

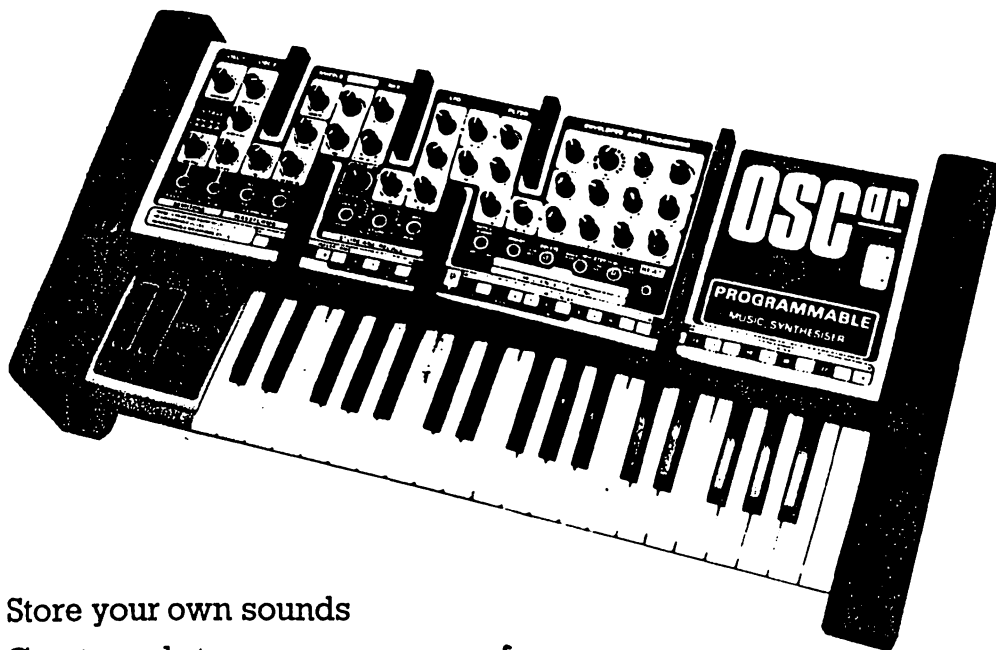
OSC^{ar}

We had three aims when designing the OSC^{ar}. Firstly we wanted an instrument that would be easy to use on stage and also stand up to the rigours of being on the road. Secondly we wanted to open up avenues of complex sound creation that until now have been unavailable in an inexpensive synthesiser, and thirdly we decided it must include a sequencer sophisticated enough to be used as a serious compositional tool.

In fact we wanted to design the ultimate lead synth.

We believe that we have achieved this with OSC^{ar}. The fast action, flexible performance controls and the programmable voices and sequences are ideal for live performance. The digital waveform construction in combination with the wealth of sound processing and modifying controls offers unlimited scope for sound creation. The sequencer's large memory capacity and powerful editing features were purpose designed for the composer.

The OSC^{ar} is the ultimate lead synth.



- Store your own sounds
- Create and store your own waveforms
- Build complex sequences
- Use versatile performance controls to add expression to your playing
- Interface with your other instruments via MIDI

Oscillator Section

5 standard waveforms: triangle, sawtooth, square, pulse (adjustable width) and PWM (adjustable depth)

5 preset digital waveforms: multiple octave, complex sawtooth, complex pulse, double pulse and "random"

5 programmable waveforms: created by the addition of fundamental and harmonic sinewaves.

WAVEFORM SWITCHES for standard waveform selection.

OCTAVE SHIFT SWITCH: sets oscillator 2 from two octaves below to three octaves above oscillator 1.

OCTAVE DISPLAY shows which octave register has been selected.

FINE TUNE & FINE OSCILLATOR 2 DE-TUNE

Tuning is very stable and accurate. Whatever the playing conditions are, there is no need to re-tune.

TRANPOSE AND INTERVAL PUSH-BUTTONS for instant and precise semitone tuning and oscillator 2 interval.

WAVEFORM PUSHBUTTONS for independent selection of digital waveforms to each oscillator. Also used for setting relative harmonic levels during programmable waveform creation.

Mix Section

Adjusts relative levels of OSC 1, OSC 2 and noise, and overall input to the filter.

Glide Section

- Portamento with optional auto function.
- Glissando.
- Normal or fixed glide time.

