action is to use in-line attenuators which drop the signal level by 20dB (how many times is that?).

Phantom Powering

Many condenser mics may be phantom powered, which simply means a way of feeding power to these mics without interfering with the audio output or having to run extra cables. If you intend using condenser mics regularly phantom powering is a must. On the other hand if you have a console which is adequate in most respects but hasn't got phantom powering, it's usually easy enough to fit. Figure 4 shows the basic scheme. Note that the mic amp input must be isolated either by a transformer or capacitors. The 6k8 resistors should be at least 2% tolerance, and 1% metal film or oxide are preferred. There is often room on either the mic amp printed circuit board or on the rear of the main connector panel to mount these components. The power supply

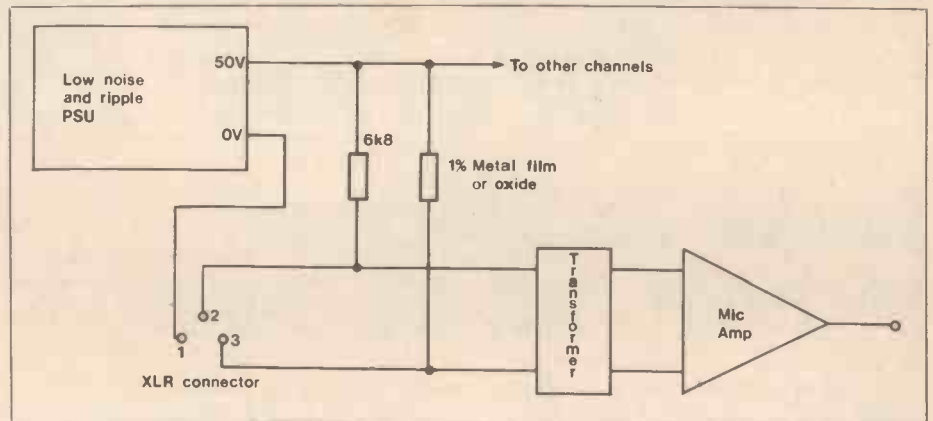


Figure 4. Phantom powering.

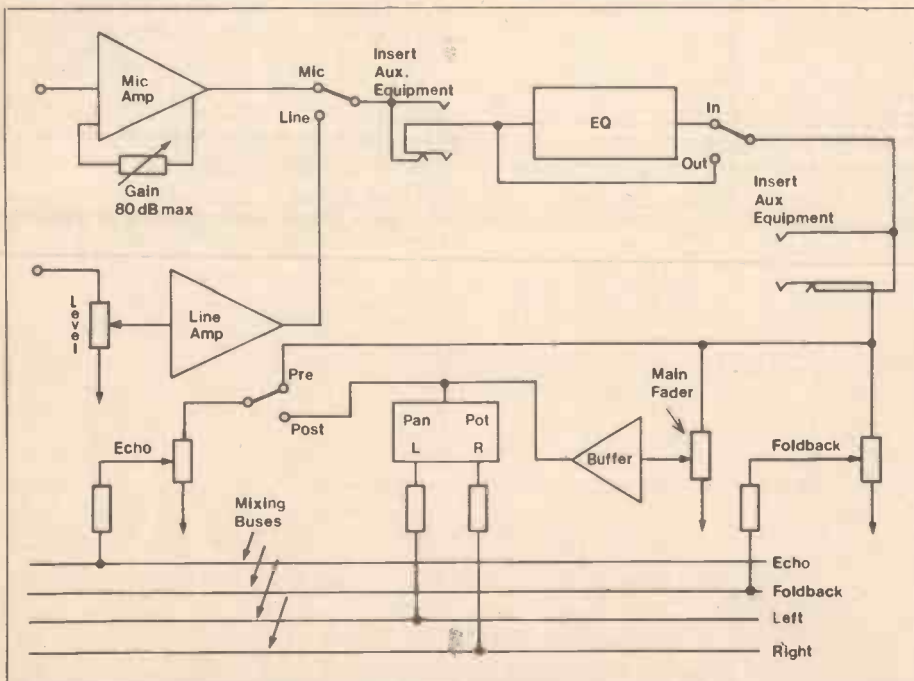


Figure 3. Typical channel of a mixing console.

unit should ideally have very low noise and ripple on the output, though if the transformers and mics are of high quality, a less than perfect supply may still work well.

Another parameter worthy of note is the maximum output level which for most systems running off +15V should be about +20dBV. The area between this point and the nominal +4dBV average signal level is called 'headroom'. It is very important to maintain this throughout the various stages of the console if signal integrity is to be kept.

Finally, the gain controls on some mic amps work by varying the feedback, which is generally a good idea. However, some purpose built mic amp chips exhibit instability as the overall gain is reduced to unity (for those very high output mics). So if you are thinking of building your own, take care choosing the feedback components. In all other respects these devices seem to perform very well.

The move in recent years away from sessions simultaneously involving numerous musicians means that a different type of studio/console/recording approach has evolved. It may be found that microphone amplifiers are redundant if the console is used mostly for electro-music since nearly all synthesisers have outputs at line level.

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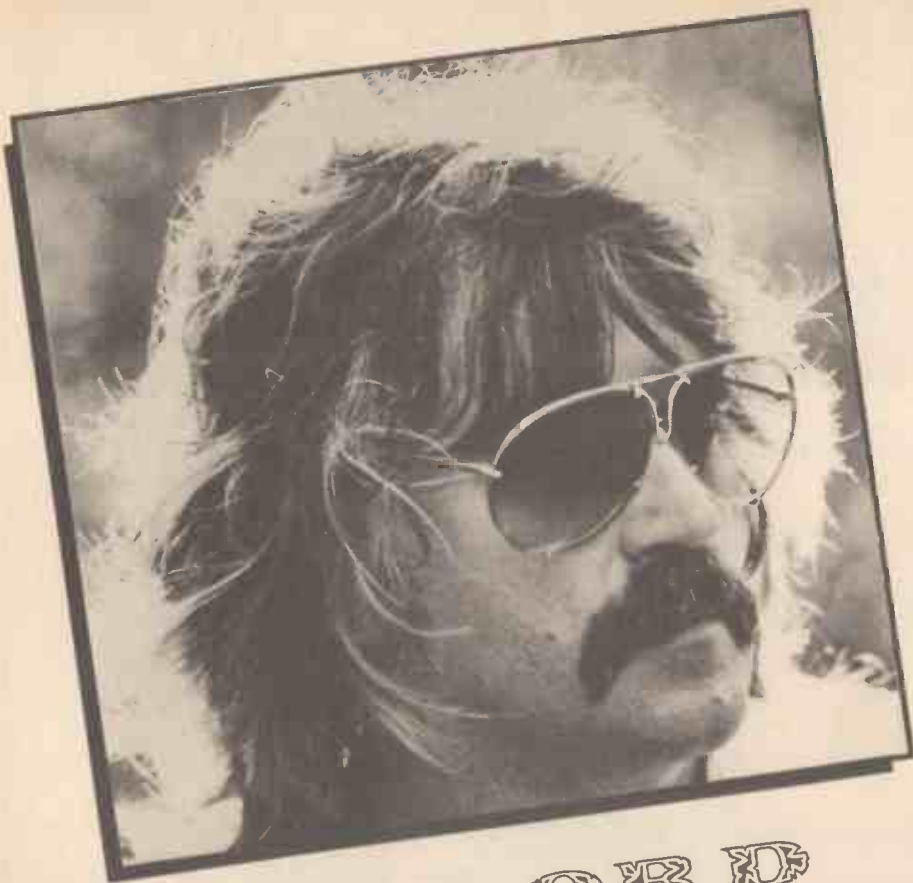
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Part 5.



JON LORD

Jon Lord is widely regarded by rock fans as one of the world's leading keyboard players. Founder member of Deep Purple, and currently with Whitesnake, Jon discusses his recently released fourth solo album 'Before I Forget'.

My initial impression of your new album was that it has terrific depth of melody and harmony and this must have come really from your wide background of classical and rock music.

Jon Yes, I think so, I think I have always been the most schizophrenic of English musicians! I don't accept barriers you see, and I get into an awful lot of trouble for that. I started piano lessons at the age of seven then I went into composition and I taught myself orchestration by buying the big books such as Forsyth on Orchestration and Walter Piston and so on. And then I got the chance in 1969 to do that concerto for group and orchestra (a rather cumbersome title) with Deep Purple and the Royal Philharmonic Orchestra. So I was able to write a full length score for a full sized orchestra and hear it played — which is a dream for every composer and that first moment of hearing is always a stunning moment. It was performed at the Albert Hall.

There were two sides to doing it — you, hear something that was in your head actually working live, and you hear others that don't work and you have to change those around. I had a great deal of help from the RPO on that. For example, the head of the cello section told me that the part he had received was impossible to play at the tempo I wanted so he rewrote it for me to make it work. I wrote the full score out and orchestrated it myself — the point I was trying to make was that I had gone quite deep

into harmony and chordal progressions over the years. Plus, having been in rock bands for a long time I have also got the simplistic approach it gives you. These two areas of experience must contribute to the way I write as I do.

Have you taken the trouble of analysing, say, your favourite pieces of classical music because you could obviously benefit from this strong interest?

Jon Yes, I often get ideas for rock songs from David Coverdale's compositions in Whitesnake from having heard something by Tchaikovsky, Grieg, or whatever.

Your themes are often so good that I feel I have heard them before.

Jon That could be a worrying thing but I breeze through that because hopefully that means they are good, and I just hope that they are not borrowed. There is, for example, a song called 'Say It's Alright' by Vicki Brown, which is actually a chord sequence that I borrowed from Mr Grieg. It is the way he puts two or three chords together which I liked, so I gently borrowed it.

On the album 'Where Are You' it seems to have a Debussy type ending.

Jon Well, again, he is a composer that I used to play quite a bit when I was a kid. Of course, you can listen to Chick Corea and hear Debussy and Ravel floating around — all those French impressionist ideas have had a lot of influence in modern jazz.

Brubeck was obviously an influence, because I just used to love the way he played a solo. He just used to knock me out. He suffered from a loss of belief in people and

the music seemed to come so easy to him, but people often did not respect his fertile imagination. In my early days I had a band with a line up of piano, bass, drums, vibes, alto sax and clarinet so we were able to do some quite wierd things. The alto sax player was Jack Shepherd who later turned to acting. For me he was one of the best alto players and he introduced me to Charlie Mingus and that school.

My interest in the jazz idiom led me to find Jimmy Smith. Well, he found me! I heard 'A Walk on the Wild Side' and I really wasn't too sure what the instrument was. I'd played church organ but I'd never heard that lovely percussive effect of the jazz organ and thought, what the hell is that, it's wonderful! Not so long after I joined an R&B band who insisted on having an organist instead of a pianist, (this was in the mid Sixties), so I fell into Hammond playing. But I was still playing church organ at the time.

Haven't you used a Hammond on your new album?

Jon Yes, it's a split Hammond that's been heavily modified. I've had it since 1968, although it's about 25-30 years old and it is one of the original C3 models.

One thing they say about organ playing and organ technique is that unlike the piano, you have to make your own expression. It doesn't matter how hard you hit the keys obviously, so you have to use a swell pedal, but I find that from a Hammond you do get something back. I have developed my own right foot swell technique, but nevertheless I do find I get a bounce back from the Hammond keyboard — almost like a piano although different in its way. And the fingering is different too.

So all the time you were developing your organ and piano techniques side by side?

Jon Yes, they are quite different to keep going together, but piano is absolutely necessary to keep the strength in your fingers, and playing can get very lazy on the organ. I really think any keyboard player can benefit by developing his or her own piano technique and style along with other instruments.

When you play the organ, if you want to play legato you must attack the next note before you leave the previous one behind. You can't use a sustain pedal like you can on a piano, obviously. So the differences in technique I really found interesting. Now I don't think about them — they are built into my technique. But I must admit when I first started playing the organ I tried to play it like a piano and it sounded awful.

So how do you go about actually putting together all these ideas? I believe you have been collecting the material for this album for some time?

Jon Yes, they have existed in a sort of shorthand form for quite a while and that is the way I work. I don't use the tape recorder when I'm writing — I use music paper. I find it less constricting in a way, because if I put an idea down on tape I find I tend to leave it in that form. Whereas, if I get a good chord sequence for something and notate it, then the next time I come to play it I've perhaps forgotten how it was originally so I have to read it again and this often gives me further ideas. It's a personal thing. I know a lot of musicians who wouldn't be without a tape recorder, but I try not to do it that way.

When I'm not on the road, I've got a room at home that I put all my gear in and it gets plugged up, and I can mess around in there to my heart's content. I've got the early TEAC 4 track Portastudio and I do a bit of overdubbing with this, but I find I get an awful amount of hiss. That's the only thing I have against it, especially if you continue to overdub and ping-pong tracks.

Once I've got some ideas I tend to hum the themes over quite a long period. Then I'll

sit at the piano with an eight bar thing that I've worked out and improvise on it. I just keep going, and this is my hit-and-miss way of composing.

The improvising has come of course from my past jazz playing, and I've always felt that the improvisational aspect of rock music has been understated. Okay, you have structured song, but then especially for live performing, the way it's played is often different because of the improvisational nature of the music. I still like to try and play organ solos that could almost be considered as tunes if I can. That's my approach to solos.

You prefer that to the more free style of 'meandering' jazz?

Jon I do of course meander with the best of them!

There is quite a variety of moods in your album and I believe you get inspiration, as we all do, from various sources — noticeable in pieces like 'Chance on a Feeling', 'Hollywood Rock and Roll' and 'Where are You'.

Jon That's why I call the album 'Before I Forget', because it is a bunch of personalised musical memories. They are all based on little things that happen. 'Hollywood Rock and Roll' is my reasonably friendly comment on the first time I ever came up against American A&R men. You know — you bring them an album on which you've slaved over and loved for months and honed to perfection (you think), and the first thing they say is "Is there a single on it?"! However, to get the effect I wanted I got Tony Ashton to sing. He's not a 'technically qualified' singer, but he is good and his style has a sort of throwaway humour. I purposefully did not fade out the track so that at the end you can hear us really enjoying it and all laughing.

Yes, I liked the vocal glissandos from the girls and then the laughter doodling away — it created the right atmosphere.

Jon The brass sounds on it came from a Moog Opus which I think is a strange instrument — it's not quite sure what it wants to be, whereas I find the Polymoog even though it is now slightly outdated, has some tremendous sounds and I still love the strings on it.

I also got a feeling of the Pointer Sisters in the singing — that sort of style.

Jon That's Vicki Brown and her daughter.

Not only have you changed the dynamics frequently, but the tempo also changes subtly and not abruptly from one mood to another as Rick Wakeman might do, but more rubato fashion.

Jon I have always been very aware of dynamics. This is something that Richie Blackmore and I used to discuss endlessly in the early days of Deep Purple, but unless you saw them live you probably wouldn't realise it. Although we had the reputation of being extremely loud we did use dynamics more than any other heavy metal band at the time. Richie and I also used to indulge in almost modern jazz type exchanges. It was done in a kind of reflective way that commented on the song. Then we would get into a little needle-match element as well. You know, Richie would do something in demi-semiquavers and I would say "Okay mate, anything you can do!" and there was a kind of contest element in it.

The control of tempo changes is really only a question of playing with another musician involved in a face to face situation — what we call the 'horses eyes and a slight nod of the head'!

The one odd piece of the album seems to be 'Bach Onto This' which you've released as a single. What surprised me is that since this piece has been a popular source of interpretation (coming from Bach's Toccata and Fugue in D minor), I wondered why on earth you had suddenly picked up on this one?

Jon If you take the context of the album as I said earlier, as being memories and things

that I have always wanted to get down, I have always wanted to do the Fugue. I have always played a bit of the Toccata on stage and I thought it would be nice to start with the famous opening on synthesiser rather than the organ. I've used the Polymoog organ preset, then routed it through the VCF and changed it round slightly. The piece also uses bass, drums and guitar. Bernie Marsden played the guitar, and I had enormous fun working it out along with the bass player, Neil Murray, and the drummer, Simon Phillips.

There is one particular passage on the drums where he is actually following the rhythm of the melody.

Jon Exactly, that was the intention. I also did not set out to do the complete Fugue.

There was one moment when I thought it almost verged on a March of the Mods style, and that is when I began to feel things were not quite as they should be.

Jon You see, we did it all in one go and it was really hard work — nevertheless, it could be a showstopper I think. I have overdubbed synthesisers and certain voices on the record but I can play all the Fugue on the organ. So I'll play it live without backing tracks — just with organ, bass and drums and (laughter) hope for the best that we would all finish together! We cut out the middle section that required lots of manual changes or tone changes. I also ignored Bach's written Cadenza towards the end. The improvisation I do only loosely refers to it. I simply try to impose a modern interpretation to the music at that point.

This piece certainly shows your playing skills and in the past your technique has been highly respected in the polls with your name being ranked highly with Wakeman, Emerson and so on. In many ways it brought back to me the virtuoso skills of the rock era in its earlier days which was refreshing to hear now.

Jon Nice to hear that. It is always something I have wanted to do and that should be a good enough reason. I have certainly used that type of thing on stage before. I also need a showpiece as well; a seven or eight minute 'tour de force', so that at the end everybody goes "phew!"

What is the line-up for the album?

Jon Basically, my keyboards are organ and piano, obviously. The piano is the studio's acoustic Steinway which has a nice bright tone. Sometimes they can be a little muffled. One of my favourite brands is the Yamaha — not the electric — which is a bright pleasant piano to play. At home I've got a Challen, baby grand, which I've had for some years now. I've just bought an Erard from a friend of mine which was made in 1870. The instrument in the publicity pictures is the Challen which I bought from Shirley Bassey and she had it painted to go with her dining room! It's not particularly good but it makes me work my fingers hard. I think that if I were going to splash out I would buy either a Bechstein or a Bosendorf. I get a huge range of expression from these instruments. I have got a Yamaha Electric Grand for stage use and this was a godsend for me. Previously, we had to use hired grand pianos and install Countryman or Helpinstall pickups and that used to take hours, and they were never right in the end.

I've never used a piano with Deep Purple, only organ, but I find it very useful in Whitesnake music. In recent years I have tried to use the keyboards as a kind of 'halo' around the sound rather than being a pinpointed part of the music. So the voice in the centre, the drums behind and the guitar at the side have the keyboards surrounding them. Whitesnake has been very helpful for me to establish that kind of playing.

Isn't your open chord style part of this?

Jon Yes, I call it rhythm keyboards, like

rhythm guitar, and I find that if I do less soloing in a concert I have much more to say on the few that I do. In the Deep Purple days it was very easy for me to start playing my own clichés, but now with Whitesnake I come to a solo completely fresh.

I don't quite know where my piano style came from but it must have been in my earlier years before I moved onto the organ and only recently have I come back to the piano as a stage instrument.

Do you use a Hammond with a standard Leslie rotating speaker system?

Jon I've got four Leslie cabinets! We took the amplifiers out of the Leslie's and used Crown DC300's to drive them instead and we've got Gauss bass speakers at the bottom and JBL horns at the top. I don't really know a lot about the technical side — I've a little man who works for me and does it all. They are not synchronised together and that is why we've got this lovely effect of a true choral sound all slightly detuned spacially. When we record we only use two and I have them facing each other with the mics in between. We used to do the same thing with a Fender Rhodes to give it a stereo effect.

I've recently invented a word for this effect — I call it Panolo as opposed to Tremolo, because it is actually a panning of the sound.

Jon What a great idea. I must use that!

One other unusual feature on the C3 is that I built into it an RMI electric piano. It is a straight electric piano with a harpsichord sound as well, and we found that the contacts to make it work were exactly the same as those on the Hammond. So we took the circuitry inside the RMI, put it in a box in the bottom half of the Hammond and linked it up to the contacts on the keyboard. Now the top manual of the Hammond can have electric piano RMI with it if I wish, and this gives me extra bite on some pieces.

I often think people forget about the simple ways they can add to their playing, by using things like extra contacts on existing keyboards rather than wait for the day they can afford a computer to link it up for them.

Jon Yes, that's true. The RMI has two piano sounds, harpsichord and a lute sound which is very much like a muted Fender Rhodes effect. It has attack on it which gives you a 'tock' at the beginning of every note, and also an organ switch which will give you a quick or a long decay. Using the short decay I get a nice effect that leaves the organ sound on sustained notes.

On top of the organ is a Hohner Piano Duo, which you don't see very often now. It is a Clavinet and a Pianet in one. The clavinet as most people know uses real strings and special hammers, and the pianet operates from vibrating reeds. Neither sold too well so they put them together and the package still didn't sell too well as far as I know! I love the sound of the clavinet and it's the main



keyboard on 'Hollywood Rock and Roll'. On top of that instrument I have my Moog Opus synthesiser. I have also got a Roland Space Echo and every instrument can be patched through that at the touch of a button. There is also a Moog Phase unit. (I should say "Mowg" but they all say "Moog" in Buffalo!) I have met Robert Moog a few times but now, as most people know, the synthesisers are made by Moog Inc. By the way, the phase unit can have all the instruments patched through it as well and it sits straight in front of me. Just to my left I've got the Moog Source synthesiser which is a lovely instrument. I'm still learning it and I don't know yet if it is going to be a successful stage instrument, but it will be very good in the studio.

Behind me I have got the Yamaha Grand with the Polymoog and then the Minimoog on top of it. I really only use the Polymoog for the string sounds and a couple of other effects that I like. Nevertheless, it was a brave instrument I think, and was one of the first polyphonics available.

Do all the strings on the album come from that?

Jon What I usually do is record low, middle and high strings on three separate tracks. This way I get more movement in the chords, rather than playing fistfuls of chords together. I usually write the string arrangements out as if it were going to be played by a string orchestra, then build it up myself. I find that way I have a good mix because I am thinking of the parts and this gives a little more air to it somehow. No matter how much echo you put around it, if you just use fistfuls of polyphonic strings it does tend to sound a bit like an Italian pop song if you are not careful.

I also use a thing called a Moog String Filter, which is really an equaliser with four different frequencies that you can boost and cut. I find it useful for doing things at the lower end of the Polymoog and if you filter out a couple of frequencies you can get a very nice solo cello effect.

Instruments that I would like to have include the Synclavier and the Emulator [reviewed in June '82 E&MM], but at the moment these are ridiculously expensive and I am not sure that I could find anywhere in my set-up for digital synthesisers apart from the Source. Your magazine is helping me find more of these instruments although I find some of the more technical articles quite difficult to comprehend. I am basically a musician who works from the emotional rather than the practical.

