

OSCar Synthesiser



The Oscar is a British-made preset and programmable synthesiser, the first product from the new Oxford Synthesiser Company. Chris Huggett, the designer, stated that the philosophy behind the design has been to retain the fine resolution and powerful sound of analogue synthesis in a virtually all digital microprocessor-based system.

The advantages of a digital design are normally summed up in terms of reliability and stability. The tuning is completely accurate and memorised sounds can be instantly recalled and are exactly as originally stored.

In addition, facilities such as arpeggiation, sequencing and waveform building are more easily programmed and accurately stored using a microprocessor, and the potential memory space is much larger. As we shall see later, the storage space on the Oscar is far larger than on any other monophonic on the market. All work done on the Oscar can be memorised and an internal battery protects these memories when the instrument is switched off or the power fails.

The usual disadvantages of the digital technique — unfamiliar programming techniques, poor resolution of controls and a rather thin sound — have all been deliberately avoided. The front panel is laid out in the conventional analogue format and the potentiometers have sufficient high resolution for all parameter changes to be smooth and not stepped.

Because digital filters are still in their infancy and the weak link in digital technology, the filter circuits are analogue but digitally controlled, for greater accuracy in programming. Care has been taken even to enable analogue distortion, often responsible for the 'fat' sound of a synth, to be introduced if required.

Voices

Let us first look at the 24 sounds which come with the Oscar, as these give a fair cross-section of the sounds possible from the machine. They are selected 'Casio' style, by holding down the Voice button and pressing one of the keys labelled +1 to +24. There are several strong bass and lead voices, solo brass, woodwind and string sounds, church and Hammond organs and the sort of short sounds which are good for sequencing. There are also a couple of sounds built using the waveform creation facility and these stand out from the rest as being the product of additive rather than subtractive synthesis.

In addition to the 24 preset sounds there is space for 12 sounds of your own, which can be created either on the panel or by editing presets.

The panel

This is obtained by pressing the Voice button and the key labelled 0 simultaneously. The front panel now entirely defines the sound produced and knobs can be adjusted until the desired sound is achieved. Once programmed the sound can be stored simply by pressing the Voice and Store buttons together with the keys between -1

and -12, from where it can be recalled by pressing the Voice button and the same key. These twelve voices can be dumped onto tape at any time, allowing an infinite library of voices (which can be easily reloaded) to be built up.

The panel features 36 knobs and 15 buttons, controlling over 80 parameters, some of which are more familiar than others. Here is a brief look at the voice creation facilities.

There are two oscillators (DCOs) which offer a choice of standard waveforms, triangle, ramp, square and pulse as well as automatic PWM (Pulse Width Modulation) by an independent LFO for each oscillator, leaving the main LFO free for further modulation. For those of you unfamiliar with PWM, it is a means of varying the harmonics in the waveform by changing the width of a pulse wave automatically, thereby obtaining a richer and more interesting sound. The amount of this modulation is controlled by the knob PW, which also controls the width of the pulse wave if this has been selected.

Pulse waves can vary between 5 and 50% and pulse width modulation between 5% and 95%. There is also a switch on the second oscillator which causes it to automatically copy the waveform of oscillator 1. The footage of oscillator 1 is controlled by two buttons (one for up, one for down) which are by the wheels at the left-hand end of the keyboard. In normal usage, the footage of oscillator 2 is also tied to this, making a very useful performance control, similar to that on the Moog Source, but operating over the whole range of the synth, not just up or down one octave.

The footage of oscillator 2 (in normal use) is determined relative to oscillator 1 by the Octave Select knob. This goes from -2 octaves to +3. As the keyboard covers three octaves, and oscillator 1 has five octave positions, this gives the Oscar an effective range of 12 octaves (more than we can hear) on oscillator 2. In Duo mode, oscillator 2 Octave Select becomes independent of oscillator 1 footage and selects from the five normal positions in the standard way.