Wheel Programming Section

- Pitchbend programmable to more than one octave (up or down).
- Pitch modulation programmable to a depth of one fifth.
- Filter modulation programmable up to full filter range.
- All settings are stored as part of voice.

LFO Section

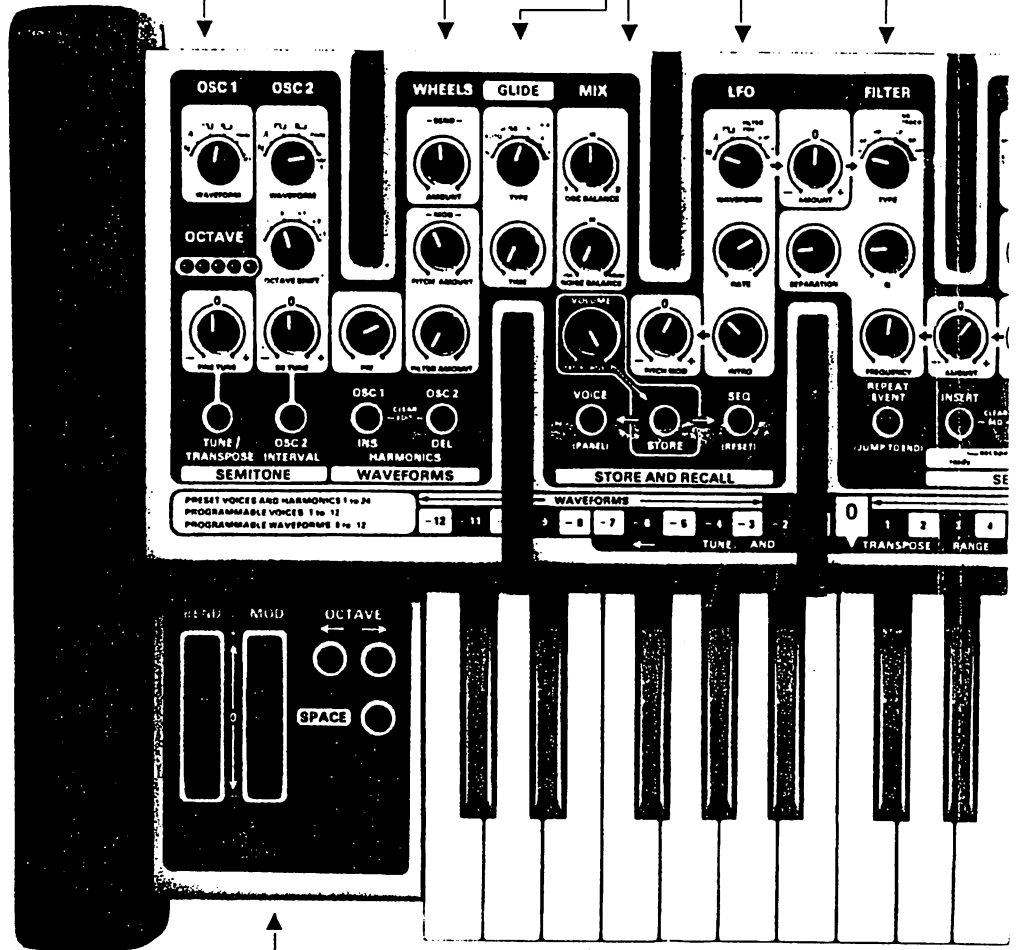
- Standard waveforms: triangle, sawtooth, square, or random
- Sample & hold, or keyboard control voltage, or filter envelope output.
- Separate pitch and filter amounts, plus or minus (additive to mod. wheel amounts).
- Variable modulation delay.

Filter Section

- Double configured pass or high pass or high
- Adjustable resonance
- 'Q' control

Envelope Section

Separate generator: volume. Filter has optional action mode

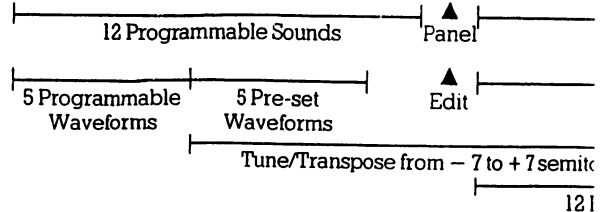


STOP PRESS

MIDI RETROFIT KIT NOW AVAILABLE FOR ALL EARLIER MODELS

Performance Controls

- Pitch bend wheel, centre sprung: range of over one octave up or down.
- Modulation wheel, centre sprung: pitch and filter modulation amount independently programmable.
- Octave push buttons: five octave setting, display shows selected octave.