There is another point too — I do get an awful creeping feeling that machines are beginning to play men, and I am worried about it. The trend seems to be that a fairly untalented musician can get his hands on a very clever machine and make it sound very good. Okay, that is fine in some respects because it gives young people a chance to do



things quickly, but it might be the beginning of the winding down of the importance of technique, and that would be a great shame because only with the technique can music break new barriers in the end. The brain, mind and heart of the musician need a channel to come out through and these are your finger tips in my book. So your fingers have to be technically able and if you want to improvise for example, you can't unless you have adequate technique because that split second when something wonderful happens in your mind obviously comes straight out and you can't spend time fumbling around.

Do you find that you are much more aware of keeping your fingers in trim?

Jon Well, I am 39 now and I believe my playing technique is still not too bad, although over the last few years I have made a big effort to practise. During the heyday of Deep Purple I hardly practised because we were working so damned hard, and really playing every night is not like practising because it is not the same discipline. From about '76 I decided on the discipline of constant practice — I still do scales, arpeggios and contrary motion and all that, and they are very useful. Practice is vital for your improvising. Without it your fingers will not do what you want and as a result you start taking short cuts. I still don't practise enough but I am working at it. It is vital.

Let's move on to the tracks of the LP and the musicians concerned.

Jon There are four drummers featured on the LP. On the first track 'Chance on a Feeling' it's Ian Paice with Neil Murray on bass, Bernie Marsden on guitar, and I am playing the Hammond and Polymoog with some Minimoog as well.

The guitar solo was interesting because we turned the amp on its back facing upwards resting on three or four bricks and put a mike 20 feet away with the amp volume turned full up — it made quite an interesting sound that's more than just fuzz and distortion. (We had some glasses of wine at the time so it seemed a good idea!)

The vocals were done by Bernie and the two girls Vicki and Sam Brown, who's incidentally Joe Brown's wife. (Joe Brown the singer). It was interesting the way the singers worked. I would simply tell them the effect I wanted to create and let them see what they produced. I would play the tune over to them

and in Vicki's case on the song 'Say It's Alright', I played her the tune and then she did wonderful things with it, bending it to her own use. Again the song 'Where Are You' which Elmer sings. I love his voice, which has a very 'lived in' feeling — it's that cracked earthy quality and an untrained quality which I like, because the song is a very sad and lonely song. I wanted a bleak vocal effect so what I did was played it over and showed him the words. So his performance was really from his understanding of what I was trying to say rather than me giving him the precise notes I wanted.

'Before I Forget' uses the Polymoog and Minimoog. The cello sound is the Polymoog with the strings filtered and the French horn comes from the Minimoog — also the flute with digital echo panning left and right in the stereo field. I wanted the type of track to be as atmospheric as possible and it was originally going to be a song. At the time I was under enormous pressure from friends and colleagues to have an album with songs on it rather than just instrumental so I was pleased with the way this one came out.

Do you write the words first?

Jon It varies, sometimes I have ideas for the lyrics but the 'Before I Forget' lyrics came first as a title and then I just doodled. I remembered an effect I had heard with flutes echoing away and I wanted that. It gives the feeling of when you sit with your chin in your hands.

Next piece is 'Tender Babes' with a white noise swirl in the beginning and an interesting medieval flavour that follows. The first time I heard it had me listening hard because it sounds like the real instruments, being used.

Jon Yes, but it is the Minimoog doing those. I tried to get a recorder effect with lutes in the background — these came from the Polymoog using the harpsichord sound filtered slightly. It's based on a 15th century tune by Thomas Tallis. Cosy Powell interrupts it with the loud drumming and brings us back to the 20th century. I am playing the Hammond with slow Leslie effects and the parts are doubled on Minimoog. The bass is played by Neil Murray (from Whitesnake).

So it is just the three of you — I call it a sort of neo-medieval rock dance.

Jon It was quite difficult for Cosy because it is all in 4/4 but uses different bar lengths,





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some three, some four. as in traditional medieval music.

'Where Are You' follows and this is where I felt the dynamics and tempo expressed the lyrics very well.

Jon The 'Waking from a Dream' solo is on the Moog Source. The words incidentally are by Elmer Gantree. I was very sad and lonely when I wrote it. It was in a hotel room in Philadelphia. We were snowed in and it was the night off in the middle of a tour and I was homesick. The phrase 'Where are You' is followed by a whistle effect — that's a Micromoog that I rarely use. (The actual notes come from the way my wife whistles to the dog when he comes running so that gave me the idea!) Most of the piece is just piano and Polymoog and it was written on a small Roland electric piano in my hotel room, using headphones. The solo instrument is the Source. I tried to get the effect of an alto sax with it. My father plays soprano and alto sax and I wanted to get the feeling of his old-fashioned dance band style from some parts using very excessive vibrato. It's an 'in' joke for my father really as he is 74 and still playing! I play the track on my own for Elmer's singing and I am particularly proud of that one.

Then comes 'Bach Onto This' — the title's a little joke again — it's a musician's phrase I have heard a lot lately: "Back onto this", and I didn't know what the hell to call it. You see I don't like to take myself too seriously if possible. So I thought, because it is quite a heavy piece to do, I would lighten it slightly with the title. On the track I used just about every keyboard I've got at various places, but not all the way through, obviously. There are a couple of places where the Polymoog touch sensitivity is noticeable and the Source is used with the Opus for particular sounds, including the white noise effect. There's also a piano there and the drums are played by Simon Philips. Incidentally, he has been doing some playing recently with Toyah.

We used a backward piano tape reversal to get into the Fugue proper. The tom-tom rhythms are at the point where I try to get Simon to follow the tune of the Fugue rather than just the beat. It's a technique that works well with classical music.

I enjoyed the filtered harmonic sweeps and the stereo positioning of the melodic lines is good for Bach's counterpoint.

Jon I wanted it all to be heard.

Next comes 'Say It's Alright' with the guitar lead played by Mick Ralph from Bad Company. Bass is Neil Murray and Simon Philips is on drums. The vocals are by Vicki Brown singing a sort of Aretha Franklin style. She has a lovely voice and spends most of her time doing backing vocals for others, but I am trying to get her a record deal because she really is a wonderful singer and can convey emotions very well. The music itself is based on a simple progression apart from

the middle eight which I took from Grieg.

'Hollywood Rock and Roll' has a slide guitar solo in the middle and the group on the track is really Bad Company minus the singer: Mick Ralphs, Simon Kirk, Boz Burrell, with Tony Ashton singing. The polyphonic brass sound comes from the Opus — I like the synthesiser to suggest traditional instruments. Tony Ashton does the vocals in a sort of spoken/singing style, (the Germans call it sprechgesang). I don't like fade outs and I managed to find a good stopping place in this one.

Often you use an effective coda or repeat end such as in 'Mirror on the Wall'. Then there is 'Burntwood', this slowly fades in with noise generator and a low synth sound until we hear Vangelis style brass notes!

Jon I did write it before 'Chariots of Fire! The place I live in is called Burntwood so it was an attempt to evoke the English countryside. I live on top of a hill so the beginning of it with the white noise is my suggestion of the wind. The horn call is the first four notes of the tune over a pedal point — all done on a Minimoog.

This one in particular could have made a good film score.

Jon Everyone at EMI has said "If only we'd got a film to hang on that one, it could have been a single!" The bass player is Neil Murray again and he is playing the Aria fretless bass. I wanted the effect of him following the tune. We double-tracked the fretless bass and put it out of sync very slightly. I think he played it, very well because it was so difficult to keep his part in tune as he moved up the fretless neck following the piano melody. I did give him notes to read and he makes it up from that. I don't mind the other musicians interpreting it their own way. If they come up with something better they can use it, but here I wrote the parts out and simply added the chords so that he could improvise.

Here is a technique that younger players might enjoy, using the bass as a copy of the melody line.

Jon Yes, it is a pleasant effect. This track could easily be played live on stage because it is just the piano with the bass and I wanted it to be like a salon piece. It is one I've played from memory although I had written it out months before as a separate piano piece.

What were your other two albums previous to this?

Jon The last one was out in '76 and was called 'Sarabande'. That was with orchestra and some rock musicians literally thrown in the deep end. The album did particularly well on the continent. The other one was 'The Gemini Beat' which was done way back in '72.

How do you feel about the new mixture?

Jon I just wanted to make a solo album without too many trappings — like a 100 piece solo orchestra!

But I do feel you have still kept the orchestral sonorities with the electronics.

Jon I am a fool for the orchestra — I love it! I consider it to be an instrument, not a collection. There is nothing more exciting than an orchestra for me. Those orchestral climaxes are very much part of my music.

Did you do the arranging for the new album?

Jon I prepared a lot of it beforehand in my mind, wrote down the various sections I wanted to appear and then took it along to the studio — I use Britannia Row (used by Pink Floyd). I usually get straight into the recording after a couple of test runs, and we usually do one track a day. I arrange it all up front and try and get the musicians in the studio when I need them. I know other people work at a greater rate of knots than me and would do two or three tracks maybe, and I'm also not too keen on doing bits and pieces at a time. As far as mixing is concerned, I am indebted to Guy Bidmead

and Mike Johnson at Britannia Row. As I say, I am not a technical person, so I find processes of mixing a bit of a mystery, but I do understand what effects I want and so on, so that is how I contribute. Of course, I don't use any of my stage effects when recording. I use studio echo which is plate or digital along with digital reverb and I don't go for a lot of synthesiser effects. I am not particularly a fan of pure electronic music and musique concrete — that's not my style. I produced the album with assistance from Guy Bidmead and we decided tracks etc. as we went along.

Not being able to sing myself is a major drawback for me. I thank God for my talent with my fingers but I wish he had let me sing as well, but I don't like to use vocoders and other electronic tricks to try and make up for that.

Is the single a direct copy of the album track?

Jon No, it is a cut down version. It was EMI's idea and they said it was very much 'Jon Lord'. The idea was not that we wanted a hit single that trailed the album, but was really aimed at getting radio play. It's cut down to under four minutes from the eight minute version on the album, I simply found logical joining points from the original track. On the other side of the single is 'Going Home' and this was played by myself with Bad Company. The theme is on the Minimoog and it has a bit of early Billy Preston stuff for organ.

You have mentioned that you would like to do some concerts and tours. Is there anything in the pipeline?

Jon Yes, but the problem is trying to get Whitesnake back into gear. We are not on the road at the moment due to legal problems our singer has, but we should be back in the late autumn. So I thought a fairly low-key concert hall tour would be a good idea using as many of the album musicians as possible.

Playing and performing is more important than the studio. I love the studio but it can be a sterile atmosphere if you don't balance it with the performing. I love going out in front of an audience, and with the lengthening process that would go on in rehearsals that would make it work live, it could make an interesting concert.

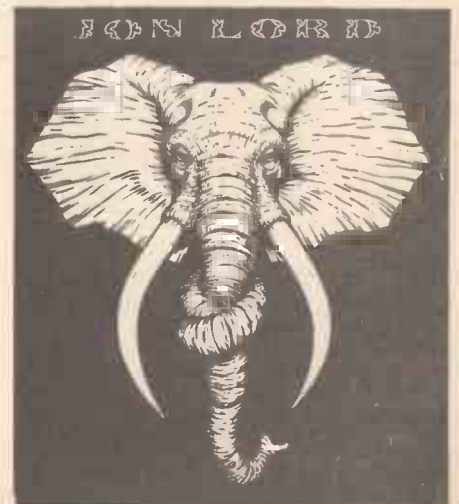
You believe there should be no barriers and take your ideas from whatever source you want?

Jon There are 12 notes from C to C and when you consider all the music that has been written from these 12 notes it is quite stunning that it is possible to make up something new. Music — be it rock, jazz, classical or whatever uses the same notes, so why the barriers? I am not a banner waver but I would like to see a less blinkered attitude towards various styles of music.

If I were to be a crusader that would be my crusade.

Mike Beecher

E&MM



JON LORD'S 'BEFORE I FORGET'



Reproduced by kind permission of Jon Lord © Arrangement copyright Mike Beecher 1982

An Electro-Music Transcription by Mike Beecher

This is the title track of Jon Lord's new album (available on EMI SHSP 4123 and is scored for piano solo and 'electronic orchestra').

It is a direct transcription of the music and highlights Jon Lord's acoustic grand piano playing for a solo performance that could be accompanied by orchestra (real or electronic), or by bass guitar, rhythm guitar, keyboards and drums.

The instruments mentioned in the electronic orchestra staves are the nearest equivalent traditional instruments synthesised by Jon in his recorded version for the LP. These should allow you to set up a suitable sound on your own synthesiser(s) if you wish to multitrack the orchestra yourself.

A possible approach for the home electro-musician using the Fostex 250 or Tascam 144/244 Portastudios might be:

Track 1—Drums (record a percussive 'guide' track for the whole piece, then only fade in when required in the first mix of tracks 1, 2 and 3 to track 4).

Track 2 — Bass notes (tails down on bass stave of orchestra).

Track 3 — Cello.

Track 4 — A mix of tracks 1, 2 and 3 plus input 4 with Horn.

Track 1 — Flute echoes and 2 part lines.

Track 2 — Voices (3 note chords mostly). Can be done on Vocoder.

Track 3 — Cello.

On final mixdown, I like to spread piano and voices with chorus send/return (Aux panned opposite to straight signal) and used E&MM Panolo on the flute (with echoes from the E&MM Digital Delay). The piano in particular benefits from added reverb, otherwise put it just a little on everything in the final mix. Bass and drums were centre stereo, with cello and horn slightly off centre left and right respectively. All the guitar chords are shown, although Jon does not use them as a rhythm accompaniment. I suggest an open finger style up to section D, followed by a steady strumming with the drums until the Coda.

The echo repeats of the flute have not been specifically notated. It is better that you listen to Jon's record yourself and add your own timing and effects.

The first bar of Section D indicates between the orchestra staves what the drummer should be doing, and simply gives you the style for playing (or programming).

Needless to say, the piano notes are not every time precisely what Jon plays, but are intended to give the feel and style of his music. Once you've studied the score closely with the LP recording, you'll begin to get an insight to Jon Lord's experience of integrating modern and classical music. Finally, don't be afraid to experiment with different sound textures for the parts and let us know how you get on. Happy Synthesising!

Before I Forget

Jon Lord

Key E Minor Slow tempo

Piano Solo *mp*

Electronic Orchestra

Flute *mp* (Echo repeat) Flute

Horn Cello

pp Em

A

Pno.

Ped.

Orch.

Cello *mf* Flute *mp* echo Cello

Bass Gtr. Em7 D G Em7 D G D C Em7 Em D G

B

Pno.

Orch.

Flute *mp* Be-fore I forget. Flute *mp* echo

Voices

Horn & Cello

A B7 C G D Am Em Em D G

Pno.

Orch.

Horn Cello Horn Cello

Em D G D C Em Em D G A B7

C

Pno. *mf* *mp*

Orch. *Voices* Be-fore I for-get. *Horn* *Cello*

C G D Am Em Em D G D

Pno. (LH) (LH) (LH)

Orch. *Flute*

Am D Am D Em C G Em7 Cmaj7 Em A7(+9)

Pno. *mf*

Orch. *Voices* Ooh Ooh Ooh. *Horn* *Flute* *Cello*

Em Em Dm Bb F C Em

Pno. *f* *mp*

Orch. *Flutes* *Voices* ooh ooh ooh oh *Flute* (+ echo) *tr.*

Am D Am D F Am D7 Bass Gtr. Cmaj7 B Am B

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Before I Forget

D Quicker tempo
2nd time 8ve (oct.up)

Pno. *rall.* *tempo. f* *(sub.)* *accel.* Theme *f* *ff*

Orch. *tr.* *echo* *echo* Vocal (mm) + Strings

Horn + drums

SD 3 CY X
MH XXXX XXXX XXXX XXXX
RIM X
BD X X X X X X X X

etc.

accel. Bass Em D G Em D G

Cmaj7 B Am B Em Em

Pno.

Orch. Cymbal Crash

Drums fill

D C Em Em7 D G F#m7 B(sus4) B7 C G

2nd time to CODA

CODA

Pno. *Sub.* *mp*

Orch. Be-fore I for-get. Flute (echo) *octave portamento* Voices (aah) Be-fore I for

Horn *mp*

D Am Em C G D Am

Pno. *rall.* *p* *pp*

Orch. get. Be-fore I for-get. Flute Echo repeat

Voices *pp* *ppp*

Horn *p* Bell Cello

rall. *pp* *ppp*

C G D Am Em

Korg Polysix



Every now and then a product appears on the musical instrument scene that causes quite a stir by offering remarkable facilities at an amazingly low price. Two such instruments that spring to my mind are the Wasp and Pro-One synthesisers, both of which offer facilities normally found in synthesisers twice or more their price. The Korg Polysix falls into this category for it has some remarkable features, but costs about a third of the more popular polysynths currently on the market. Whilst there have been technical compromises made on the Polysix in order to reduce costs, that doesn't prevent it producing some classy sounds. These sounds can be stored in 32 memories and should that not be enough you can dump the memories on to cassette and build up your own library of sounds.

As the name implies, the Polysix is a six voice polyphonic synthesiser; that is, it has a separate synthesiser module for each of its six voices allowing independent articulation for each note. The synthesiser module consists of 1 Voltage Controlled Oscillator (VCO), 1 Voltage Controlled Filter (VCF), 1 Envelope Generator (EG), 1 Voltage Controlled Amplifier (VCA) and a number of Low Frequency Oscillators for various modulation purposes. The fact that it only has a 1 VCO per voice might seem to be a limitation but also included on the Polysix is a versatile chorus unit that allows you to create some rich sounds indeed — but more of that later.

The VCOs can be pitched at 16', 8' and 4' and have a sub-octave that can be switched in at 1 or 2 octaves below. Normally I am very wary of sub-octave devices but this one is very effective and adds a lot of depth to a sound. There is a 3-way selector switch which offers sawtooth, variable pulse or modulated pulse waveforms. The Width control next to the selector allows you to vary the pulse width from square (50/50) to nothing (0/100). This is more useful than it may first appear as it enables you to effectively turn the VCO off if you wish to use the filter in the oscillation mode for Syndrum effects or whatever. The modulated pulse has a separate LFO for its sweep and the Width control doubles as a modulation amount control. Having separate modulation for the pulse width is useful as it enables

you to have a slow modulation of the pulse width, yet still retain normal vibrato. This means that you can recreate the effect of two VCOs, if carefully set. My only criticism is that you cannot modulate the pulse width with the EG — this can be a particularly dramatic effect and one that I missed. Apart from that, Korg have provided a comprehensive and versatile oscillator section.

The filters on the Polysix are of the 24dB/Octave Low Pass variety and sound good and punchy. Cut-off and resonance controls are provided and the filter can be put into self-oscillation. There is also an EG amount control that enables either positive or negative-going filter sweeps. Finally, there is a Keyboard Amount control which is variable from 0-150% so that the filter can track the notes played on the keyboard. It's nice to see a variable control here instead of a switch as is common on a lot of synths these days. You can use the filter as another oscillator if you wish, or by tuning the filter to the VCOs some impressive bell and vibes sounds can be obtained plus realistic organ sounds.

The EG is a 4-segment ADSR type and has a wide range of attack and decay times. Sustain is variable from 0-100%. The Release also has a wide range but is not linked to any form of footswitch which I think is a small drawback — that would have been a nice performance facility. The VCA is the final link in the chain and has a switched attenuator so that you can preset the levels of sounds stored in the memory, overcoming drastic changes in level as you switch sounds. Alternatively, you could preset a solo lead-line sound to be louder than the other sounds so that it will stand out above the rest when you break into your solo. There is also a slide switch that selects whether the VCA is to be shaped by the EG or a simple on/off gate type envelope.

The Polysix's LFO section has Rate, Delay and Amount controls which can be routed to either the VCOs, VCFs or VCAs, selectable by a slide switch. If you wish to modulate the VCOs and the VCFs, all is not lost because the modulation wheel to the left of the keyboard is permanently connected to the VCOs for vibrato. By selecting VCF on the selector switch and using the modulation wheel, simultaneous modulation is possible. It's

nice to see VCA modulation available — this allows some very effective vibes sounds to be created. The output of the LFO is only a triangle type waveform for vibrato, filter sweeps or tremolo effects (but not trills). Should you wish to modulate the filter with another waveform, there is a socket on the back for external modulation of the cut-off frequency.

All the six voices are internally mixed and are fed into a chorus unit. It is this that transforms the Polysix into a very powerful beast. It offers three modes of operation and can also be switched out if so desired. It can be a chorus unit or a phase shifter, in which case the variable control varies the speed of the effect. When switched to act as an ensemble device this control alters the intensity of the effect. This section is programmable and when used in conjunction with the modulated pulsewidth and the LFO, enables you to store some fine orchestral textures in the memory.

Also on the instrument is an Arpeggiator which allows you to have cascading patterns of notes travelling up, down or up and down over 1 or 2 octaves or the full range of the keyboard. You can latch the Arpeggiator which means that you can take your hands off the keyboard leaving them free to alter controls, play another instrument or make a cup of tea while the notes zoom up and down. The Arpeggiator has its own clock (variable between 0.2 and 20Hz) which means you don't have to use up the LFO facilities to set its speed. The Arpeggiator can be triggered by a rhythm machine, sequencer or Synclock via a socket on the back.

Memory

As if these facilities weren't enough, there is a bank of buttons to the right of the instrument that enables you to store up to 32 of your own sounds in 4 banks of 8 locations in a computer memory. Storing a sound is simplicity itself. You push a slider switch (located to the right of the 8 memory selectors) to 'Enable', and the red Write button will now begin to flash. You then press the grey Manual button followed by the bank and memory selector buttons to specify the preset location, whereupon the LED on the

Korg Mono/Poly - Unexplored possibilities



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

Korg Polysix - Infinite capabilities



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

The choice is KORG!

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

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

KORG inspires your creativity.

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



Name _____
Address _____

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

E&MM/8/82

Write button will go out and the sound is stored. By pushing the slider switch back to 'Disable', the sound is protected from erasure.

The control panel is in permanent Edit and should you feel that the sound you have just recalled from a particular memory needs a slower attack or more filter sweep you simply move the appropriate control until you are happy with the sound. If you want to store the updated sound, you just go through the Write procedure but instead of pressing the Manual button, you only press the relevant memory location buttons and the updated sound is stored. If you don't want to store the revised sound, you simply press the memory location buttons and the sound reverts to its original state.

Storage and editing of all the synthesiser functions (except the Arpeggiator) is done with the memory circuits and sounds can be 'dumped' on to cassette, in which case the 4 bank selectors double as 'To tape, From tape, Verify, Error/Cancel' switches (upon selection of the tape interface slider located to the left of the top bank of buttons). Although I've not tried this procedure it is reputed to take only 8 seconds to dump and retrieve sounds to and from cassette.