The Fine Tune knob adjusts the pitch of both oscillators over a range of a semitone up or down. This control is not stored in memory as it needs to change according to the tuning of fellow musicians. Tuning changes of greater than a semitone are controlled by the Tune button and the keyboard. By this means it is possible to transpose the keyboard very quickly, even in the middle of a solo, for example, in the same way as selecting a voice. By simply holding

down Tune, and pressing the key between -7 and +7 on the keyboard (a fifth up or down), the whole keyboard is shifted by that interval (in semitones), another handy performance control. It can also be stored as part of a sound.

The Detune knob and the Interval button function in the same way for oscillator 2 in isolation. It is possible to set up fine detuning between the oscillators and this can be stored as part of a voice. This is vital as detunings are often an integral part of a voice program. For standard intervals between the oscillators, we use the keyboard and the Interval button in the same way as before. This time only oscillator 2 is transposed giving a constant interval between the two oscillators. Again this can be used as a performance control (for example a quick phrase in fifths or major thirds in the middle of a solo) or stored as part of a voice.

Building waveforms

Next to the Oscillator Section there are two innocent-looking buttons marked Waveform. These are the key to one of the biggest features of the Oscar: digital waveform building by harmonic addition. Pressing button 1 in conjunction with key 0 replaces the standard oscillator waveform with this feature on oscillator 1, button 2 puts it on oscillator 2, or pressing both transfers the entire sound creation to additive synthesis.

Holding down button 1 now enables the function of insert and pressing any key between +1 and +24 inserts a harmonic into the waveform. Pressing key 0 with both buttons clears it to start from scratch. By turning the synth to Hold, you can hear the harmonics building up. Key 1 gives you the fundamental at full volume. Key 2 gives you the first harmonic (second harmonic to a physicist) at half the volume. Key 3 gives you the second harmonic (third harmonic to a physicist) at one third the volume and so on up to key 24, the twenty-third harmonic (twenty-fourth to a physicist) at one twenty-fourth of the volume.

These harmonics can be made louder by re-inserting them again and again up to full volume i.e. the seventeenth harmonic (key 18) can be put in up to eighteen times. You can listen to this process happening and Delete (button 2) any harmonics you don't like. Finished waveforms can then be stored either on their own or as part of voices and recalled at any time, for use or further editing. This feature of the Oscar is unavailable on any other monophonic, and the 'smallest' polyphonic with this feature is the PPG Wave 2.2 As with the PPG, waveforms

OSCAR Synthesiser

your arpeggio (as long as at least one note is held), whereas Delete allows you to change chords without old notes still being played. Again Tempo controls the speed.

It is best to think of the Oscar sequencer as being similar to those contained in drum machines. There are twelve simple sequences which can accept up to 250 notes between them, and these can be used as the building blocks for the ten chaining sequences. The chaining sequences have the memory capacity of 255 events between them and each event can be a change of voice command, a simple sequence, an individual note or space (although this is somewhat wasteful of memory space, it is much better to use a simple sequence), a number of repeats or single sequence or for an individual note or space, or a loop command.

When creating or editing a sequence, notes played staccato come out as Multiple Triggered on playback, notes played legato as Single Triggered. To make a note last longer than one sequencer step, the note is held while the Step Forward button is advanced the appropriate number of steps. There is a space insert button next to the wheels under the left hand, which sounds like a burst of noise in edit, but doesn't sound at all in playback.

Editing is facilitated by the use of Insert, Delete and Step Forward and Backwards buttons. All sequences are programmed in step time, as this facilitates external synchronisation (necessary if performing with other musicians, a drum machine or a click track). The Tempo knob normally controls sequencer speed, but if switched to external triggering it allows the incoming pulses to be divided (so the sequence only plays on every 2, 3, 4, 5, 6, 8 and 12 pulses).