SEQUENCER

- 1500 step time events shared between 12 sequences and 10 chains.
- Full edit functions with step forward or back, insert and delete.
- Single or continuous loop playback

Seq

- SEQUE
- Norr
- Tied
- Lega
- Rest
- Repe

Section

filter can be
 as a low pass, band
 pass filter.
 able separation of
 different frequencies
 variable cutoff slope or
 resonant peak response.
 control to introduce

Envelope Generator

ADSR
 controls for filter and
 filter envelope
 optional delayed
 decay.

Triggering Section

Trigger Switch. Single/multiple trigger select or automatic trigger select for volume and filter envelopes.
 Tempo. Controls speed of sequence, arpeggiator and automatic envelope triggering.
 Gate Time. Sets envelope sustain time during automatic triggering.
 Function Switch. Selects three functions (with or without hold facility)

- Normal monophonic playing
- Arpeggiator with choice of up, down or up/down and choice of real-time or memory operation.
- Duo oscillator assignment (or sequence accompaniment)

MIDI

- Note information transmit and receive (including sequencer and arpeggiator)
- Optional channel assignment to one of 16 channels
- Program change transmit and receive (switchable)
- Wheel information transmit and receive (switchable)
- Can be used as a polyphonic keyboard controller
- MIDI transmit ON-OFF function
- Voice, programmable waveform and sequencer data selectively dumped

In Out Thru



Input and Output Section

- ← Dual Function Jack Socket
Trigger in/out
and
cassette in/out
- ← Audio Output Jack Socket
can also drive
stereo headphones

Multi Function Keyboard

New note priority for responsive playing. Additional functions in conjunction with control push-buttons

24 Programmable Sounds

Harmonic Select (during waveform editing)

tones

Basic Sequences

10 Chained Sequences

← Voice (Sound) Select

← Waveform or Harmonic Select

← Oscillator Transpose

← Sequence or Chain Select

Sequencer Section

SEQUENCE EVENTS

- Normal notes
- Edited notes
- Gate notes
- Rests
- Repeat event commands (up to 24 times)

CHAIN EVENTS

- Any sequence events plus
- Complete sequences
- Voice selections

Digital Oscillators and Waveform Creation

The OSC^{sr} was designed to capture the best of both worlds, that of the analogue and that of the digital. Nowhere is this more apparent than in the oscillator section. The two oscillators use wavetables stored in memory — a system that has, until the introduction of the OSC^{sr} only been available in the very expensive computer keyboards. This system lends itself as much to the formation of conventional analogue waveforms as it does to the combining of pure sine waves, which are used as the basic building blocks of additive synthesis. This approach was adopted to give the maximum potential for sound creation.

The oscillator waveform select switches are situated on the top left of the front panel. Each has triangle, sawtooth, square wave, pulse and pulse width modulation options. The reason for the three variations of square wave choices is to allow you to set up a particular pulse width or pulse width modulation depth prior to selection of that position, enabling the switch itself to become a live performance control. The "PWM" waveshapes are modulated, by two independent preset LFOs for optimum moving chorus effect. The sixth position on the OSC 2 waveform switch reads OSC 1! Curious you might think, but in practice a very usable feature. In this position OSC 2 will adopt exactly the same waveform as OSC 1 — so that two waveshapes can be selected by one switch alone — extremely useful for live performances. OSC 2 can also be detuned by plus or minus a semitone, or in octave steps two octaves below to three octaves above OSC 1.

Another two excellent performance features are the innocuous semitone buttons on the bottom left of the front panel. These are the OSC 2 interval and tune/transpose controls. Pressing the former in conjunction with keys within a specified range on the keyboard transposes OSC 2 from a fifth below to a fifth above in semitone increments, while the latter conveniently allows you to change to any key. These controls used in conjunction with the two octave up/down buttons allow an unprecedented measure of live performance flexibility. The fine tune control has a range of plus or minus a semitone and is used to tune the OSC^{sr} completely stable oscillators to other instruments.