The Korg also has a key assign mode. There are 4 buttons associated with this section which are 'Poly' which puts the keyboard into the polyphonic 6 voice mode. 'Unison' puts all 6 voices under control of 1 key for some stunning lead line sounds. 'Chord Memory' allows you to play a chord

and hold it so that by playing only 1 note the chord remains constant. This is particularly effective with intervals of a 5th and an octave. 'Hold' as the name implies sustains any notes indefinitely.

Finally, to the left of the keyboard are 2 wheels, 1 for injection of vibrato as described earlier, the other for pitch bending. This latter wheel has a variable sensitivity control so that you preset your bends very precisely to a tone, a third, fifth or whatever. These are generally comfortable to use and a great improvement on KORG's usual joystick but I share Dave Crombie's view in his review of Korg's Mono/Poly (E&MM April 1982) that it is difficult to tell whether or not the wheel is back at the centre of its travel because the detent is so weak.

Conclusions

In appearance, the Polysix is a smart, professional looking instrument that is not too dissimilar to a Prophet 5. The control panel is blue and the casework is a smart wood finish, with brackets on the back of the instrument for winding the mains cable around. The Polysix is very sturdily built and it's good to see that no compromises have been made in its construction.

I think the Korg Polysix is a winner. It is capable of producing rich orchestral sounds as well as delicate solo sounds. The programmable section makes it ideal for stage and studio work alike and the edit facilities

make it very flexible indeed. I must admit that, although I appreciate the usefulness of memories, I feel that some people don't explore the full potential of a synthesiser equipped with such facilities. Instead they select a memory as an easy way out. I have heard many reports of Prophets, Jupiter 8s, etc. being returned for service with the original factory presets in them, not one original sound anywhere. This probably explains why so much synth music sounds so similar these days. I just hope that people take the time to explore the Polysix and not rely on the factory presets because it is capable of producing a wide range of sounds.

My only criticisms are that I would like to have seen a noise generator and polyphonic portamento included. The Arpeggiator trigger input is not directly compatible with ARP, Roland or Seq. Circuits but may be interfaced using the Korg MS-02 Interface or E&MM Universal Trigger Interface.

All in all, though, I give Korg full marks for producing a great synth. It has all the right features on it and I personally prefer it to some of the top of the range polysynths I've played. As these synths have all gone up in price recently putting most of them in the £3500 bracket the Polysix, at £1200 or less is a very important instrument and will attract a lot of customers — including me.

Steve Howell **E&MM**

The Korg Polysix is distributed in the U.K. by Rose Morris & Co Ltd, 32/34 Gordon House Road, London NW5. Tel: 01-267 5151.

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WORKING WITH VIDEO

Part 2 Setting Up A Studio

Andy Emmerson

In the May issue I left you halfway through setting up your own private video studio, so we had better tie up the loose ends.

Taking this task literally, this means connecting everything together. Wiring your whole studio is straightforward if you take each item on its own and follow the normal instructions in the manuals. If you are in doubt why not make yourself known at the local technical college? Almost certainly they will have an audio-visual 'king' (who will probably feel flattered to be regarded as an expert) or you could ask at your local amateur radio club if they have any amateur television enthusiasts (ATVers). As an ATV enthusiast myself, I can assure you we always help newcomers and of course we don't just play at closed circuit TV, we broadcast as well. Transmitting amateur television is a complete hobby in itself and I'll deal with this subject at length in another article soon.

In the discussion so far I have assumed monochrome operation because video "on the cheap" has to be in monochrome unless you are very lucky. Owning one colour camera is a step towards all colour production because (a) black and white sequences mixed in with colour can be extremely effective (we see far "too much" colour nowadays!) and (b) you can buy low-cost devices to colourise black and white images artificially. Sony make one which sells for around £75: using a black and white camera you can photograph titles and captions, for instance, and colourise these, then superimpose them over pictures obtained with a normal colour video camera. The main things to remember about colour operation are that you need more money, more lighting and the connection or rather inter-connection of apparatus becomes more complicated if you want to achieve good results. The same basic principles apply, of course. As always, keep your eyes open for bargains — it's amazing what you may find in the small advertisements in *'Exchange and Mart'*.

If you want to 'get into' video in a hurry books are the fastest way to pick up knowledge. Back in the January issue I reviewed a new book from Newnes called *'The Video Handbook'*. Although expensive at £19.90 it is extremely comprehensive and you can't beat it, especially if you are interested in the more technical aspects. If you cannot find this book in your local library and fancy something a little easier on the pocket you will find a number of other video books on the market, most of them written for the American semi-professional user. They tend to deal a lot with reel to reel video machines and the models of camera mentioned are of course all American ones: they are, therefore, only partly appropriate for the European scene. The chapters on production techniques, staging, lighting and video photography are, however, fully relevant. They are all written for 'non-technical' readers and bits of them may make you squirm a little! The one I like the best is called *'The Video Primer'* by Richard Robinson. Two editions can be found in the

bookshops — one at £4.95 is a tall, narrow paperback of 380 pages while the other is a larger format hardback and costs about £8. The contents seem to be identical and needless to say, I purchased the cheaper edition. It is a very honest book and is down-to-earth in a way which European books seldom are. It shows you how to solder a PL-259 plug and how keying works in an effects generator. There is a comprehensive glossary at the back and it should keep you quiet for a weekend at least!

A few months ago I bemoaned the poor audio quality of many TV sets and mentioned that music on video was seldom 'hi-fi'. A step in the right direction is the decision of Magnetic Video to duplicate its video-cassette releases with full Dolby stereo sound. This is a step in the right direction and anticipates my earlier prediction that stereo sound VCRs will appear during 1982. To hear the full stereo effect you will be able to connect your (new) VCR to your hi-fi system and there are also a number of TV sets with twin speakers for stereo coming on to the market now.

Another development is the ever-increasing number of pure and simple music tapes being released. An example is EMI's tape entitled *'The Tubes' Video'*: now you may or may not like The Tubes but seldom have I seen a more polished presentation. And in a hour or so you can develop a visual and musical theme so much more than a three minute segment on *'Top of the Pops'*. Some first-rate concert performances are also available, such as ELO's extravaganza at Wembley Stadium, which is high on my 'want to get if only I could afford it' list. Here is the

snag, of course, nobody will deny that these prerecorded tapes are desperately expensive, and unlike record albums, there's no way the average individual can afford to build up a collection. Well, not legally anyway.

For some reason that last thought brings me to video clubs. These are springing up like mushrooms nowadays and the rental charges for short periods can be very reasonable. Try to avoid the clubs which demand huge deposits: other clubs now work on a nominal deposit system. Some take a cheque which they promise not to bank unless you disappear off the face of the earth. Many clubs allow you to borrow a film overnight for £2 or less, which can be cheaper than going out to the cinema, well after counting the cost of fares, drinks and icecreams, it is! This welcome development may also be instrumental in bringing down the price of prerecorded tapes to purchase.

Finally, here's a novelty which may set a trend and should appeal to musicians who are also video owners. Denny Laine, of *The Moody Blues* and more recently *Wings*, has made a video for Fletcher Films entitled *'A Helping Hand from Denny Laine on Guitar'*. In this recording Laine gives advice on choosing, tuning and playing the guitar as well as useful hints on songwriting and recording. Available on the three popular formats, the programme lasts for 59 minutes. Other artistes have been lined up for Fletcher, and Rick Wakeman is booked to perform on keyboards. I haven't been favoured with a review copy, so I cannot say if it's any good but it sounds like a good idea. Why not check it out if this is your scene?

E&MM



MUSIC MAKER EQUIPMENT SCENE

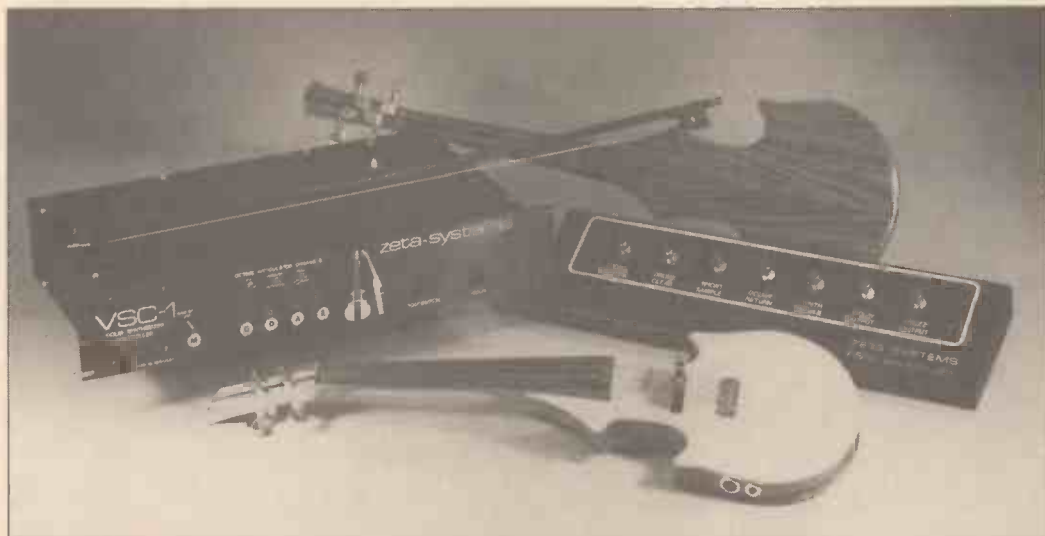
VIOLIN SYNTHESISER CONTROLLER

Using a new technology (patent pending) developed at Zeta Systems the VSC 1 allows the violinist complete access to synthesiser technology while in no way compromising his playing style.

The instrument is hand crafted from choice hardwoods and incorporates four independent full range pick-ups mounted in the bridge, one per string, to produce a complete quad signal devoid of I-M distortion. Other features include four laser trimmed position transducers mounted in the fingerboard, triggers and pitch and amplitude control voltages for each string, phase-locked loop auto tune circuitry to constantly maintain tuning between string and synthesiser and a sophisticated seven stage remote footswitch.

Front panel controls include master and fine tuning as well as a variety of performance options all in a compact two space rack mount unit and the full system retails for under \$5,000. Custom orders are accepted and violins are available separately.

For further details contact Zeta Systems, 1122 University Avenue, Berkeley, California 94702. Tel: 415 848 7728.



GIBSON CHET ATKINS CUSTOM

New from Gibson is a Chet Atkins Custom Electric guitar. Two special acoustic chambers lie beneath the solid spruce top and each string has its own plastic saddle and piezo pick-up. Overall string balance is achieved via a small circuit board with each



pickup having its own miniature volume control situated on the rim of the guitar.

The 'CE' neck version has a classical feel and the 'CE-C' neck has a full width classical neck with a wide flat fretboard. Each limited-edition guitar comes with a parchment paper individually signed by Chet Atkins.

Further details from Rosetti & Co. Ltd., 138 Old Street, London EC1.

EV MIKES

The PL88 is a single D cardioid vocal microphone which has the correct amount of bass boost (proximity effect) when used close up and features a built in 'Acoustifoam' blast filter and a shockmounted head.

With a frequency response of 60-1300Hz it can also be used for miking up instruments. For instrumental use the variable bass response can be utilised to achieve clean bass pick up at a distance of 60cm. By moving the PL88 a few more centimetres the bass will be increased.

The PL88 is available in high and low impedance versions (150 ohms and 47,000 ohms) and both retail at £49.75 plus VAT.

Details from Electro-Voice Division, Gulton Europe Ltd., Maple Works, Old Shoreham Road, Hove, Sussex BN3 7EY. Tel: 0273 23329.



PORTABLE STEREO KEYBOARD

JVC (UK) Ltd have just introduced the KB500 portable stereo keyboard, stereo sound is provided through its built-in speakers or by linking to a hi-fi system.

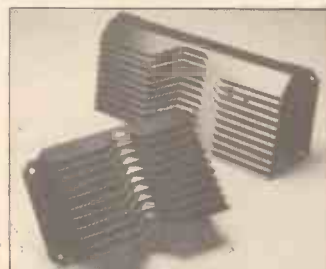
An 'Ultra-chord' facility converts melody notes into full chords enabling the player to use complex chording techniques using only one finger, and a 'Compucorder' system allows programmes of up to 42 bars of accompaniment chords and chord changes for up to three different

pieces of music — 126 bars in all.

There are eight different instrument sounds: clarinet, harpsichord, Hawaiian guitar, jazz organ, jazz flute, piano, organ and vibraphone and the makers claim that this is the only single keyboard to have two ensemble settings — Brass and Strings.

The KB500 has a microphone socket, phono socket and can be played from the mains or using batteries.

Details from JVC (UK) Ltd., Eldon-wall Trading Estate, Staples Corner, 6-8 Priestley Way, London NW2 7AF. Tel: 01-450 2621.



CELESTION ACOUSTIC LENSES

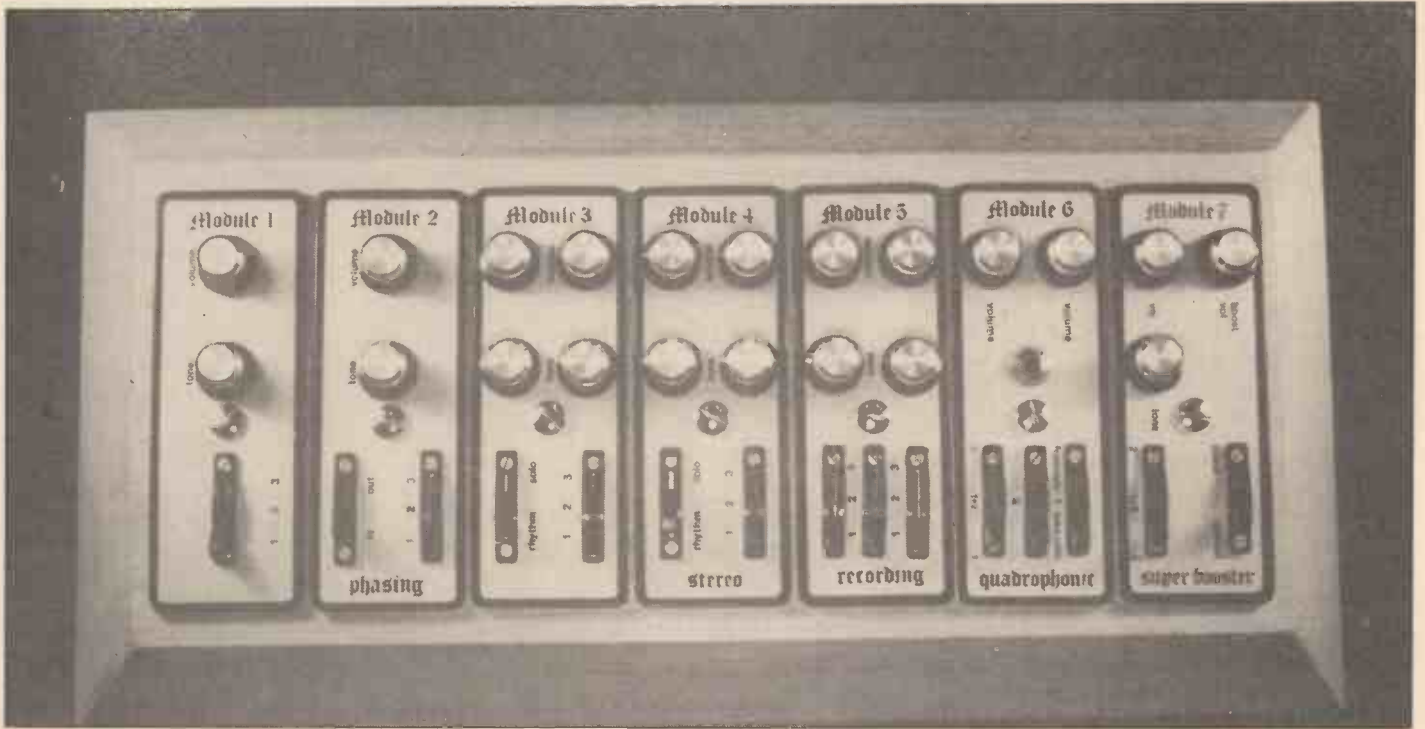
Celestion has introduced a new pair of acoustic lenses for use with the

company's HF50 and RTT50 professional horn tweeters. Acting as angle-dependant delay lines they give a broad, flat-fronted coverage pattern and are recommended for short throw use.

The A17 is designed to fit the HF50/50X, measures 198x125 mm. and retails at £10.78. The AL12 is designed for the RTT50/50X, measures 308x125 mm. and retails at £14.00. Both prices include VAT.

Details from Celestion International, Ditton Works, Foxhall Road, Ipswich. Tel: 0470 73131.

Shergold Modulator 12 string



The range of modules.

Quiz time! Think of a British guitar, quickly... Well done everyone who said Burns, think of another. Hayman, perhaps? The Genesis fans among you, and those who peeked at the title of this review, probably suggested Shergold. Now then, what do all these guitars have in common, apart from being British and, of course, excellent? That's right, they were all built by the same two people, Jack Golder and Norman Houlder, who also produced Baldwin, Ormston and (with E&MM's very own Peter Cook) Ned Callan guitars. In other words, these two know just about as much as it's possible to know about making solid guitars.

Yes, it's hobby horse time this month, and apart from the superiority of British guitars in general, and Shergold in particular, the other subject is rock music itself. Having alienated the guitar builders of the world, I am now turning on those nasty rebellious musicians; but when you think about it, all these so-called rebels seem to be playing exactly the same instruments. All their guitars have six strings, all the basses have four, and when you've taken away all the Les Pauls, Stratocasters and Precision basses there seems to be precious little left. Here are Shergold turning out twelve string guitars, eight string basses, six string basses (some without frets, even) and double neck guitars in addition to more conventional instruments; it's no wonder they aren't rich and famous, they're too adventurous.

At this point I had better admit to a slight bias. Over the years, my guitar collection has included two Shergolds: a Marathon bass and a Masquerader guitar. I also have a weakness for guitars with other than the

accepted number of strings; since this weakness is affecting my wallet, I'd better get on with the review before I get the sack.

Construction

Shergolds have a reputation for being "handsome is as handsome does" guitars, and certainly the two I've had have been a bit lumpy, with rather too much black plastic attached to them. By comparison, this one is positively good-looking; it doesn't even have a scratch plate, so the contoured ash body is shown off to best advantage, but still protected by a robust looking polyester finish.

The neck is maple, finished in polyurethane and with a separate fingerboard, bound in black plastic which covers the fret ends and prevents lacerated fingers. This arrangement, along with the polyurethane fretboard, is going to make refretting somewhat troublesome — and costly — but judging by the generous cross-section of the frets, that problem won't arise for some considerable time.

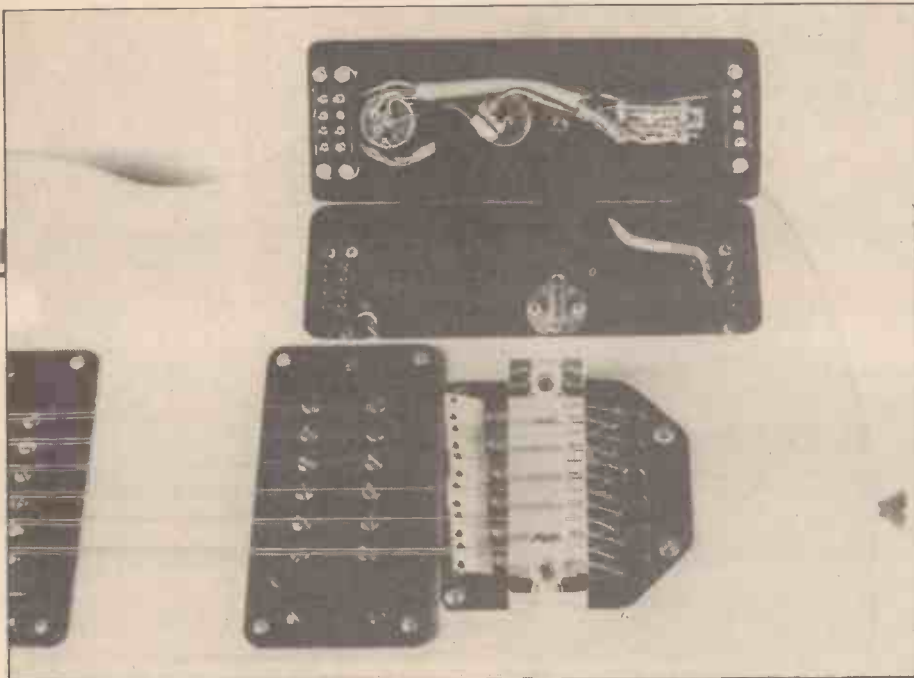
As well as twelve of the small variety of Schaller's metal cased machine heads, there are eight small metal "mushrooms" on the headstock which guide the strings smoothly through the nut, and stop them snagging on the other tuning pegs. All this metalwork makes the balance head-heavy with the guitar on knee or strap, but not annoyingly so. Shergold employ a "zero fret" — a fret at the top of the fingerboard where the nut would normally be, which gives potentially better intonation and separates action adjustment from the nut cutting operation. The nut simply governs the string spacing — it's made of bone on this guitar,

but unfortunately has been cut for heavier gauge strings than are actually fitted, so that the strings slop about a bit in the slots.

Two other features of the neck are invisible; firstly, the counter adjustable truss rod which can actually bend the neck in both directions; and the mortice and tenon arrangement at the heel which keeps the joint solid even though it's a bolt on neck. As a result of all this, the neck is as easy to play as a six string, and should be a revelation to anyone used to an acoustic twelve string; the neck is one of the standout features of the guitar.

The bridge is not so good, though; the steel base has keyhole slots to retain the ball ends, which would make for fast string changing were it not for the fact that you then have to feed the string ends through holes in a block of perspex. This block provides a smooth, warm resting place for your hand, though. The string saddles are brass, and are adjustable for height in the usual way. It is also possible to adjust the string length, to compensate for the different vibration characteristics of different thicknesses of strings. The trouble is, there are only six saddles; since the lower four pairs of strings are tuned in octaves, and are hence of different thicknesses, both strings of a pair cannot be adjusted separately. What this means is that the pairs tend to go out of tune at the high end of the fingerboard if they were in tune at the bottom; the G strings and lower E strings are unusable above the twelfth fret.

Mind you, I'm spoilt; my own twelve string is a Fender electric XII, which has the only individually adjustable twelve string bridge I've ever seen. Why should it be the only one? Such a bridge would vastly improve this instrument.



Close-up of the module mounting.

The Electrics: The Module System

The Modulator comes with a single volume and tone control and a three way pickup selector switch, mounted on an unpreprocessing plastic plate. On any other guitar, that would be the end of the story except for players with drills and soldering irons; not on this one. Shergold have an excellent system of plug-in control modules; you simply undo the large screw in the centre of the plate, unplug the whole assembly and fit a different one. Module 1 is the simple one fitted to the guitar, which should be quite sufficient for stage use. The others get more complicated as their numbers ascend.