The most effective use of Duo is in playing along with the sequencer. This is because oscillator 2 is completely isolated from the performance controls and voice circuitry to allow it to play the sequencer line. The only controls which still affect it are oscillator 2 controls and Gate Time. The oscillator 2 Waveform Select knob can be used to choose a different waveform (additive waveforms sound particularly good on

the sequencer). The Octave Select knob gives the absolute footing of the sequence and the Interval button allows the sequence to be transposed independent of the keyboard. The Gate control (normally used to imitate length of key playing in normal sequencing and arpeggiation) is now the absolute length of the sequenced notes and can be adjusted to suit.

All performance controls (wheels, Octave Up and Down buttons and edit function) can now be used on oscillator 1, without changing the sequence at all and the Oscillator Balance knob controls the balance between sequence and real-time accompaniment on the keyboard.

Editing programs

In order to allow analysis of programs and smooth editing, knobs are not instantly active although the Oscar is in continuous edit mode. Looking at the Octave LEDs gives an indication of any knob in the recalled program and once the knob has been moved to that position a slight tweak will free the knob for editing. This prevents the usual problem of ragged edits during the performance.

Economy has kept the external connection sockets to two, but these are exploited to maximum advantage. The audio output accepts a 'mono' jack plug for connection to an amplifier or mixing desk, but is actually a 'stereo' socket which allows high impedance headphones to be used. For this reason, the audio signal is 'fairly generous' and input levels should be kept down to avoid distortion.

The other jack socket is also stereo and has a dual function. In use with other equipment it serves as Sync In/Out. The tip connection accepts an External Trigger so that a mono jack plug can be used. If a trigger is to be required from the Oscar, it should be taken from the ring of a stereo jack plug (a 4 millisecond +5 volt pulse is produced every time the Volume Envelope is triggered i.e. every time the Beat LED flashes).

In Cassette Dumping this socket doubles as the Save/Load connection. Again for ease in Loading, the tip connector is for loading

signals (incoming) so a mono jack plug can be used on stage. The ring connection gives out the information to be saved on tape and so a stereo jack plug must be used.

Circuitry

The circuitry is exposed by removing two screws from each end cheek, and pulling out the bar which releases the rubber clamps at the front of the panel. Sliding the clamps back then allows the panel to be lifted clear of the case.

Three PCBs are used to house all of Oscar's electronics, the third being underneath the keyboard. This contains all the key contacts and performance circuitry.

A single sided board holds the power supply components (apart from the transformer — which is underneath), control pots and switches along with multiplexer circuitry. This board is merely for control commands and software changes will allow different functions to be controlled. Connected to this, via a multiway plug and socket, is the digital control and sound generation.

Chris Huggett has done an amazing job in packing all of this circuitry onto one double sided, plated through, board measuring around 6" square! The board holds a Z80 processor, firmware EPROM, Z80 CTC, 8255 PPI, ADC, DAC, CMOS RAM, decoding circuitry and all the analogue devices, including dual transconductance amplifiers, required for the sound generation.

If any problems occur, it is most likely to be with this card, therefore, care has been taken to make it a simple job to remove and replace. Note, however, that any stored programs should be dumped to tape before removing the card, since the battery backup for the CMOS memory is on the single-sided PCB.

Conclusion

It is difficult to do justice to so many features in the limited space available, but special emphasis should be given to the programmable filter drive and waveform creation (which allow the Oscar to sound like a complete range of synthesisers from the MiniMoog to a PPG); to the performance controls which provide more flexibility 'live'; and to the sequencer which is unrivalled in terms of space and structuring in this price range. It should also be pointed out that the Oscar is a software-run device, for which updates will be possible by merely replacing RAM and ROM chips. This will allow Oscar to overcome the all too familiar problem of obsolescence.

Usually there is little room for patriotism when deciding how to spend your hard-earned money on electronic music products but with Oscar, you now have that choice.

E&MM

The OSCAR can be seen at Rod Argent's Keyboards or Rose-Morris and is currently selling for £499 including VAT. Further information from: Oxford Synthesiser Co., 5 Gladstone Court, Gladstone Road, Headington, Oxford. Tel. (0865) 67065.



Internal circuitry.