As an alternative to the conventional waveforms OSC^{sr} offers an additional facility to generate unconventional waveforms. Any waveforms can be broken down into a set of sine waves at various amplitude and frequencies. The basic pitch is the fundamental, the first harmonic is twice the fundamental frequency, the second harmonic is three times the fundamental frequency and so on. In the waveform construction mode the 24 keys above middle C are used to select the fundamental and the 23 successive harmonics, and their relative levels can be adjusted by inserting each up to 16 times. Using this additive synthesis method, the combinations of sounds possible are only limited by your own imagination. Once you have created a waveform it can be stored in any of five locations and can be assigned to either or both oscillators. Five preset waveforms under the unlikely names of multiple octave, complex sawtooth, complex pulse, double pulse and "random" are also available.

Dual Peak Filter

An innovative dual peak filter with low pass, band pass and high pass modes is used, enabling you to create sounds no other synthesiser can. With the separation control at minimum, the filter has a 24 dB/Oct rolloff. Start turning the separation control clockwise and the filter splits into two with two independent cutoff frequencies. The further the separation control is rotated the further apart the cutoff frequencies become. This is extremely effective for emulating acoustic instruments (most of which have more than one natural resonant frequency), and for simulating quite lifelike vocalisations. Also included is a filter drive control which determines the level of input to the filter. When driven hard the OSC^{sr} adopts a warm rich timbre, while reducing it makes the sound harsher and more clinical.

Continually Triggering Inverse Envelopes . . ?

There are two ADSR envelopes available, one for the filter and one for the amplifier. As well as modulating the filter, the filter envelope can also modulate oscillator pitch, and in both cases positive or negative envelopes can be applied. A delay to the per envelope can also be introduced.

- Single and multiple triggering for legato and staccato
- Negative envelopes can also be continually independent triggered, individually or together, by an internal or external clock.

Fixed Glide Time

The OSC^{sr} offers six different modes of operation: normal, automatic (which allows you keyboard control over the glide effect) and glissando which increments in semitones. The three remaining modes are quite unique. Again you have a choice of normal, automatic or glissando but with a fixed glide time. If, for instance, you have selected a glide time of 1 sec, it would take that length of time to glide from one note to another regardless of the interval between. This allows you a much more flexible approach to your playing as you can predetermine the exact instant at which the last note played will be reached.

Programmable Arpeggiator

The arpeggiator has up, down or up/down modes which can either be played in real time by holding down the arpeggio you want to play, or played in the memory mode by only holding down one key and programming in additional notes.

An extra very powerful feature is that the arpeggiator can actually be programmed into a voice and be recalled when the voice is reselected.

Tied Notes and Voice Changes

In keeping with the OSC^{sr} design philosophy the sequencer is comprehensive and extremely flexible. It enables you to program real time feel sequences with step time precision. It has a 1500 event capacity which can be shared between 12 sequences and 10 chained sequences. Enter sequence edit mode, play a series of notes, leave sequence edit mode, hit the sequence start button and it will play the sequence back at the tempo rate. Its as simple as that.

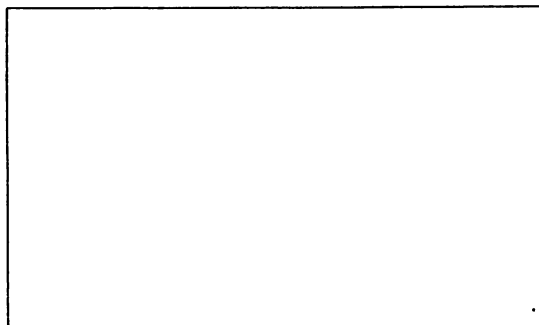
If you want something a little more interesting follow exactly the same procedure but this time lengthen some of the notes using the "tied-note" feature, insert some rests, play a legato phrase (and delete some of those bum notes). Once you have created a few sequences, enter the chain mode and start joining them together. Insert some fills in between and add some voice changes — before you know it you have created a compositional masterpiece! Enter duophonic mode and you can play along with the sequence.

The sequencer can also be clocked from an external source via the trigger input. The incoming trigger pulses can be internally divided by 2, 3, 4, 6, 8, 12 or 16 — an invaluable facility for syncing to the many different clock signals that are prevalent in other sequencers and drum machines.