Module 2 — Phasing

Not the phasing you get from an effects box, but a switch that puts the pickups out of phase to get a resonant, penetrating sound when both pickups are on. Otherwise the controls are as for module 1.

Module 3

Separate volume and tone controls for each pickup, a pickup selector plus a rhythm/solo switch: this bypasses all the controls to give full output. It's instructive to note that this switch has an effect even when volume and tone are on full; they are still loading the pickups to some extent, and presumably this happens on all guitars, although this is the first time I've had it demonstrated to me. Excuse me a moment while I fit bypass switches to my guitars.

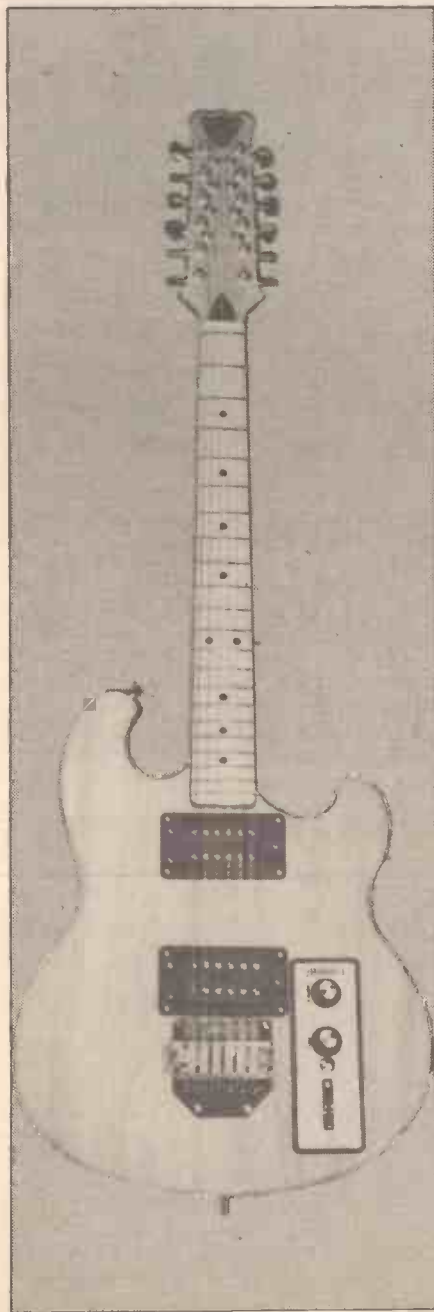
Module 4 — Stereo

This one is identical to module 3, except that each pickup has its own output channel — the jack socket (on the side of the guitar again!) is a stereo type. This enables you to have a different effects unit on each channel, and switch between them with the pickup switch. Alternatively, you could use "clean" and "dirty" inputs on your amplifier, or even use the two channels as stereo; quite effective when recording.

Module 5 — Recording

My favourite! This is similar to module 3, but instead of the rhythm/solo switch, there is a coil switch for each pickup. The arrangement is similar to my old Masquerader — see also "Hot Wiring Your Guitar", October '81

E&MM AUGUST 1982



E&MM — and has three sounds for each pickup. As well as humbucking and single coil sounds, the third position connects the coils in antiphase to give a very trebly output. This sound is not much use by itself, but is ideal for adding a bit of "glitter" when both pickups are used; a very satisfying range of sounds is available from this module.

Module 6 — Quadraphonic

A little bit over the top, this one; it gives you a separate output for each coil in each pickup, with the help of an extra stereo jack socket mounted on the module plate. I couldn't think of a sensible use for this one, and I don't think anyone else has, because the module wouldn't fit in the guitar; it has double ganged pots, and one of them fouled the pickup cable.

Module 7 — Super Booster

Shergold pickups seem to be wound for good treble response rather than all-out hell for leather output, so this module has a simple PP3 powered preamplifier built in. This has its own volume control and may be switched in and out of circuit at will "to overdrive even the toughest of amps". Number 7 would be more use on lead guitar, but it certainly does what it says.

Curiously enough, modules 6 and 7 are the only ones to have the lettering the right way up: the others seem to be designed so that the audience can read the control functions, rather than the player! If none of the above modules do what you want, you can also get a blank plate with the plugs fitted. Called Module 8, this enables you to design your own circuitry and/or control configuration if you wish.

The Sound

The pickups are humbucking types cased in black plastic, and are sealed with epoxy to stop the feedback that used to be a problem on the older ones. The good treble response is an advantage on a 12 string, which doesn't need a particularly high output; and the wide range of sounds is very useful. So much so, that I'm trying to work out how to fit humbuckers to my Fender, which has single coil pickups giving treble, more treble and not much else.

Since 12 string guitars aren't widely used in electric music, it might be difficult to decide how to approach this instrument; rest assured that you don't have to play like Mike Rutherford or Roger McGuinn to make use of one. Although they can sound very beautiful, especially with chorus and a little reverb, I'm a great fan of the 12 string for virtually all rhythm guitar, even the most violent. It can fill out your sound on stage, or make overdubs unnecessary when you're recording; so go on, be different!

Peter Maydew

E&MM

Recommended retail price of the Modulator 12 string is £299.38; modules 2 to 5 are £30.21 each, number 6 is £33.27 and number 7 costs £37.43. Shergold guitars are built by Shergold (Woodcrafts) Ltd, 9 Avenue Industrial Estate, Southend Arterial Road, Harold Wood, Romford, Essex RM3 0BY.

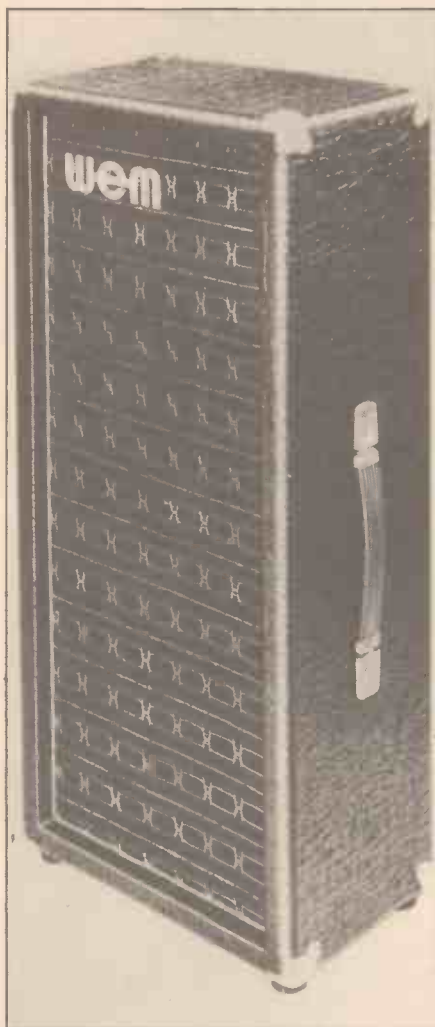
SOUND ON STAGE

A Short History of British PA

Ben Duncan

In the beginning, the term PA applied to any makeshift means of making vocals audible, typically using a pair of 12" guitar speakers, a 25 watt guitar amplifier and 'Public Address' microphones boasting a frequency response not dissimilar to British Telecom's. The cheerful simplicity of this type of setup was both acceptable because the audiences' expectations hadn't been raised by domestic Hi-Fi nor their enthusiasm lowered by a bored palate — and necessary — because in those days, bands often played several clubs in one evening! Then, in the mid-60s, the intensity of expression available to guitarists was given sharp impetus by an extraordinarily loud amplifier bearing the name Marshall, and virtually overnight guitars became predominant, leaving inaudible vocals in their wake. Up to 1967, musicians were too busy with their music to care about or even to *think* about PA; there was then little awareness of the crucial manner in which audiences' perception of sound could alter the nature of a concert. Musicians remained aloof and left alleged 'technicalities' in the hands of their roadies. With the benefit of hindsight, it's easy to smile at attempts by perplexed and hard-driven roadies to make loud vocals possible sans feedback using 100 watt amplifiers and speakers designed empirically for a good guitar sound rather than a Hi-Fi response. Eventually, Charlie Watkins (whose WEM guitar amplifiers and echo units had developed alongside rock'n'roll from the beginning) took the initiative and in 1967 assembled arguably the world's first high power on-the-road PA system — 1000 watts! The widely used 1kW WEM PA consisted of five 100 watt column speakers per side, driven full range by five corresponding 100 watt amplifiers; these were the very first high power transistor amps, and together with the columns, they provided a smooth if not exactly broad frequency response. But most significant of all was the WEM 'Audiomaster' mixer, which coincided with the practice of mixing the sound 'out front', amidst the audience, plus the diversification of PA from vocals only through to the wholesale miking up of instruments. Suddenly, with the discovery that close miking gave different, more dramatic sounds, it became fashionable to amplify *everything* through the PA, even if some instruments were quite loud enough without! Simultaneously, the concept of stage monitoring was imparted from the States, courtesy of the Who's Bobby Pridden, who persuaded Charlie Watkins to add extra mixing facilities and outputs to his Audiomasters; these lead to additional power amplifiers and monitor speakers on stage.

By 1970, and within the space of 3 years, the basis of PA as we know it today was established. This rapid development was fostered by the sudden interest of musicians, manifest most notably as competition between bands such as The Who, The Move, Pink Floyd *et al* to own the 'best' PA. But, equally important, the fertilisation of ideas arising from the first large scale touring of the U.S.A. by British bands was to provide



The WEM column speaker was the bedrock of British PA in the late 60s.

the impetus for innovative British PA design in the 70s. For whilst the WEM PAs were arguably the first practical realisation of on-the-road sound systems and provided the early British festivals with unrivalled sound clarity, in a technical sense, the 'house' PAs of American venues were markedly superior.

PA from 1971 to 1981 — a Decade of Loudspeaker Politics

In 1970, Phil Dudderidge, Engineer with Led Zepellin (today a director of Soundcraft) spotted JBL and Altec house PA speakers whilst touring in the States. He wasn't the first sound engineer to be enthusiastic about the high efficiency of these horn-loaded systems, but unlike other, more dedicated roadies (Bazz Ward!) he was sufficiently keen on the idea of importing the concept of horn speakers into British PA to leave Led Zep and begin manufacturing with Paul Dobson. In turn, the evolution of this partnership led to RSD amplifiers, Studiomaster and

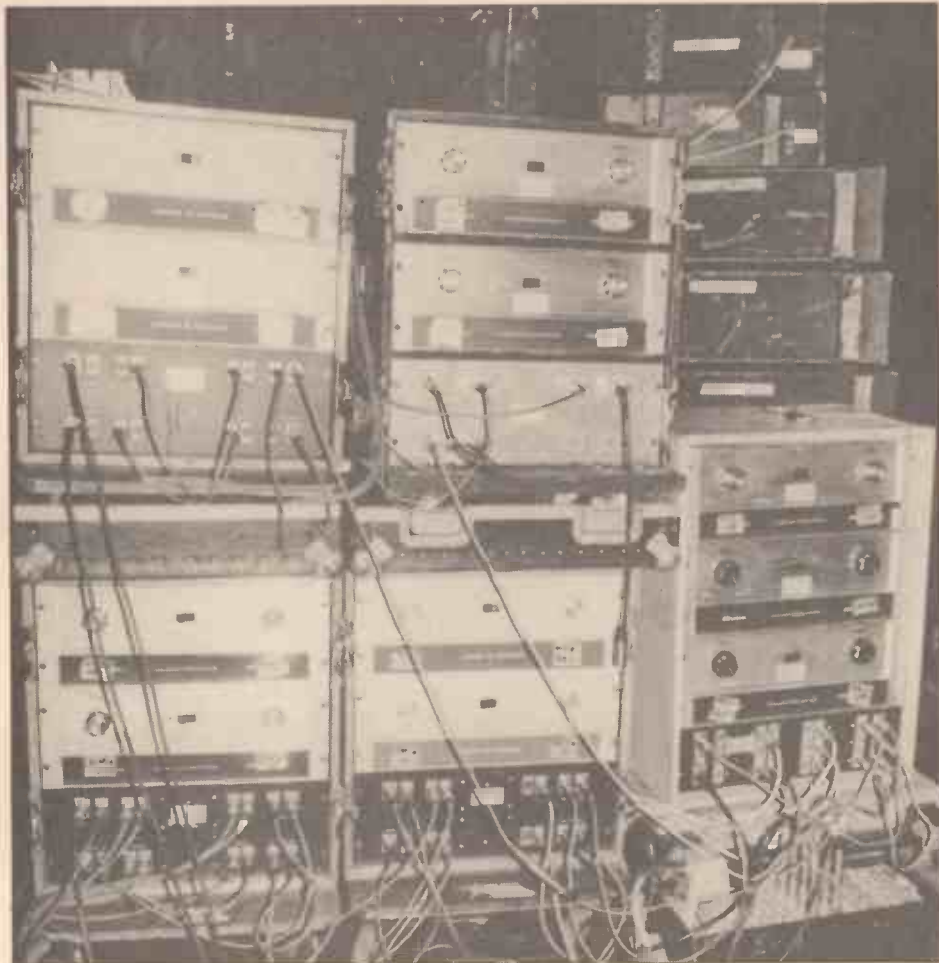
Soundcraft mixers and the Europa Concert PA company.

In the same year, incipient heavy metal arrived from the U.S.A. to tour here in the shape of Iron Butterfly and with them came two giant eight-foot-high RCA 'W-Bins'. These bizarre horn speakers were originally designed for cinema sound systems circa WW2, and within their rapturous endorsement (their incredible loudness caused something of a sensation) was the intriguing re-discovery of 1930s and 40s cinema sound technology by the Rock business. In deference to the 'delicate' sound of Charlie Watkins' column speakers, the horn loaded designs arriving from the States were very efficient, if large hence potentially very noisy, especially in combination with burgeoning amplifier powers. But, more important, without sensitive and intelligent application, it was all too easy to generate highly coloured and distorted sound, as a 'power at all costs' syndrome developed.

Circa 1971, Steven Court made American JBL drivers widely available, and Bill Kelsey (then of Kelsey-Morris) produced PAs for bands like Ten Years After, King Crimson and T. Rex, modelled around American cinema horn designs. He also laid the foundations of the modern PA mixing desk, whilst Dave Martin relinquished his job as a recording engineer to develop commercial horn speaker stacks especially for Rock PA. Around the same time, there was friendly rivalry with Tony Andrews, who'd worked with the Pink Fairies and Piblokto, as he began to build his own speakers with an emphasis on organic development and a marked sensitivity to music.

In 1972, the first of a new generation of PAs arrived, one being supplied to Supertramp. This was the original Midas PA, designed by Jeff Byers and Chas Brooke, with advice from Scott Thompson of Colac PA hire, who'd picked up many ideas whilst touring the States. Here, for perhaps the first time, active crossovers were used, the signal being split according to frequency prior to the power amplifiers. This technique resulted in greater efficiency and had the potential for making a smooth response easier to attain. In addition, to complement the new crossover, specialised horns were used to cover the audio spectrum in three bands. We might take this for granted today, but prior to this point, PAs had only used two types of driver to cover the audio band, whilst of course, in the 60s, PAs were driven full range, with correspondingly large doses of intermodulation distortion.

Subsequently, Midas went on to specialise in the production of PA mixing desks built to studio standards and, at the same time, teamed up with Dave Martin, whose forte was to produce a standard (if unexceptional) PA speaker system. Together, Martin-Midas pioneered the concept of a 'package' PA, wherein all the components were matched. Meanwhile during 1973, Tony Andrews and Tim Isaac, working on the road as 'Sonic Trucking' produced a midrange speaker which was a radical improvement over the widely misused compression-driver loaded



The Amcron DC300, introduced in 1967 was the first high power transistor amplifier. Although obsolete, it's still seen in many rigs.

midrange horns prevalent at that time. Their curious invention was later dubbed the 'Turbo' by musician Tim Blake. (Later, it was to become the forerunner of what's widely regarded as the best Rock PA speaker — the Turbosound TMS3 Module.)

Early in 1975, the practice of mixing monitors on stage was established by Midas with consoles designed especially for the task, having 6, 8 or 10 outputs, so enabling each musician to have a personal monitor mix. Prior to this, the monitor signals originated from the outfront desk, and even if the 4 or so monitor 'sends' provided were sufficient to cover a small band, the engineer outfront was invariably too busy to give proper attention to the needs of the musos on stage.

In 1976-8, coincident with the rise of the New Wave and independent record labels, street and club musicians *en masse* began to acquire — or hire — elaborate PAs, made available at affordable prices. These rigs were essentially scaled down versions of large systems owned by major bands and hire companies. From this time, an unprecedented interest in PA by musicians at large developed. At the same time, prompted by the raised expectations of musician and audience alike towards PA sound quality,

resulting from the now widespread ownership of domestic Hi-Fi equipment, dissatisfaction with established PA speaker systems in the classic JBL and Martin mould grew. Along with use of more refined microphones (studio types were by now often seen on stage) and desks (studio quality desks were now available from at least three manufacturers), a proliferation of Hi-Fi power amplifiers and the almost universal endorsement by major PA companies of phase correct, -24dB/octave crossovers, speaker technology suddenly stood out as an anachronism. Not only were the standard speaker systems all too eager to rip ones ears, they required wearisome twiddling with EQ knobs to achieve acceptable tonality and, moreover, their hideous black bulk was suddenly a major embarrassment: artics brimming with speaker cabinets were no longer good politics in the days of loss-making tours. Thus, a number of idiosyncratic hire companies, dissatisfied with the status quo developed highly attuned and efficient, no-ear-rip, but above all compact speaker systems utilising a judicious blend of standard components. The new realism of the tightly stacked PA speakers of the late 70s is evident in Paul Weller's humorous quip as he walked around before a gig,

inspecting the stage equipment — "Where's the PA?"

Towards the end of the 70s, beginning in the U.S.A. with the Clair Brothers' 'S3', full range PA cabinets began to appear. Here, instead of an untidy and/or difficult to fit together assortment of bins, horns and lenses, one or two drivers for each frequency band were mounted in a discrete and cogently shaped box, rather like a conventional 3 driver Hi-Fi cabinet. Not only did this result in a tidier and more compact stack — it also made 'flying' (hanging speakers above the stage for improved coverage in large, multi-tier auditoriums) less irksome.

So, ten years after the wholesale infusion of American techniques, the proliferation of oddly-shaped loudspeaker components has begun to revert to the simplicity of full range boxes having a surface similarity to the column speaker stacks of the 60s and, along the way, countless decibels of muddy and nauseous sound have been refined to a state where loud music can be enjoyable, at least for those who can afford state-of-the-art equipment!

PA for 1982

The implicit moral of this short history is twofold. Firstly, mistakes have been made, and it's perilous to assume that powerfully advertised and widely-used equipment is the best. Malcolm Hill has called Rock PA "A very emotional business," whilst Tony Andrews hits the nail on the head even more squarely in his observation that certain famous PA speakers have "displaced the general public's perception of the nature of real music" — a frightening 1984'ish idea. . .

Musicians, then, in knowing intimately the sound of their instruments have the unique ability to make sensitive and judicious assessments about the quality of a PA, provided they have open minds, relying on their ears rather than being swayed by convention or advertising hype. If you're not a musician, or you're trying to assess synthesised sound, which has no reference point, then the key question in the absence of intimate knowledge is 'does music reproduced through this PA do things to my head?' For emphatically, good music coupled to a good PA system produces a distinct shift, a stoned gestalt wherein the sound takes on an added dimension.

Secondly, whilst 100kW PAs seem remote to the average musician, the majority of small PAs are based on techniques and hardware gleaned from the systems developed by affluent bands and entrepreneurial hire companies and, increasingly, small rigs are simply trimmed down copies of major systems. Thus, in future parts of this series, we won't ignore the techniques and innovative ideas of the large hire companies. However, from the next article, we'll concentrate predominantly on tackling the down-to-earth knowledge required by impecunious musicians to select equipment and to build and operate practical systems. Next article, we'll set off with mixing desks.

UNDERSTANDING ELECTRONICS

Noise Generators

Noise is used as the basis of many musical effects, such as clapping and cymbal type sounds, and it can also be used to enhance effects which are based on tone generators. It also has applications as a control voltage source, particularly for random sample and hold note generation, and for modulation effects like thunder, etc. Probably most readers will be familiar with the 'hissing' of an FM radio off-station, but few people seem to understand just what electrical noise is, and how it can be generated.

Noise is really a randomly changing voltage, and it is not really possible to show a noise waveform in the same way as a sine-wave or squarewave signal can be shown as an oscillograph. If a large number of noise oscillographs were taken, due to the random nature of the signal, each one would be different. It is also difficult to show a noise signal as an oscillograph due to the very wide range of frequencies of which the signal is comprised. The most common type of noise is 'white noise', and this consists of all frequencies in equal amounts. As we shall see later, white noise can be filtered to produce various types of 'coloured' noise.

Simple Noise Generators

Special noise generating diodes are available, but are not very popular as they are quite expensive and require a fairly high supply voltage of around 22 volts. There are many other devices that can be used as noise generators, and Figure 1 shows a simple example of a zener diode noise generator.

Zener diodes are normally used as simple voltage stabilisers, but the output voltage does actually vary slightly and randomly, producing a good noise signal. Normally this noise signal is unwanted and is removed using a decoupling capacitor, but in this case the noise is coupled by C1 to a high gain common-emitter amplifier which utilises TR1. This gives a voltage gain of around 40dB, and boosts the output of the zener diode from around 10 millivolts peak to peak, to around 1 volt peak to peak. However, the signal level obtained will vary somewhat from one zener diode to another. Although a 5V6 zener is specified, the circuit will in fact work using any zener diode having an operating voltage of 6V8 or less.

There are alternative devices which can be employed in this circuit in place of the zener diode, and good results should be obtained using a germanium diode. These tend to have quite a significant reverse current flow, and the leakage current varies randomly from instant to instant giving the required noise signal. The output signal level is comparable to that obtained using a zener diode, but the noise generally has a noticeably less 'smooth' sound with some quite large voltage spikes present.

An excellent noise signal can be obtained using a germanium transistor. These tend to have significant leakage currents between

the collector and emitter terminals (with the base left unconnected), and this current again changes randomly from instant to instant, producing the noise signal. In the circuit of Figure 1, and assuming that the transistor used is a PNP type (OC72, OC81, etc.), the collector connects to the negative supply rail and the emitter is connected to the junction of C1 and R1. With an NPN type, such as an AC127, the connections should be reversed. The output signal level is again something in the region of 1 volt peak to peak. Note that silicon diodes and transistors will not work properly if used as described since these devices have extremely low leakage current, and consequently give very little noise output.

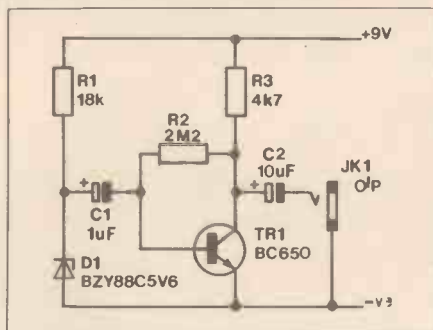


Figure 1. A simple noise generator.

It is possible to use a silicon transistor as a noise generator if the reverse base-emitter breakdown characteristic of the device is used to give a sort of zener diode action. Assuming that an NPN type (the BC650 is suitable) is used, the base connects to the negative supply rail and the emitter is connected to the junction of R1 and C1. The collector is left unconnected. A PNP device such as the 2N3702 can be used, but the connections to the base and emitter leads should then be reversed. The output signal level is generally a little higher than that obtained using a zener diode or germanium devices, but some silicon transistors have a reverse base-emitter breakdown voltage that is too high to permit operation on a 9 volt supply. However, using a supply potential of around 12 volts or so, any silicon transistor should operate properly in this circuit.

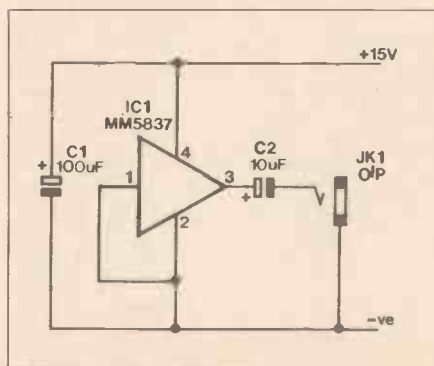


Figure 2. A simple digital noise generator.

Digital Noise

Noise can also be generated using digital techniques and the normal method used is to have a shift register clocked at about 30kHz with several outputs connected via Exclusive-OR gates to the Data input. Although the pattern repeats, using a shift register 18 stages in length allows a maximum pattern of $2^{18}-1$ states to be created. The signal can be tapped off the data input, decoupled and amplified.

National Semiconductor supply an IC which does all this on one chip, the MM5837. The circuit requires only two components to operate and is shown in Figure 2. C1 is a supply decoupling capacitor and C2 blocks the DC in the output signal. The output signal is a few volts peak to peak in amplitude.

Analogies are often made between noise and the visible light spectrum, and it is from this that the term 'white noise' is derived. Light at all frequencies in equal quantities gives white, uncoloured light. High frequency noise of around 6 to 20kHz is analogous to light at the blue end of the visible light spectrum, and could therefore be termed 'blue noise'. Similarly, noise at low frequencies in the region of 20 to 100Hz could be described as 'red noise', and middle frequency noise at frequencies of about 400Hz to 1kHz could be termed 'yellow noise'. However, only a rough analogy between audio frequency noise and the visible light spectrum can be drawn, since the latter covers a limited frequency range with the highest frequencies being less than double the lowest ones. The audio spectrum covers a span of about 20Hz to 20kHz, with the highest frequencies consequently about a thousand times higher in frequency than the lowest ones. This is, nevertheless, a convenient and useful way of describing filtered white noise of various types.

Pink Noise

The most common type of coloured noise is 'pink noise', and this has equal signal levels in octave bands. In other words, there is the same signal level between 20 and 40Hz as there is between 40 and 80Hz, 80 and 160Hz and so on. This obviously gives reduced signal level at high frequencies in comparison to white noise, where there is equal signal level in bands of equal width (e.g. 20 to 40Hz, 40 to 60Hz, 60 to 80Hz, and so on).

Pink noise can be produced from a white noise source using a filter having a 3dB per octave attenuation rate. This is a slightly awkward roll-off rate since the lowest rate attainable using straight forward CR filters is 6dB per octave. It is therefore necessary to use a filter of the type shown in Figure 3, where several capacitive elements are used, with a resistor in series with each of these. The resistors prevent each capacitor from reaching the ultimate 6dB per octave attenuation rate, and as one section of the unit becomes ineffective the next section takes over. The exception is the final section which uses C4 with no series resistor. Here, as the input frequency is increased, a roll-off rate of



Robert Penfold

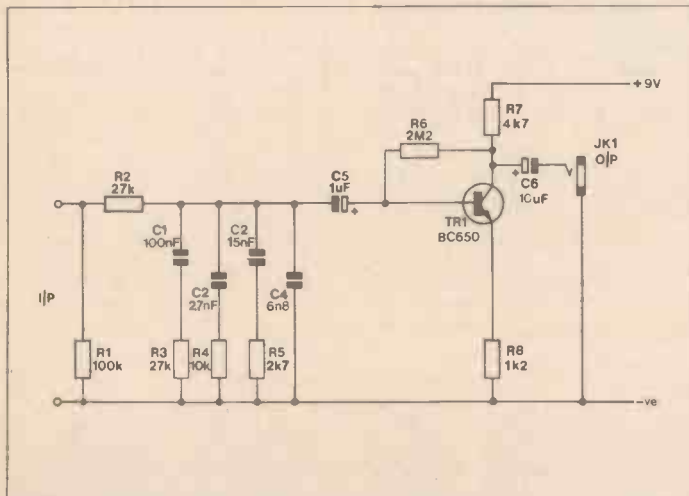


Figure 3. Circuit of white to pink noise converter.

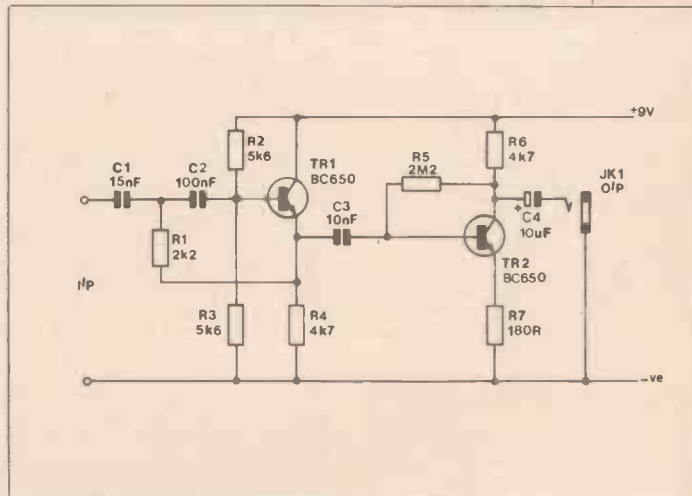


Figure 5. Circuit of white to blue noise converter.

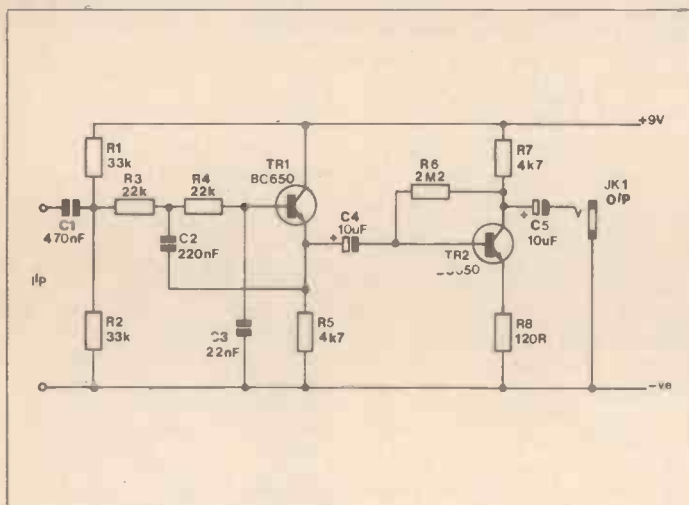


Figure 4. Circuit of white to red noise converter.

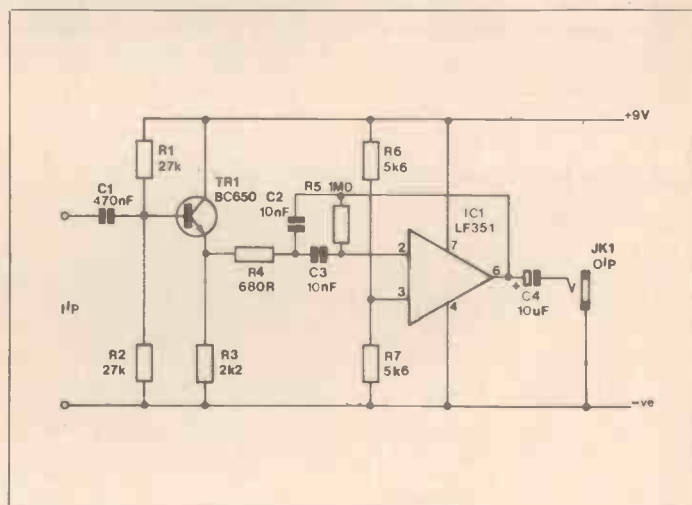


Figure 6. Circuit of white to yellow noise converter.

6dB per octave will eventually be produced, but only at frequencies above the upper limit of the audio spectrum. For this reason it would be superfluous to add a resistor in series with C4. Of course, a filter of this type does not give a perfect 3dB per octave slope, but it is more than adequate to give a good quality pink noise output.

TR1 is used in a simple common emitter amplifier which gives a small amount of voltage gain to compensate for losses through the filter. It also acts as a buffer amplifier which presents a high impedance load to the filter and gives a reasonably low output impedance.

Red Noise

Red noise can be produced by feeding a white noise source into a low pass filter having a fairly low cut-off frequency at about 100Hz. Low frequency noise of this type is useful as the basis of sea and wave type sounds.

The circuit of a white noise to red noise

converter is shown in Figure 4, and this is a straight forward two stage active filter having a roll-off rate of 12dB per octave. This is sufficient to ensure that high frequency input signals are attenuated to the point where they are unnoticeable. The cut-off frequency of the filter is approximately 125Hz, but this can be varied by altering the values of C2 and C3, with changes in the values of these components producing an inversely proportional change in the cut-off frequency. C2 should always be kept ten times the value of C3. TR2 is used as a common-emitter amplifier which makes up for the losses through the filter circuit.

Blue Noise

Blue noise can be produced from a white noise source using the filter circuit shown in Figure 5. This is a simple 12dB per octave active filter having a cut-off frequency of approximately 6kHz. This is, of course, a high pass type so that low frequency noise signals are attenuated and a high pitched 'hissing' sound is obtained from the circuit.

This type of noise can be used as the basis of cymbal type sounds and similar 'crashing' sounds.

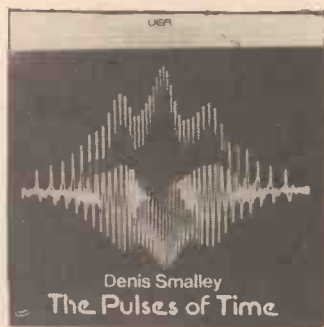
Yellow Noise

By filtering out a fairly narrow band of noise signals, especially if the frequency band is around the centre of the audio spectrum, it is possible to produce quite interesting and slightly weird sounds. Without any envelope shaping, noise of this type sounds rather like the howling sound of a gale.

Figure 6 shows the circuit of a simple filter which gives a yellow noise output from a white noise input. TR1 is merely an emitter follower buffer stage which ensures that the main filter circuit is fed from a suitably low source impedance. The filter is a straight-forward operational amplifier band-pass type with the circuit values chosen to give quite a narrow bandwidth with a peak response at about 700Hz. The centre frequency can be changed by altering the values of C2 and C3 and is inversely proportional to their value.

E&MM

RECORD REVIEWS



The Pulses of Time
Denis Smalley
UEA 81063

This album is an attempt to push the traditional boundaries of music a little further and belongs to the 'class' of musical family in which you will find Berio's 'Visage', Henri's 'Variations Pour Une Porte et Un Soupir' and much of Stockhausen ('Kontakte' and 'Tele-musik').

Side One consists of 'The Pulses of Time' which reflects differing approaches to the roles of pulses in time.

The pulses evident in the piece are those of metre and spacing of musical ideas. The sound sources are derived from the clavichord and various electronic metallic sounds including real and synthesised drumming and percussion.

The essence of all Smalley's work on this album is the exploration of the combination of various timbres in series contrasting with interludes of short silences or 'less busy' timbres through which the music ebbs and

flows. The pieces are, in fact, sound sculptures revolving around the processed sounds and harmonic spectrum of selected instruments and sound sources.

'Pentes' on Side Two evokes a sense of spaciousness (as suggested by the title) and most of the music was composed by transforming instrumental sounds. Halfway into the piece the almost untreated sound of the Northumbrian pipes drifts in, progresses through simple harmonies and emerges into a melody - the only 'tune' as such on the album.

Following 'Pentes' is 'Chanson de Geste' which was written for Carol Plantamura, soprano, and a founder member of the Centre of Creative and Performing Arts at the State University of New York. 'Chanson' was written to be performed live by solo female voice, a second subsidiary voice, clavichord, a pair of stones, a wooden ruler and a tuning fork. All the sounds are amplified by close miking. The role of the voice is to produce 'air contours' and the eventual slow enunciation of 'sound' and 'word'.

'Pentes', along with another of Smalley's works, won the Fylkingen Prize for electronic composition in Sweden in 1975.

The whole album is a fascinating insight into the work of Denis Smalley and the development of musical frontiers. Any music without a 'tune' needs to be listened to with a different attitude. Music and art, like everything else, must progress. This is one man's progression.

Computer Don't Breakdown

Don Slepian
Don & Judy Records

Do not be misled by the cover (it looks worse in colour) — this LP contains some very interesting music.

Don Slepian has been writing electronic music since the early 70's and is accomplished in the art as well as, having developed his own particular style. With a rather limited array of instruments (compared with some electro-musicians) he produces full, lush, symphonic, lyric and melodic compositions.

'Computer Breakdown' on side one has a blue-grass, hill-billy feel which, oddly enough, works.

The second track, 'Horizon' moves through three phases and is orchestrated in great manner using, among other instruments, the Yamaha CS-80 and Electric Grand Piano, RMI Electric Piano and Eventide Harmonizer.

The third track, 'Glimmerings' runs through a riff on an EML 400/401 sequencer and the fourth track, 'Judy's Rose' uses Judy Slepian's (Don's wife) voice in a loop as a sound source with the Korg PS-3100 synth.

All the pieces are more classical than pop orientated and Don's use of synth orchestration (notably the Korg PS-3100 and Alles Digital) in full, Synergy-like chords is masterful. The pieces are all melodic, well constructed, full of varying timbres and a delight to listen to.

Included in the review copy was a thin plastic sampler disc containing excerpts from Don & Judy's catalogue. Many tracks are of the 'meditational' or 'relaxing' music type which seems to be very popular in America (check out Steven Halpern



and his Anti-frantic Alternative).

Such music is not to everyone's taste and even those who play music to relax cannot always agree on the best type. Usually it refers to slow or tempo-less music often involving pentatonic/eastern patterns and simple harmonies.

Side two is 16 mins 38 secs of 'Sonic Perfume', an excerpt from a 60 minute piece called 'Sea of Bliss' available on cassette.

A notable example of modern, popular electro-music as this record is, some of sounds seemed, to me, to need harsh edges rounding off: an example, I feel, of how difficult it really is to 'humanise' the really rather cold, emotionless synthesiser. But, let this not detract at all from a record certainly worthy of inclusion in your electro-music collection. Don & Judy's records and catalogue are available direct from: Don & Judy, Box 836, Edison, N.J. 08818, USA.

"Life" and Other Games

Kevin Peek
ARL 5067

This is the second solo album from Kevin Peek, Sky guitarist, and shows certain developments in style and attitude towards his writing. He wrote most of the tracks himself and played synthesisers on some as well as guitar.

Obviously, the tracks are guitar-orientated and (perhaps it's imagination) they have a certain Sky quality about them. Since Kevin composed 'Hotta' and 'Sahara' as well as arranging 'Tocatta' it's not altogether surprising.

The whole record is very pleasant and easy to listen to; foot-tapping in places and you may find yourself rummaging the odd riff or beating out the rhythm with your hand. Other tracks such as 'Capricorn II' are slower and more lyrical with beautiful



classical-guitar playing over synthesised strings. Percussion by Tom Nichol is a perfect blend. Excellent drums on 'East of Suez'.

The recording is crystal clear; production perfect — as one would expect from such a team.

The LP concludes with an arrangement of the Hendrix classic, 'Hey Joe'. Comments, for or against, would be unjust but it is performed with Kevin's individual style — appreciate the artist and acknowledge a craftsman.

Superficial Music

Bernard Szajner
IRC 008

Superficial music which just tickled the surface of the mind, didn't tiresomely claim any deep emotion whether of grief or exaltation." This quotation on the cover from Graham Greene's 'Journey Without Maps' does not quite sum up the record. If this was really Szajner's aim then it must be said that he succeeds admirably for it conjures neither deep grief nor exaltation.

Without digging deeply into the intricacies of Greene, if, as appearances would suggest, the record title and quotation are to cover the broader notion of 'no emotional effect at all' then Szajner would seem to fail by definition for all music tends to have some agreeable or disagreeable effect upon the listener, however slight.

It is worth noting that Szajner invented the laser harp used by Jean-Michel Jarre on his 'Concerts In China' LP.

Side 1 consists of selected tapes from Szajner's 'Visions of Dune' played backwards at half speed and processed through various devices. A quaint notion, not entirely original and it certainly provides 17 minutes of intriguing, if relatively unentertaining, listening.

Side 2 is longer and sounds as if most of it was recorded 'forwards' but one cannot help but wonder if the 'musical/emotional' effect would have been any different had it been played backwards.

A strange LP after his mainly lyrical 'Some Deaths Take Forever', a step away from the 'popular' field and into 'experimental' effects.

Listen before buying.

Behind The Gardens — Behind The Wall — Under The Tree

Andreas Vollenweider
CBS 85545

These compositions, all by Vollenweider, are performed mainly on a modified harp. Other instruments include soprano saxophone, accordion, various guitars and Prophet and Oberheim synthesisers.

The tracks are all lyrical: easy, flowing chord changes; mellow timbres; soft percussion being very supportive — not dominating; an almost-latin rhythmic feel to some pieces and there are short snatches of vocal which are slightly reminiscent of Santana.

The whole album is in a similar style, very easy to listen to — none of the tracks particularly stand out from its neighbours; they all flow, one into the other, complimenting each other perfectly.



The style is relaxed, the music has a sense of space about it, almost pastoral, and the addition of thunderstorms and bird-songs enhances the effect. The synthesisers were, in fact, recorded in a field near Berne.

A warm, pleasant record, not earth-shattering but then it's not meant to be. Andreas Vollenweider, a dark-haired Harpo winks at you from the front cover.

Eye In The Sky

Alan Parsons Project
Arista LC 3484

This album is the sixth from the Project and it continues the concepts of the other albums by bringing songs together under a common theme. The themes are not always easy to categorise and often involve "something secretive and uncanny".

The album uses the Fairlight CMI programmed by Alan, and features such musicians as David Paton, Chris Rainbow, Lenny Zakatek and Elmer Gantry. Musical styles range from pop and rock to lush orchestral arrangements, some with classical under-tones.

It is difficult to arrange the albums in any order of preference — buy them all!



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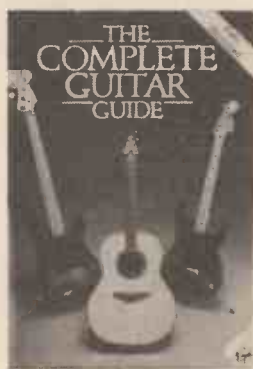
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BOOK REVIEWS

The Complete Guitar Guide
by David Lawrenson
Published by Virgin Books Ltd.
Price £4.95

The publishers of this book have tried to cram so much into its 200 pages that any reviewer could be forgiven a slight trace of scepticism when first approaching it. To cover all the material promised (which includes chapters on buying a guitar, looking after it once you've bought it, a discussion of amplification available, a look at how guitars are made, a section on vintage guitars, profiles of 26 guitarists, a guitar tutor plus reviews of all the guitars now available) this book would have to be some kind of paper-backed Tardis! Not surprisingly the resulting coverage isn't quite as complete as the title would have you believe.

But before going on to this book's glaring omissions it is only fair to say that it does have many good points. Its history section, though basic,



accurately traces the instrument's development taking in the pioneering days of Leo Fender and Les Paul and ending with a look at Japanese copies and customising. The advice on buying a guitar is sound and should insure the first-time buyer against any costly mistakes and the maintenance section contains all the card-

inal rules. Likewise the amplification, guitar-making and vintage guitar sections are perfectly adequate and, for the newcomer especially, they offer a useful and informative read.

It is when one comes to the "first ever analysis of all the guitar equipment available today, including acoustic, lead, bass and rhythm guitars" that the faults really begin to show. The first guitar I looked up was, naturally enough, my own — a Gibson Les Paul Standard. It's not even mentioned! A rapid thumbing through the lead section revealed that the entire new Vox range and the Ibanez Blazer, to give just two examples, are also neglected. In the acoustic section only one Martin is mentioned (the up-market 00028) and Fender acoustics may as well not exist. Bases fare no better with the superb Overwater 05957 conspicuous by its absence. Having said that the guitars that are mentioned (19 acoustic, 62 lead, 35 bass) are given excellent one-page illustrated re-

views and are rated for construction, finish, sound, playability and value for money.

In short then this is a very selective list and to give the impression that it contains "all the guitar equipment available today" is either a very foolish mistake or a pretty contemptible marketing ploy on the part of the publishers. I can see people reading the cover and paying out for what they think is a fully comprehensive list only to be very disappointed. If you are looking for such a list I would definitely warn against buying this book.

If, on the other hand, you are a newcomer to guitars and need some basic guidelines on what to look out for then this book could be for you. There's even a short beginners lesson teaching tuning, six basic chords and barre technique at the back.

At £4.95 the choice is yours, but don't take the title too seriously.
Alan Hardman

Servicing Radio Hi-Fi and TV Equipment
by G. J. King
Published by Newnes
Technical Books
Price £6.95

Gordon King is a prolific (indeed formidable) author and magazine contributor and, moreover, what he writes is always cogent, down to earth, and above all, readable, though it does seem a little dry at times in comparison to the slapstick sagacity of Steve Dove *et al.* This book is the third edition of a classic first published 16 years ago under the title 'Rapid Servicing of Transistor Equipment'.

Although the author assumes an elementary knowledge of electronics and goes on to discuss transistor fundamentals in the first two chapters, he then very laudably hits the nail on the head with the statement: "It is possible to trace faults in transistor circuits without any knowledge of how the device works." At this point, there arises a bizarre irony, because readers who have already begun to find their way around hideous masses of wires and coloured plastic boxes, using intuitive, magical and lateral modes of thinking, will either not require this book at all (because they feel experience is the

best teacher), or they will be the book's greatest advocate because of its ability to provide inspiration or a different (i.e. logical) direction when intuitive 'hunches' have failed to find the fault. On the other hand, if your approach is strictly logical and methodical, any book of this kind won't be of much assistance, unless, as a skilled engineer you possess habitual dexterity at perceiving all circuits in terms of first principles; a situation which arises because most of the circuits in this book (as in most) are out of date, have little or no direct relevance to equipment used by electro-musicians, and again, because it's obviously unfeasible to present even a fraction of the myriad of circuit configurations, and, like any worthwhile book, it will only help ardent and obsessed neophytes.

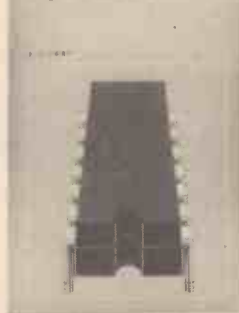
Nevertheless, this book's quintessential reference to all who delve inside electro-musical equipment; but don't borrow it from a library because it's the sort of book that will gather dust until repairs are desperately called for at 1.00 a.m. on a Sunday morning. When you do need it, it will be a godsend.

At £6.95, being approximately the price of an hour's labour, this book need only shortcut one probing session by one hour to pay for itself. And whatever this book's practical short-

comings in relation to synths, amplifiers and mixers, no other book, to my knowledge, tackles these topics adequately, and these are just the specialised, practical areas that E&MM's Electro-Music-Engineer articles can cast light upon.

Ben Duncan

How to Use Op Amps



How to Use Op-Amps
by E. A. Parr
Published by Babani
Price £2.25

For the modern electro-musician, an understanding of op-amp behaviour and a knowledge of the op-amp's role as the basic building

block within almost all audio and musical analogue (i.e. non-digital) circuits and systems is of paramount value. 'How To Use Op-Amps' isn't the most profound survey of this topic on the market, but it is highly readable, comprehensible to a determined beginner, broad in its coverage, and above all, filled with a host of quintessential (and practical) circuits relevant to sound engineers and musicians. The book also contains shortform data on most commonly encountered op-amps (with the notable exception of the NE5534) and a chapter on power supplies. All who construct E&MM projects should consider this book an invaluable source for ideas, and a guide to project debugging.

Ben Duncan

Loudspeaker Catalogue
Published by Wilmslow Audio Ltd
Price £1.50

Wilmslow Audio Ltd have long been known for their expansive range of audio loudspeakers. Their new 84 page catalogue/databook is packed with useful information about speakers, cabinet designs, crossover networks and related design equations.

The catalogue is available from Wilmslow Audio Ltd., 35/39 Church St., Wilmslow, Cheshire SK9 1AS.

Organ Registrations & Techniques

by Roy Neal
Published by Sceptre Publishers
Price £6.50

This book follows on the heels of Roy Neal's highly successful first book, 'The Magic of the Organ'. The magic expounded in this new 1982 publication is described by its title but the text covers much more than it suggests.

The author's style of writing is pleasant, witty and interesting and an eminently readable typeface has been used throughout the book. These factors made the careful reading required in reviewing this volume a distinct pleasure.

It would be only too easy to write in a dry and dusty manner in covering such a title but Roy Neal holds the

reader's interests completely by his easy and informative style.

The opening chapters cover the development of pipe and electronic organs. Though somewhat academic, these set the scene for the remainder of the book. Waveforms, overtones and modulation are discussed before the author turns to orchestral instruments and the synthesisers, emphasising harmonic content and characteristics as an aid to registration.

The next section of the book is a valuable one, devoted to keyboard technique. Useful points emerge as Roy Neal deals with memorising, improvisation, chord harmony and counter-melody.

The final chapters look at the life histories of three well known organists: Christopher Dearnley, Len Rawle and Keith Beckingham, and describes their individual techniques at



their consoles.

I am bound to point out two small but misleading errors that escaped

the proof-reader — and leave you to ponder on these statements: 'A flue pipe 8' tall will sound a note the equivalent of the piano's middle C' and, dealing with Hammond tone-wheels, 'A wheel with 8 teeth was revolved by an electric motor at a speed that produced a C note. Another wheel of 16 teeth ... to provide another C note one octave lower in pitch; and one with 32 teeth to sound yet another C a further octave below.'

Otherwise, the advice offered is both sound and useful. I can recommend this neat hardback book to those wishing to immerse themselves in the art of organ playing, guided by an author with a wealth of experience in playing and teaching.

Ken Lenton-Smith

Yamaha Professional System Effectors



The new Yamaha PSE, 'Professional System Effectors', range provides the musician with a very versatile signal processing system. The range includes ten effect units, a 'mini-pedal', noise gate, line selector and two flight cases with integral power supplies and patching options.

Each pedal is housed in a smart black diecast box with a large rubber pad covering the base to prevent the pedal slipping under pressure. The supply, provided by a standard PP3 battery, is connected when a jack is inserted into the input socket.

Effect 'on' is indicated by an illuminated LED situated above the input socket. The footswitch, which has been custom designed for the range, inspires confidence in operation as do the controls which are smooth, well positioned with clear legends.

A short description follows, covering each of the units in turn.

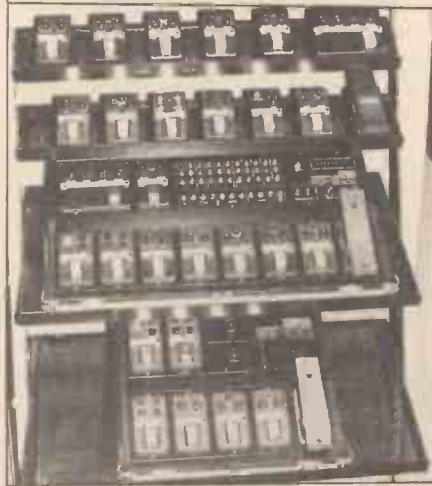
Phaser

The Phaser creates a pleasant 'cyclic' effect similar to that produced by a rotating speaker. Two controls are provided, these are *Speed*, which varies the rate of the phase shifting effect from one cycle every five seconds to ten cycles per second, and *Depth* which controls the range of the effect.

With no signal present there is no noticeable breakthrough of any phased noise from the circuit, an important point to consider with high power PA systems.

Chorus

The Chorus unit uses a custom bucket-brigade delay line to slightly modulate the pitch of the input. When this is re-mixed with the original signal, a rich moving texture is produced. This is similar in effect to several identical instruments playing the same note. The two parameters which can be adjusted are the *Speed* and *Depth* of the triangle wave modulation. The speed ranges from one



The complete range of Yamaha Effectors.

cycle every three seconds to eight cycles per second. There is the option of a second output for stereo systems and this increases the effect dramatically as the signal appears to move across the stereo field. Some of the high frequency content of the input signal is removed when the unit is switched in, but this is inevitable due to the circuitry employed.

Flanger

The Flanger also uses a bucket-brigade chain to delay the input signal. When this signal is fed back to the input and mixed with the incoming signal an infinite series of notches are created in the frequency spectrum of the output. Audibly, the effect is similar to phasing but with a much deeper, metallic tone colouration. The Flanger has four controls: *Manual*, which sets the centre point of the comb filter, *Feedback* which increases the peaks and troughs of the comb (the same effect as resonance on a synthe-

siser filter), and the modulation controls, *Speed*, which varies the rate of modulation from one cycle every ten seconds to ten cycles every second, and *Depth* which controls the range of the modulation.

There is no apparent 'click' when the footswitch is operated and with no input signal the circuit is virtually noiseless. Care must be taken, however, with the settings. When the *Feedback* control is advanced past seven on a scale of zero to ten, and the *Manual* frequency control is in the low ranges, self oscillation occurs which can reach a maximum of one volt peak-to-peak. This can be used to great effect to create some penetrating sounds, but can become a bit overpowering.

Although this unit was designed (like all the effects) for the guitarist, it must be one of the most compact and effective flangers available and works equally well on other instruments.

Octaver

The Octaver produces a signal one octave below the input. The input signal is 'squared-off' and then digitally divided by two. This signal is used to 'chop' the input, creating the octave below with similar tonal characteristics.

Three controls are provided, a *Direct* level, an *Effect* level and a polarity switch which inverts the effect waveform. Since the circuit must lock on to the fundamental of the incoming signal, only single notes can be played through the Octaver. This waveform must be as 'clean' as possible, so the Octaver should be the first in line if a chain of effect pedals are used. When the input drops below about 6mV, the unit can no longer determine the fundamental and produces the same output from *Direct* and *Effect* outputs, however, in normal use this action is not obtrusive as it takes place at the very end of the signal decay.

The unit works very well, producing a 'thick' bassy sound when used with guitar in the low and middle ranges and a powerful solo sound when played 'up the neck'.

Distortion

The Distortion circuit amplifies and 'clips' the input signal. This 'squared-off' signal then passes through a tone network to remove some of the higher harmonics. The three parameters which can be adjusted are: *Distortion*, which sets the level at which the signal is clipped; *Tone*, which ranges *Soft* to *Hard* and *Output* level.

Using both the Distortion and Tone in combination allows a large range of effects to be set, from soft 'fuzz' to a real Heavy Metal overload!



The SB200 stage board in use.

Effects Common Specifications

| | |
|-------------------------|-----------------|
| Input Impedance | 1M |
| Output Impedance | 1k-20k |
| Noise Level (0dB=775mV) | -85dB to -100dB |
| Dimensions | 70 x 65 x 125mm |

Yamaha Effectors

Tone Booster

The *Tone Booster* circuit consists of a pre-amp, tone control network and an output amplifier. There are four controls: *Bass* which provides +5dB/Oct boost and -8dB/Oct cut at 100Hz; *Treble* which provides +5dB/Oct boost and -7dB/Oct cut at 2KHz; *Gain* which has a maximum setting of 41dB, and *Output Level*.

Circuit noise is noticeable with no input signal present if the Gain and Treble are both set at maximum, so these controls should be used carefully.

Parametric Equaliser

The Equaliser is basically a band-pass or band-stop (notch) filter. The three parameters which can be adjusted are: *Gain*, which can be set to ± 18 dB; *Frequency* which controls the centre frequency of the band, ranging from 110Hz to 3.8kHz; and *Band-Width* which controls the resonance or 'sharpness' of the band. When the Gain is positive the equaliser has a band-pass characteristic, and when negative it has a band-stop characteristic. (The band-stop mode can be used to prevent acoustic feedback by filtering the related harmonics.)

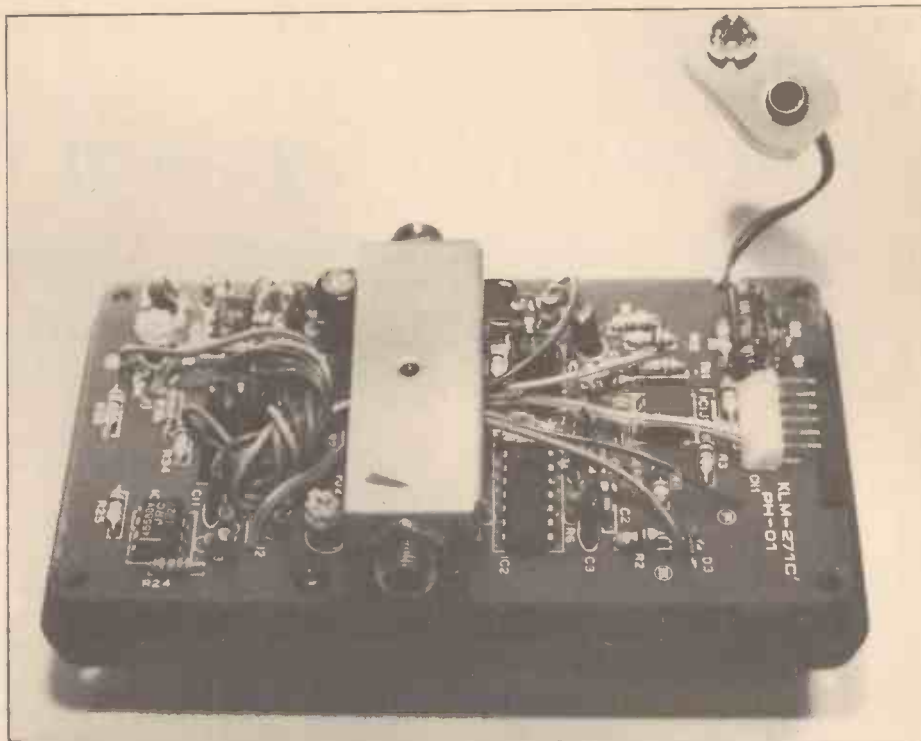
When used with the system board, the centre frequency can be controlled by a voltage from the 'Mini-Pedal' providing a sophisticated wah-wah.

Care must be taken when setting the equaliser. When the Gain is at full boost and the Band-Width set at maximum, circuit noise is noticeable with no input signal present. Operating the footswitch at these settings also tends to make the filter 'pop'.

Compressor

The Compressor uses a current-controlled amplifier to boost small signals and to attenuate large ones, thereby reducing the dynamic range. Three controls are provided: *Sensitivity*, which controls the rate of the Compressor action; *Output Level* and a switch to select between two Attack characteristics. The second position is used to emphasise the initial attack, useful for finger-picking.

The Compressor can, therefore, be used to limit excessive signal levels and to provide a measure of sustain to decaying signals.



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Depth, Feedback,
Manual



**OCTAVER
OC-01**
Functions: Effect
Level, Direct Level,
Polarity SW(A/B)



**DISTORTION
DI-01**
Functions: Tone,
Distortion, Out Level



**TONE BOOSTER
TB-01**
Functions: Treble,
Bass, Gain, Out Level



**PARAMETRIC EQ
PE-01**
Functions: Band-Width,
Frequency, Gain



**COMPRESSOR
CO-01**
Functions: Sensitivity,
Out Level, Attack SW
(1, 2)



**LIMITER
LI-01**
Functions: Release
Time, Threshold,
Out Level



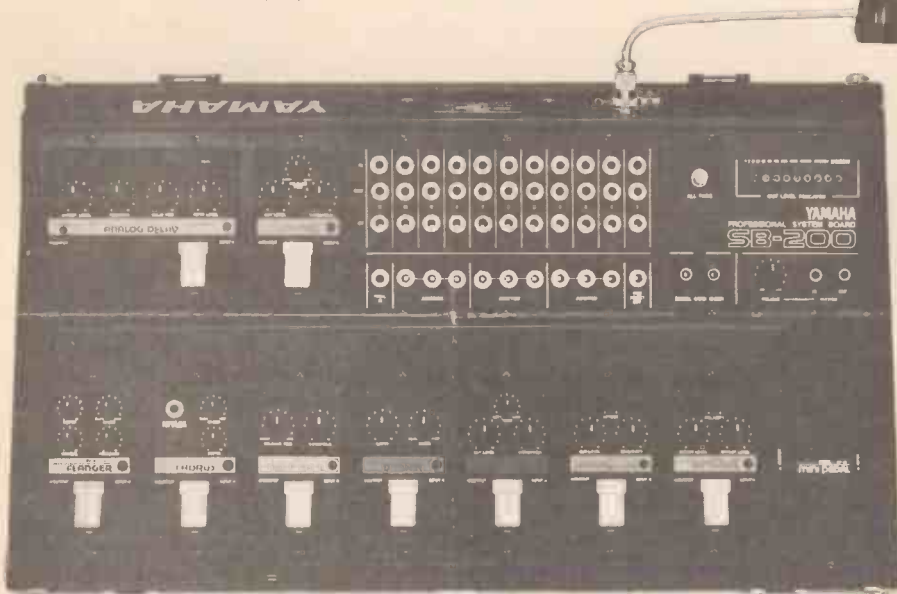
**NOISE GATE
NG-01**
Functions: Threshold
Release Time



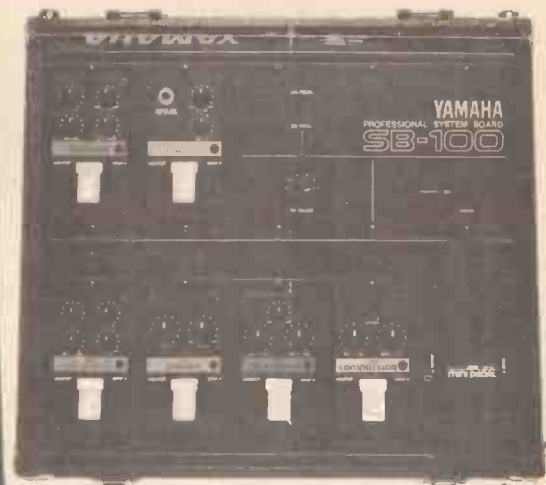
**LINE SELECTOR
LS-01**
Functions: SEND 1, 2
Return 1, 2



**MINI PEDAL
MP-01**
Functions: Pedal
Volume, Sub Volume



PROFESSIONAL SYSTEM BOARD SB-200
Functions:
Front Panel: Out Level Indicator, All Pass SW., Phones In,
Phones Out, Phone Volume, Signal Cord Check
Patch Panel: In, Out, CV, Inst Direct Out, Final In, Junction
Rear Panel: Panel Light Connector



**PROFESSIONAL SYSTEM BOARD
SB-100**
Functions: Pedal Function SW,
CV Selector SW



**ANALOG DELAY
AD-10**
Functions: Input Level, Delay Time,
Feedback, Effect Level,
Peak Indicator, Power Indicator



Yamaha Musical Instruments, Kemble-Yamaha, Mount Avenue,
Bletchley, Milton Keynes MK1 1JE, Bucks. Tel: (0908) 71771.

Please send me details of my nearest Yamaha effectors stockist, and my free colour poster. **

Name _____
Address _____

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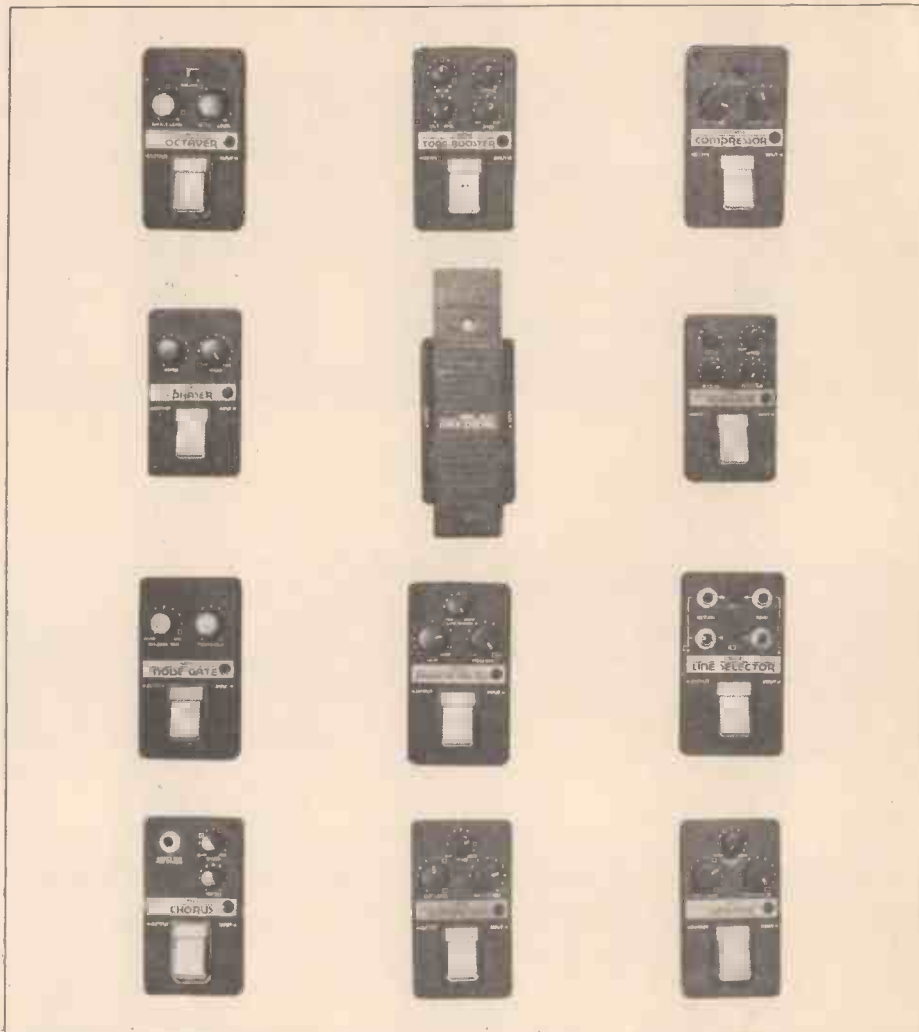
Yamaha Effectors Complete Systems

Two system boards are available to complete the range. The SB100 will hold seven single size PSE units or six standard units with the Analog Delay which takes up two positions. The board is housed in a strong rexine covered case with a detachable lid. The case contains an integral mains supply to power the fitted units. To install an effect, the four screws securing each box are removed and the circuit with the top panel is fitted to a special plate which screws on to the board. The power and signal connections are made via a moulded connector fitted inside each effect box. In normal use the effects are connected in order, from the right bottom row, to the left top row. However, the order of effects can be re-routed internally. A feature provided is the facility to control the parameters of several of the effect units with a control voltage. This voltage is derived from the *Mini-Pedal* and can be assigned to one of the other six positions.

The SB200 board accepts up to eleven single size PSE units and allows the connection order to be rerouted externally. There are ¼" jack sockets for *In*, *Out* and *CV* for each of the eleven positions. If no jacks are inserted the order of connection is the same as for the SB100. Using this arrangement, re-routing of effects can be done quickly and easily on stage with patch cords.

A *Mini-Pedal* can be put in any of the eleven positions and the control voltage from the respective jack can be patched into the *CV* input of the required effect. The effects which can be voltage-controlled and the parameters varied are as follows: the *Manual* frequency of the Flanger, the *Delay Time* of the Analog Delay and the *Frequency* of the Parametric EQ.

Other important features include three patch junctions, an instrument direct out-



Summary

| Unit | Order Ref. | Retail Price (inc. VAT) | Comments |
|----------------|------------|-------------------------|--|
| Phaser | PH-01 | £52 | Works satisfactorily, but lacks depth compared with other makes. |
| Chorus | CH-01 | £64 | Best depth of effect in mono but for the rich thickening effect, which is the more usual application, it needs the dual output offered. |
| Flanger | FL-01 | £78 | This one's a winner and for its compact size offers a wide range of flanging effects. |
| Analogue Delay | AD-10 | £179 | — |
| Octaver | OC-01 | £58 | A very good, if not the best, octave unit we've come across, following the guitar signal well. |
| Distortion | DI-01 | £44 | A superior design with a useful soft to hard range. |
| Tone Booster | TB-01 | £45 | This comparatively expensive unit will be a useful extension to any guitar's tone controls. |
| Parametric EQ | PE-01 | £64 | A nice filter effect unit that is useful for removing hum, noise or feedback on wide bandwidth and picks out harmonics at sharp bandwidth. With the <i>Mini-Pedal</i> in the system board as a <i>CV</i> source, it turns into a great wah effect. |
| Line Selector | LS-01 | £54 | Active unit with low noise. High priced, but professional. |
| Mini Pedal | MP-01 | £55 | Don't buy this unless you plan to get a system board, since it tips over too easily when used freestanding, due to the small area of the base. |
| System Board | SB-100 | £299 | This basic case comes with detachable lid, built-in power supply and <i>CV</i> feature, but nothing more. |
| System Board | SB-200 | £499 | This has to be the unit for the serious professional as it allows the optimum choice of patching and units. |

put, a *'Final In'* which disconnects the selected chain when a jack is inserted, a *'Signal Cord Check'* circuit which lights an LED with an in-circuit lead, an *'All pass'* footswitch which disconnects the effect chain selected (this function operates automatically if the mains supply to the board disappears for some reason — useful in preventing an embarrassing silence!), a headphone output with an external input and a bargraph LED output level indicator.

The SB200 is also mounted in a rugged flight case with detachable lid and comes with a gooseneck panel light for on-stage setting or patching changes.

Conclusions

Yamaha have obviously put a lot of thought into the design of this system. Each pedal is extremely well made, combining mechanical strength, high quality signal processing and clear functional labelling.

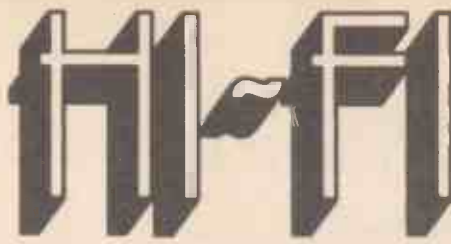
The range of effects covers almost every possible way to modify an instrument signal. The system boards are a novel concept with their patching and *CV* options and provide a reliable, versatile pedal set-up for stage use.

The system is designed with complementing impedance matching and little increase in background noise, an important consideration when building up an effects range.

You could buy one effect at a time and eventually fit them into a system board. A complete system will cost you over £1,000, but no doubt the pro musician will consider it worth every penny!

E&MM

Kenneth McAlpine
Alan Hardman



Tape Bias & Overloading

Jeff Macaulay

Cassette machines have come a long way since I first had one in 1967. In fact, my first taste of 'hi-fi' was via this mono machine playing a stereo music-cassette of Pepper through a mono wired pair of stereo headphones! However, to come back to the present, although there are a large number of models to choose from, very little gets written about tape machines compared say to pickup cartridges. This is a pity since many of our readers, being musicians, will use their cassette decks for live recording.

If you lift the cover of your cassette player you will see the heads. Incidentally, although it should be self-evident, no tape machine will work to its full potential if these are not cleaned regularly. Nor, I hasten to say, should they be cleaned with 'Duraglit' as an acquaintance of mine once did! Proprietary fluid or WD40 should be used, applied gently with a cotton bud.

A tape recorder works by converting the incoming signal to a varying magnetic field across the gap in the record head. As the tape passes its magnetic coating stores the signal. On replay the small magnetic variations left on the tape by the recording head are recovered and amplified by the internal electronics. The output signal from the replay head though is very small — about the magnitude of some moving-coil cartridges' output. All would be well if the transfer characteristics of magnetic tape were linear but it isn't. Moreover, for good results the tape head recording gap needs to be very small. The reason is that at high frequencies the gap becomes comparable in size with the magnetic particles of the tape itself.

For cassette players the problems are multiplied by the relatively slow speed of the tape. A good reel-to-reel recorder operating at high speed will have a much better top response due to the fact that more particles are passing the head every second. Figure 1a shows what happens when a magnetic field is applied to a tape. Note that this transfer curve is far from linear. To overcome the severe distortion that would result if audio were to be simply fed to the head, bias is employed. In early machines the biasing was accomplished by means of a permanent magnet as was tape erasure. These days though a high frequency bias signal is used. What actually gets on to the tape is a composite signal with the audio riding on top of the bias signal (Figure 1b). In this way the signal is applied to the more or less linear portion of the transfer characteristic.

Because this signal is ultrasonic it cannot be directly accommodated by the tape and doesn't actually get recorded. The bias is also used to erase the tape. Often the inductance of the erase head is used as part of the bias oscillator circuit. When erasing, the *hf* jumbles the magnetic particles up in a random manner. When recording, the tape is passed in front of the erase head before the recording head thus removing the previous recording. The recording head needs to be fed with current in order to magnetise the tape. However, the head is largely an inductive load. This means that its impedance rises with increasing frequency. In

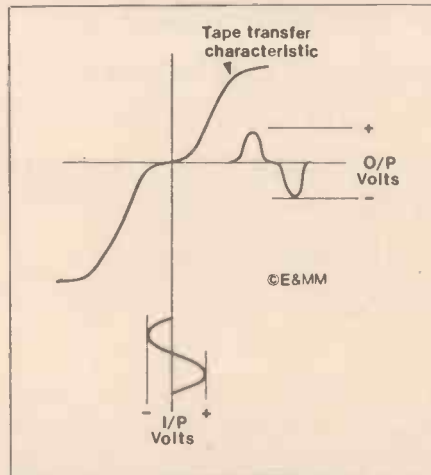


Figure 1(a). Tape transfer characteristic — without bias the signal is distorted.

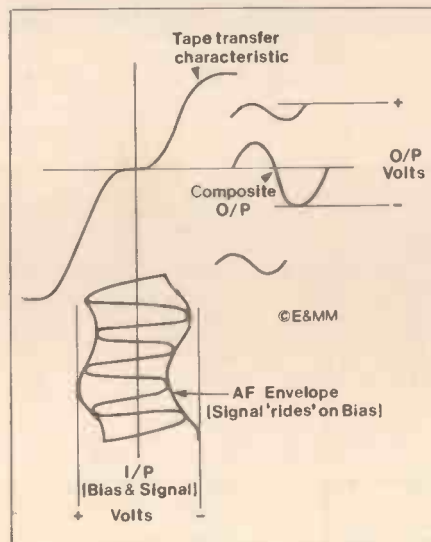


Figure 1(b). Here, the signal 'rides' on top of the *hf* bias, and an undistorted output results.

order to maintain the flux the head has to be supplied with constant current drive. In the days of valves this was easily obtained by feeding the head from the anode via a large resistor. This worked because the high supply voltages used with these amplifiers meant a nearly equally large signal swing.

Nowadays, as often as not, the head is included within the feedback loop of the record amplifier to provide the necessary drive. The internal pre-amp and playback

amplifiers also use equalisation to reduce noise and maintain a flat response. The record amp has treble pre-emphasis built in whilst the playback amplifier provides de-emphasis.

As you can imagine, every different tape formulation has a unique transfer characteristic and so the amount of bias used is critical. Too much bias and the treble becomes recessed; too little and the treble is emphasised at the expense of both the bass and mid range. Ideally, you will find a bias control on your cassette deck to enable different tapes to be used.

Finally, perhaps a word about what happens when the tape is overloaded. It is important that the playback amps do not clip before the tape saturates. Tape saturation is a comparatively gentle process akin to soft-limiting without generating large amounts of high-order harmonic distortions. Figure 2 shows the effect on the replay frequency response as signal level is varied. Note the early fall of the top response as signal level increases. Indeed, this is the most damaging effect of increasing signal, and is known as *hf compression*.

Unfortunately, it does not follow that the more expensive the tape you buy the better your recording. So much depends on the way the machine has been set up. For serious recording therefore, get a machine with *variable biasing* and invest in a test oscillator to set it up properly. At least this way you will be assured of the best possible results whichever tape is used. If your machine lacks this feature the best that can be done is to try the various tape types until you find one with the best response for *your* machine.

Live recording is a creative process which suffers somewhat from the constraints of the cassette medium. In particular, splicing a cassette is, to say the least, hit and miss. A good mixer is a must unless one is addicted to very simple mixing techniques. Ideally a compander should be used (see E&MM May 1981 'Noise reduction unit') as this will allow a recording to be made which will not lurch uneasily between being drowned in noise and overload distortion. Much of the poor reputation of cassette decks in the hi-fi sense is due to inadequate care in the recording process. Another cause is poor maintenance. Tape dropout, wow, flutter and *hf* loss are more often due to wear, or the accumulation of dirt and grease on the heads and pinch wheel than any serious shortcoming of the equipment. Purists advocate the cleaning of these parts before every recording but they should be attended to at least once a week.

E&MM

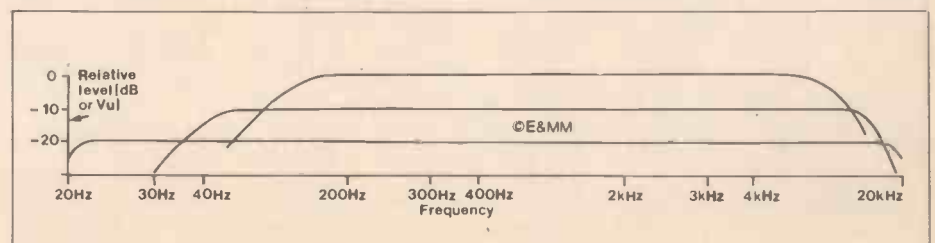


Figure 2. Frequency response v. recording level — graph shows *hf* compression.

up. C2 and C3 decouple the supply rails and C4 removes any DC bias at the amplifier output. (The polarity of C4 is not important — the DC bias may be positive or negative depending on the individual op-amp, but it will always be of such small voltage that wrong polarity will not affect the operation of the circuit nor will it damage the capacitor).

RV2 is the level control, with R2-5 and RV1 forming the pan network which feeds the two mixing busses.

Output Amp

The output stage is shown in Figure 1b. This is an inverting amplifier, similar to that in the channel inputs, which sums the signals present on its buss. RV2 adjusts the output level. The action of this amplifier causes the mixing busses to be 'virtual earths'. This means that the amplifier is in effect current operated. No signal voltage will be measurable on the buss lines because there is none, a point worth remembering if you are checking with an oscilloscope!

Power Supply

The mixer requires +15, 0, -15 volts at about 50mA. You may well have a suitable power supply available; if not, the one described will supply several mixers.

The circuit, see Figure 5, is a standard bridge rectifier/smoothing arrangement supplying three terminal fixed voltage regulators. You may notice that two separate bridge rectifiers are used where one would suffice; this is because two separate PCB's are used for the + and - rails. These are standard Maplin items (YQ40T, YQ41U), obtainable from Maplin Electronic Supplies, P.O. Box 3, Rayleigh, Essex SS6 8LR. The regulators do not require heatsinks. R1 provides a degree of earthing of the OV rail whilst avoiding the possibility of earth loops when the mixer is used in conjunction with other equipment that is earthed. Refer to the component numbering list for the values of components used on the PSU PCB's. The identifier numbers correspond with those printed on the PCB's.

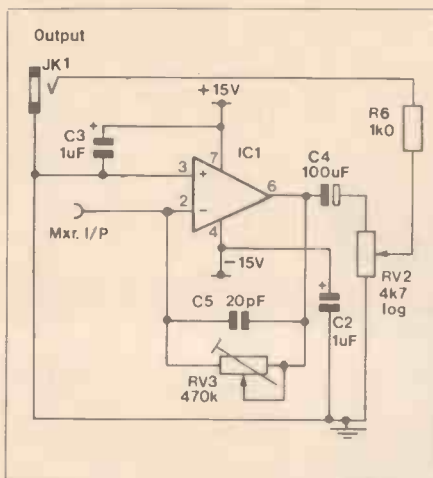


Figure 1b. Circuit diagram of output stage

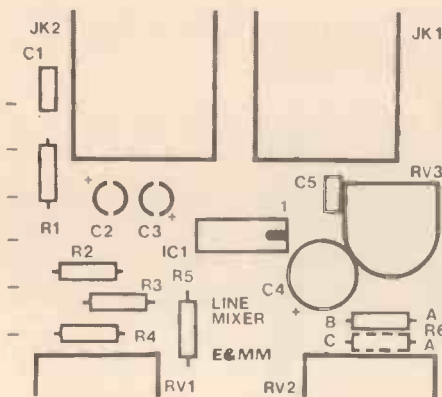


Figure 3. PCB circuit overlay.

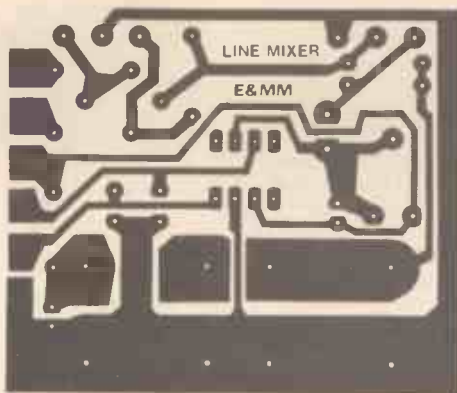


Figure 4. PCB track layout.

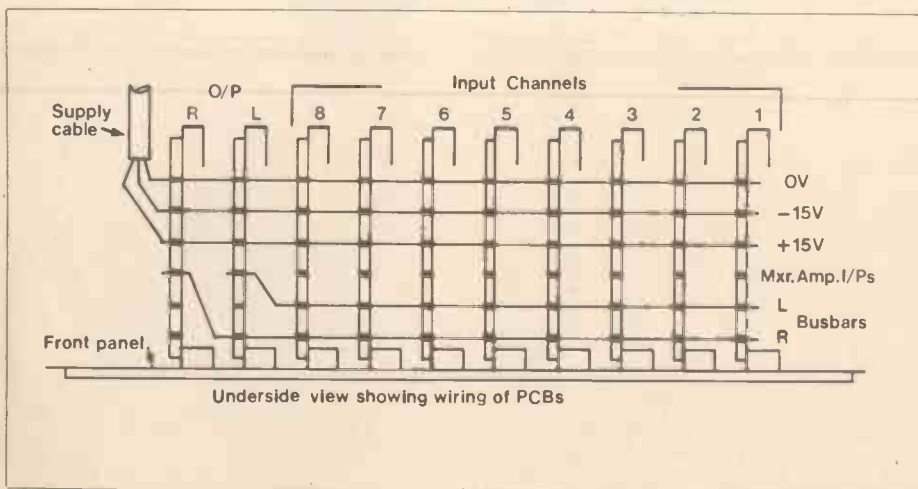


Figure 2. Board connection diagram.

'Audioconn' connectors have been specified for the output connection since they are very reliable and provide a solid flex grip, but these could of course be replaced by DIN connectors to keep expense to a minimum.

Construction

Assembly is straightforward and should present no problem if care is taken with polarised components and semiconductors. Cut the pot shafts before mounting to the PCB's.

The PCB's used for the input and output stages are identical. However, eight of these are configured as inputs and two as outputs. When assembling as an input stage, all of the components are inserted and soldered. R6 should be fitted across AB, see Figure 3. When assembling as an output stage, omit the components R1-5, RV1, C1 and JK2. R6 should be fitted across AC.

Once the PCB's have been assembled, they can be mounted on the front panel. The boards are interconnected as shown in Figure 2. (The boards supplied by E&MM do not have the interconnection slots made, so it is advisable to cut these with a small hacksaw or file before mounting them, on the panel). If the mixer is to be mounted in a rack or similar enclosure, then bare tinned wire may be used to connect the boards. If the mixer is to be used as a free standing unit, then sleeving should be used to insulate the supply and busbar wires.

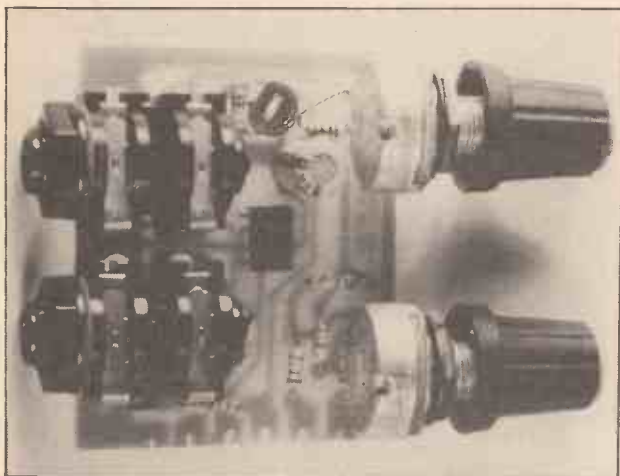
Finally, fit the power supply lead to the ends of the +15V, OV and -15V wires. The spare holes on the output stage can be used to grip the supply cable with a nylon tie.

Testing

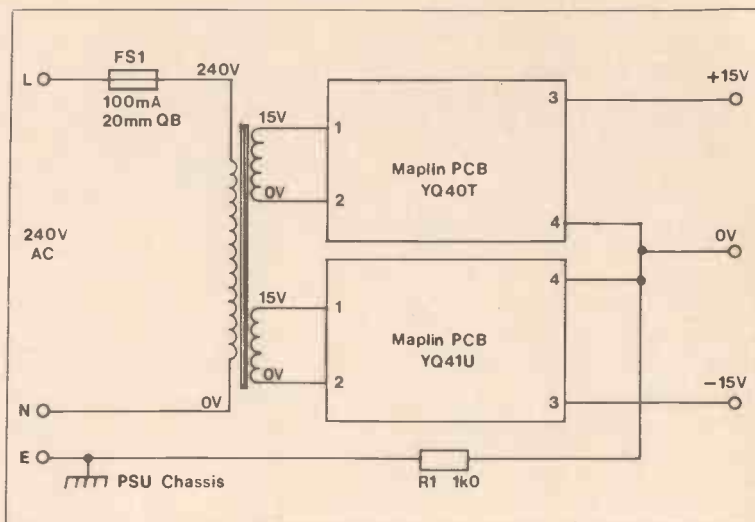
It is unlikely that there will be any problems, but if there are, it should be possible to check through the system with a signal source and an amplifier. Check each channel individually by inputting a signal and checking that it is returned through the foldback output. (Make sure the gain preset is not set to zero!) When the output amplifiers are operating correctly, no signal will be measurable on the mixing busses. (This was explained earlier). If the mixer does not operate first time, switch off and check for dry joints and solder bridges. Then check that electrolytic capacitors have been inserted with the correct polarity, IC's are correctly orientated and power supply is not reversed.

With the mixer operating correctly, the gain presets can be adjusted to suit the equipment you are using. Try to keep the levels on the busses fairly high as this means less gain will be required on the output amplifiers, minimising hum pickup on the busses. If hum is a real problem even when the mixer is mounted in the rack, an aluminium panel connected to OV mounted under the busses will help. Connecting the front panel to OV will also offer an improvement.

8201 Line Mixer



The input stage PCB.



Suggested power supply connection diagram.

PARTS LIST FOR 8201 MIXER

Resistors — all 5% 1/2W carbon unless specified.

| | | |
|--------|--------------------------------|--------|
| R1,3,5 | 47k | 24 off |
| R2,4 | 220k | 16 off |
| R6 | 1k | 10 off |
| RV1 | 47k Lin Pot | 8 off |
| RV2 | 4k7 Log Pot | 10 off |
| RV3 | 470k sub-min horizontal preset | 10 off |

| Capacitors | | |
|------------|--------------------------|--------|
| C1 | 100p ceramic | 8 off |
| C2,3 | 1u 35V tantalum | 20 off |
| C4 | 100u 25V electrolytic PC | 10 off |
| C5 | 22p ceramic | 10 off |

| Semiconductors | | |
|----------------|--------|--------|
| IC1 | LF351N | 10 off |

| Miscellaneous | | |
|---------------|-------------------------------|--------|
| JK1-2 | 1/4" Mono Jack Socket Moulded | 18 off |
| | PCB | 10 off |
| | Knobs and caps to suit | 18 off |
| | Front panel | |
| | Letraset | |

All the parts are readily available from most component suppliers except for the PCB, which can be purchased direct from E&MM, 282 London Road, Westcliff-on-Sea, Essex SS0 7JG at a cost of £1.30 including post, packing and VAT. Please order as: 8201 Mixer PCB. Special Offer: complete set of 10 PCBs price £11.50 inc. P&P and VAT. Order as 8201 PCB Set. (Allow 21 days for delivery.)

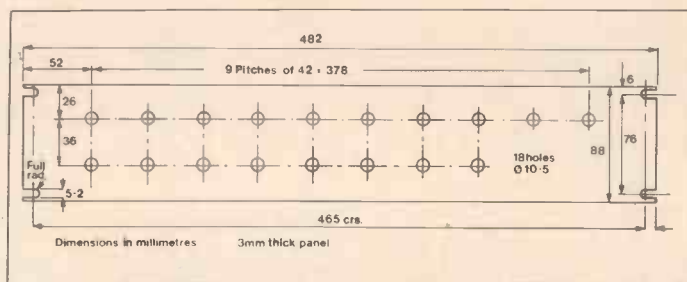
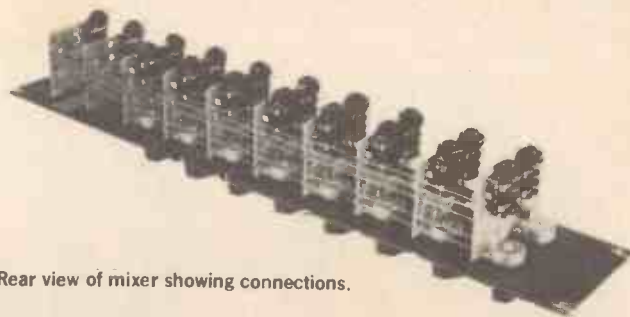


Figure 6. Front panel drilling detail.

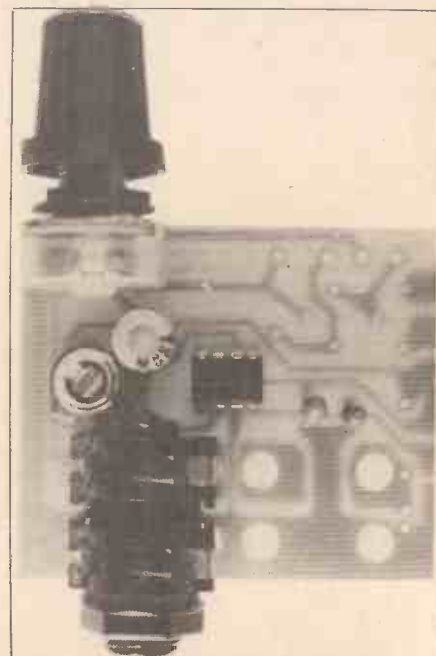


Rear view of mixer showing connections.

Parts List For Suggested PSU

| Resistors | | |
|----------------|------------------------------|-------|
| R1 | 1k 5% 1/3W | 1 off |
| Capacitors | | |
| C1 | 1000u 25V Axial Electrolytic | 2 off |
| C2 | 10u 35V PC Electrolytic | 2 off |
| C3 | 100n polyester | 2 off |
| Semiconductors | | |
| BR1 | W005 Bridge rectifier | 2 off |
| IC1 (+) | uA78M15UC regulator +15V | 1 off |
| IC1 (-) | uA79N15UC regulator -15V | 1 off |
| Miscellaneous | | |
| T1 | Miniature Transformer 15V | 1 off |
| FS1 | Fuse 100mA 20mm | 1 off |
| | Fuse holder | 1 off |
| | SR Grommet 6W1 | 1 off |
| | Audioconn 3 way | 2 off |
| | Suitable case | 1 off |
| | Positive supply PCB | 1 off |
| | Negative supply PCB | 1 off |
| | Mains cable | |
| | 3 core connection cable | |

A blank, 4mm thick, 19" by 2U high aluminium panel is available from West Hyde Developments Ltd., Unit 9, Park Street Industrial Estate, Aylesbury, Bucks HP20 1ET. Order code A6F702. The price is £7.79 including P&P and VAT.



The output stage PCB.

NEW PRODUCTS

AMM 100

The Soundex AMM 100 provides a useful and compact measuring peak programme meter for location, studio and workshop applications. It has a protected balanced input and the impedance may be selected by push-button to be either 100K or 600 ohms. The sensitivity range of the amplifier section is -60dB to +10dB in 10dB steps and an 'uncal' facility allows 10dB of infinite variation within the range selected.

A headphone output is provided for monitoring of the signal during measurement. Both input and output sockets will accept standard P.O. type 1/4" jack plugs.

Power may be from either the mains via a CEE 22 connector at the rear of the instrument or the internal batteries. Battery condition can be monitored and whenever the instrument is connected to the mains the batteries are automatically recharged. Mains connector lead and rechargeable batteries included as standard. Price is £250.00 plus VAT.

Details from: *Bulgin Electronics, Park Lane, Broxbourne, Herts EN10 7NQ. Tel: 09924 64455.*



The Tardess

The Tardess TCU3000A is a Tape Compatibility Unit designed and manufactured by Tardis Ltd. The most obvious effect of this unit is to provide noise reduction, however, the Tardess alleviates most of the other problems associated with transferring a high quality signal to and from tape. The product claims to provide

an increase in signal to noise ratio of over 40dB, with a dynamic range of over 100dB and total harmonic distortion of 0.1%. The unit should be priced at £130 plus VAT.

For further details contact: *Tardis Ltd., Unit 3, Sunningdale Road, South Park Industrial Estate, Scunthorpe, South Humberside. Tel: 0724 849750.*



Custom Sound

Newly available from Custom Sound is the 726 bass amplifier. This amplifier is available in two versions,

both amps have identical facilities, the only difference being the power output — a choice of 150 or 300 watts. Both amplifiers feature volume, bass, middle and treble controls, compressor with in/out switch and LED mode indicator, 5-band graphic equaliser with in/out switch and LED indicator. A bi-amp feature is also included which enables the musician to utilise the advantages of speaker enclosures designed separately for bass and high register frequencies.

Pop Star Outfit From J.H.S.

The complete Pop Star outfit from John Hornby Skewes comprising a battery powered amplifier and microphone. This tiny unit (230 x 200 x 120) boasts a 2 watt output into a 100mm speaker. Facilities provided are bright and normal inputs, volume, tone and a useful head phone socket. The manufacturers say the amplifier is suitable for guitar practice and could be useful for dressing room tune-ups.

Provision is made to power the unit from a mains adaptor. At £35.00 (inc. VAT) this could be just the job for budding artists.

Further details from: *John Hornby Skewes, Salem House, Garforth, Leeds, LS25 1PX. Tel: 0532 865381.*



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Kitaro is widely regarded in Japan for his electronic music and the album 'Oasis' represents his best album to date. With the growing interest in his work in Europe, there is no doubt that many of our readers will take this opportunity to hear one of his superb recordings.

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Price includes postage & packing in UK only.

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Guitar Buddy

Practice Amplifier

by Edgeworth Electronics Ltd.

The E&MM Guitar Buddy has been designed as a low cost kit suitable for both beginners (to the art of music or electronics), as well as providing a handy musicians' practice amp for almost any location. Its leivity and compactness makes it very portable; in addition, it can be powered by an internal PP9 battery, an AC mains adapter or from the electrical system of your car via a cigarette lighter plug. Although designed primarily for use with electric guitar, the two input sockets will accept signals from other sources such as high impedance microphones and electronic keyboards.

An important feature of the Guitar Buddy is the provision of a headphone socket, a must to avoid disturbing the family, or (when out on the road) hotel clientele, or other musicians when tuning up in the galvanic atmosphere of the dressing room!

Circuit

Most of the amplifier circuitry is contained in the TDA1011 integrated circuit, but a few external components are required for the IC to operate.

The input signal is passed via paral-



The Guitar Buddy.

Bootstrap capacitor C9 allows the output to swing close to the supply rail, to squeeze as much undistorted output from the amplifier as is possible for any given supply voltage. As the output terminal rests at half rail volts, C11 is necessary to block DC voltage from the speaker. A Zobel network consisting of R4 and C10 compensates for variations in speaker impedance with frequency,

as seen by the amp, and ensures high frequency stability. When headphones are connected via the socket JK3, the internal speaker is disconnected and R5 attenuates the output signal to avoid damage to cans and ears alike! Note that the contacts on JK4 switch off the internal battery when external power is connected.

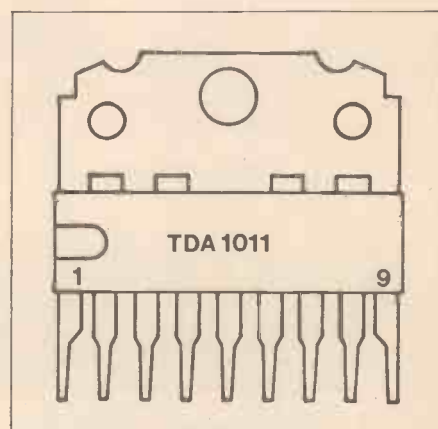


Figure 2. TDA1011 Pinouts.

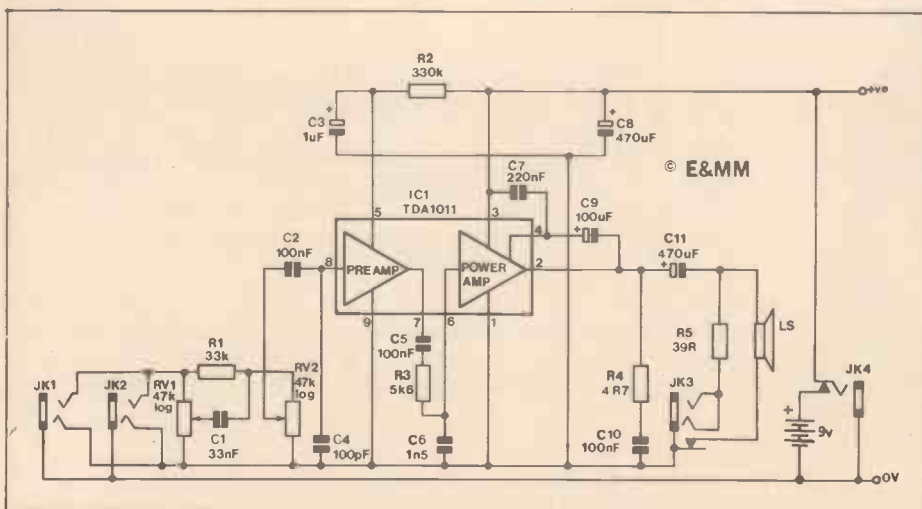


Figure 1. Guitar Buddy circuit diagram.

leled sockets JK1 and JK2 to the passive tone network consisting of RV1, C1 and R1. Volume control RV2 permits attenuation of the signal before it passes to the preamp stage of IC1, via coupling capacitor C2. At this point potential radio frequency interference is attenuated by C4. The output of the preamp stage is then coupled via C5 and R3 to the power stage of IC1. C6 is an additional high frequency filter.

Easy-build Construction

Since all of the components, including the control pots and jack sockets are mounted on the circuit board, the construction is very simple. The only external connections required are those of the battery and the speaker.

Using the component overlay shown in Figure 3 and with reference to the photograph of the completed board, the components can be inserted and soldered. Start with the resistors, then the capacitors, remembering to observe the polarity of the electrolytic types. There is only one link on the board which can be made with a short length of tinned wire or resistor lead.

- * 2½ Watt Output
- * Multiple power-source options
- * Two inputs for guitar, microphone or keyboards
- * Tone and Volume controls
- * Headphone socket for private practice
- * Smart black plastic case

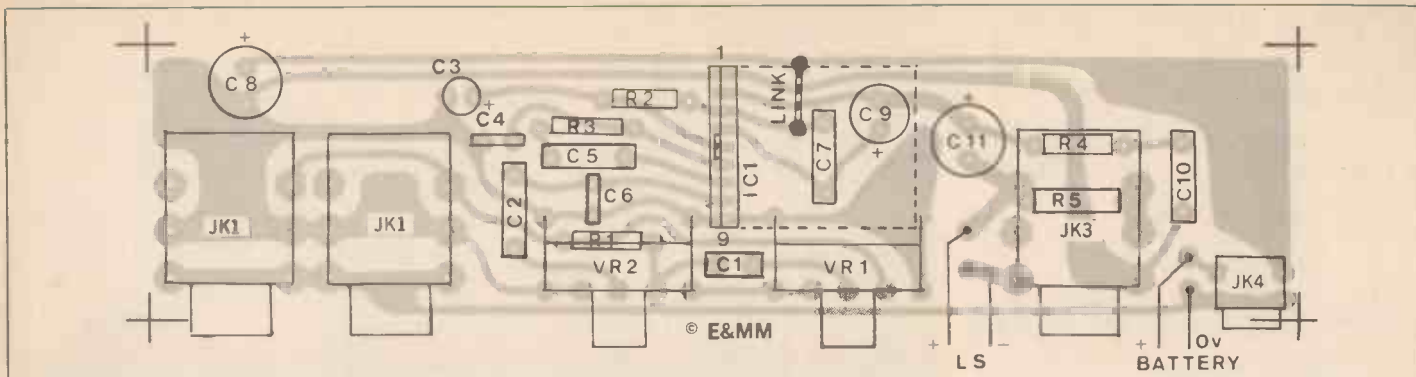


Figure 3. PCB component overlay for the Guitar Buddy (not to scale).

The integrated circuit should be mounted to its heatsink before being soldered to the board. The orientation of the IC can be determined from the pin-out given in Figure 2. Take care not to bridge any of the IC pads when soldering.

The jack sockets and pots can now be soldered in place.

When all the components are on the board the battery connector and speaker leads can be connected. Take care with these connections as a mistake at this stage can be costly!

Insert the board through the holes in the case and the printed fascia panel, then secure with the three chrome nuts for the input and headphone sockets. After connecting the speaker, glue foam strips to the inner sides and bottom of the front half of the case. This will help to reduce cabinet resonances. The large foam pad should be formed loosely over the speaker, making sure that the battery connector protrudes. This completes the internal assembly.

The battery connector goes through a slot in the battery compartment in the rear of the moulding. The two halves of the case can now be joined using the four fixing screws. The small foam pad is pushed into the bottom of the battery compartment to cushion the PP9 battery. All that is required now is to push on the control knobs and connect the battery.

Playing

The amplifier is switched on whenever a jack plug is inserted into either of the input sockets. A point about volume controls, often overlooked by musi-



An internal view of the Guitar Buddy.

PARTS LIST FOR THE GUITAR BUDDY

Resistors — all 1/2W 5% carbon unless otherwise specified

| | | |
|-------|-------------|-------|
| R1 | 33k | |
| R2 | 330k | |
| R3 | 5k6 | |
| R4 | 4R7 | |
| R5 | 39R 1/2W | |
| RV1,2 | 47k log pot | 2 off |

| | | |
|------------|-------------------------|-------|
| Capacitors | | |
| C1 | 33n mylar | |
| C2,5,10 | 100n polyester | 3 off |
| C3 | 1uF, 35V electrolytic | |
| C4 | 100p ceramic | |
| C6 | 1n5 ceramic | |
| C7 | 220n polyester | |
| C8,11 | 470uF, 16V electrolytic | 2 off |
| C9 | 100uF, 16V electrolytic | |

| | | |
|----------------|----------|--|
| Semiconductors | | |
| IC1 | TDA 1011 | |

| | | |
|---------------|--|-------|
| Miscellaneous | | |
| Speaker | 5", 4 ohm, 5W | |
| JK1,2,3 | PCB mounting 1/4" stereo switched jack sockets | 3 off |
| JK4 | PCB mounting 3.5mm | |

| | | |
|-----------------------------|--|-------|
| PP9 style battery clip | | |
| PCB | | |
| Custom moulded plastic case | | |
| Control knobs | | 2 off |
| Heatsink | | |
| Foam damping | | |
| Hardware | | |
| Fascia panel | | |

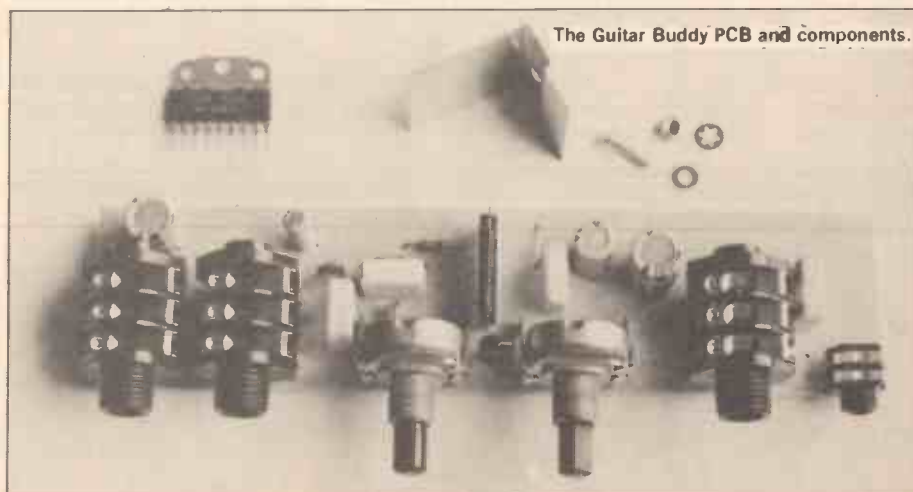
SPECIFICATIONS

| | |
|-------------------------------------|-------------|
| Input sensitivity | 25mV |
| Input impedance | 30k |
| Power output into internal speaker: | |
| 9V supply | 1 watt |
| 12V supply | 2 watts |
| 13.8V supply | 2 1/2 watts |
| Current consumption | 500mA |
| Maximum supply voltage | 14V |
| Dimensions | |
| Width | 193mm |
| Height | 230mm |
| Depth | 120mm |

cians, is that their setting bears no fixed relationship to the power output; with a high output pickup, full power may be obtained long before the volume control is turned fully clockwise.

Most headphones on the market being stereo, the amplifier is kitted out with a stereo phones socket, wired to drive both earpieces in mono, and at the same time disconnecting the internal speaker. If an external power source is used, ensure that conventional polarity is observed, viz, the *tip* of the plug is positive, and the *body* negative. The battery is disconnected whenever an external power supply is in use. As with all battery powered gear, don't forget to remove the battery when the amplifier is out of use for long periods. Now you can begin those long hours of dedicated practice!

E&MM



A complete kit of parts for the Guitar Buddy as listed is available from Electronics and Music Maker, 282 London Road, Westcliff-on-Sea, Essex, SS0 7JG, at a price of £19.75 including p&p and VAT.

WARREN CANN'S

Electro-Drum Column

Part 1

Whether you're an acoustic kit player or a drum machine programmer, this column's for you!

We've invited Warren Cann, our consultant drummer with the internationally known group Ultravox, to get our readers trying out rhythms with their Syntoms, Synwaves, Hexadrumms, Electric Drummers, micros and skins. Here's the first one of the series which contains Warren's own drum rhythm ideas that he's used.



"Hi, it's a great pleasure to be able to reach so many of today's (and tomorrow's) electro-musicians through this column. I'll be covering a very wide range of rhythms that I've used in my playing and in this first part I'll obviously be commencing with some basic beats for you to experiment with.

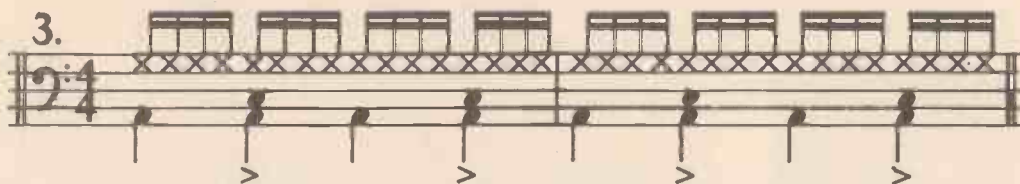
"All the examples will be available shortly on a narrated cassette for you to have alongside the music and I've added comments on each example below for rhythms that have a disco beat. Try them all!"



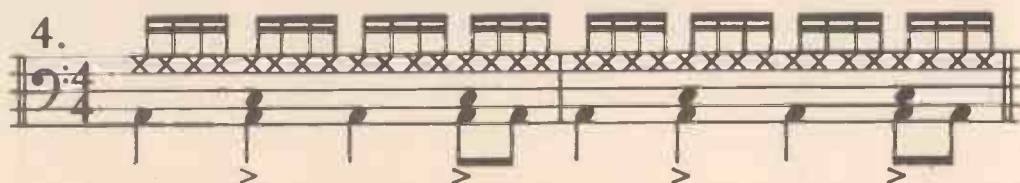
1. The disco beat! 4 to the measure on the bass drum, snare on the 2 and 4, and eights on the high-hat. This beat fits just about anything and everything (as all of the 'Stars on 45' type tracks attest). Don't feel it's beneath you because it's so simple - that's its greatest virtue.



2. An interesting variation of 1. The bass drum plays only on the 1 & 3. Not having a bass drum underpinning the snare gives more of a push-pull effect to the beat. The high-hat is playing 1/4 notes on the off-beat and this type of high-hat pattern really kicks any beat along.



3. The disco beat (1) again but with 16's on the high-hat. The bass drum and snare drum fit almost anything, but adding this high-hat part tends to be too busy if used throughout an entire song. It's ideal for, say, a chorus where you want things to lift.



4. Same as 3 but with an added bass drum beat on the '4 and', a subtle variation that pushes the beat along more.

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So far 1982 has been the year of the disappearing record shops. The collapse in retail sales has been so dramatic since mid-February that literally hundreds of shops the length and breadth of the U.K. have decided to call it a day. In spite of the relative success of such creative folk as Trevor Horn and Martin Rushent more sophisticated electro based LPs have suffered very badly indeed. The message is seemingly that even a band such as Japan with its fashionable image and hit singles cannot expect to carry its audience into the realms of superb production and musical imagination so obviously present in its albums. The simple 'synthipop' of the last year from the likes of Depeche Mode has, according to many retailers, made it a lot more difficult to sell sophisticated offerings. The backlash to pop/disco doodlings has even hit the hardened collectors — according to distributors and retailers sales of back catalogue and new artist material is badly down.

Artists still in favour include Jarre, Kitaro, Klaus Schulze and Didier Bocquet. On the independent front RCA have handed over

the distribution of Brain to Making Waves. This will mean the re-release of Schulze's entire back catalogue and Froese's 'Ypsilon in Malaysian Pale' and 'Electronic Dreams'. On things German... the re-release of the Ohr and Pilz labels has caused very little interest except for Popol Vuh's 'Aguirre'. The saga of 'Innovative Communication' has seemingly ended with the release by a German Barry Manilow! Nine months behind schedule Spoon has released new material by Irmin Schmidt and Can and re-released Holger Czuzkay's 'Canaxis 5'.

Pulse expects to be releasing albums in the autumn or winter by Didier Bocquet with Jean-Pierre Gauche and by Bernard Xolotl with Daniel Kubiaka. The top priority however will go to a brand new recording epic by London's Jade Warrior. Apparently, the duo were recently very pleased by having some of their work played on three consecutive weeks' selections of Desert Island Discs! But what chance will a new album have if it isn't racuous disco rhythms played by robots with daft hair cuts?

Matthew Gavin

E&MM

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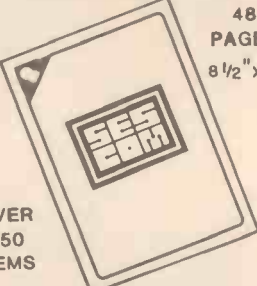
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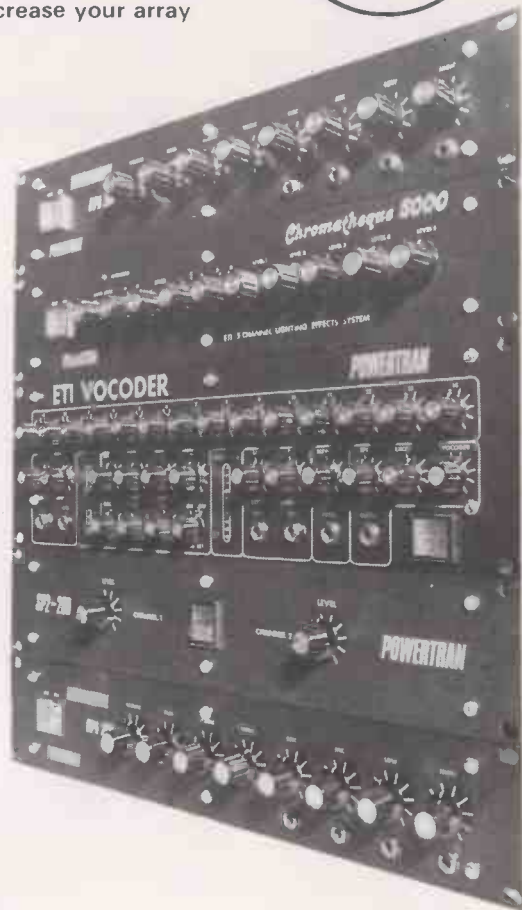
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