Dumping Memories

OSC^{sr} is fully programmable and all memories are backed up by an internal battery which means that you do not lose precious information when power is turned off. You can also dump your memories to tape via the cassette interface (or via the MIDI interface), providing a convenient way to build up a whole library of voices, programmable waveforms and sequences.

These are just some of the exciting features to be found on OSC^{sr}, but don't just take our word for it. Go to your local dealer now and ask for a demonstration.



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OSCar
Programmable Music Synthesiser

OPERATING INSTRUCTIONS

Oxford Synthesiser Company
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OSCAR OPERATING INSTRUCTIONS

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1. INTRODUCTION

Meet OSCar

OSCar is a comprehensive monophonic synthesiser and sequencer which offers both extensive creative possibilities and instant recall of voice and sequence programmes in live performance.

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 digital design eliminates the drift in parameters and the continual "setting up" required in analogue systems. Tuning is quartz crystal derived and is very stable and accurate (no need for "auto-tune"); pre-programmed voices remain exactly as they were set originally.

The use of a microprocessor allows many complex functions (many of which would not otherwise be possible), to be called up at the touch of a button. Facilities like the arpeggiator, the sequencer and waveform creation are all built in and easy to use.

The results of creative work such as voices, sequences and waveforms are all reliably retained in the system's memory after switching off the mains supply. In addition they can all be saved on cassette tape, allowing an unlimited library of sounds and sequences to be kept.

In addition to standard synthesiser facilities OSCar offers:-

24 PRE-SET VOICES
12 PROGRAMMABLE VOICE LOCATIONS
5 STANDARD WAVEFORMS INCLUDING PWM WITH INDEPENDENT RATE OSCILLATORS
5 PRE-SET SPECIAL WAVEFORMS
WAVEFORM CREATION BY HARMONIC ADDITION WITH 5 STORAGE LOCATIONS
22 INDEPENDENT SEQUENCES WITH LARGE CAPACITY AND FULL EDIT FUNCTIONS
10 OF THE SEQUENCES CAN CONTAIN OTHER SEQUENCES AND VOICE CHANGES
KEYBOARD CONTROLLED LEGATO PHRASING DURING SEQUENCE WRITING
SEQUENCE NOTES CAN BE TIED
"REPEAT EVENT" COMMAND SIMPLIFIES SEQUENCE WRITING AND SAVES SPACE
ALL PROGRAMMING IS RETAINED WHEN POWER IS SWITCHED OFF
CASSETTE STORAGE OF VOICES, SEQUENCES AND WAVEFORMS
NEW NOTE PRIORITY KEYBOARD
TOTALLY DEPENDABLE TUNING
KEYBOARD CONTROLLED TRANSPOSE AND INTERVAL
PUSHBUTTON OCTAVE CONTROL
DUOPHONIC ASSIGNMENT FOR KEYBOARD OR SEQUENCE ACCOMPANIMENT
WIDE RANGE OF GLIDE FACILITIES
ARPEGGIATOR WITH SEVERAL OPTIONS
DOUBLE FILTER WITH FREQUENCY SEPARATION CONTROL
PROGRAMMABLE FILTER DRIVE
FULLY ADJUSTABLE FILTER TRACKING
WIDE RANGE OF TRIGGERING AND ENVELOPE REPEAT OPTIONS
ENVELOPE PITCH CONTROL
GATE TIME CONTROL DURING SEQUENCE PLAYBACK OR AUTOMATIC ENVELOPE REPEAT
INDEPENDENT BEND AND MOD WHEELS WITH SEPARATE PROGRAMMABLE AMOUNTS
AUTOMATIC LFO MODULATION DELAY INDEPENDENT OF WHEEL MODULATION

Voice No .

1 —
2 —
3 — PWM strings
4 — ORGAN
5 — FM(PWM) *
6 — *
7 —
8 — BRASS
9 —
10 —
11 — WAWA
12 —
13 —
14 — Piano
15 — Filter
16 —
17 — Robot
18 — Piano
19 —
20 —
21 — Brass
22 —
23 —
24

SPECIFICATION

VOICES:- 24 pre-set and 12 programmable locations
(all controls settings except volume, tune, tempo & wheels are stored)
Control position "find" display aids voice editing

DCOs:- 2 with monophonic or duophonic assignment

WAVEFORMS: triangle, ramp, square, variable pulse and PWM (controlled by 2 additional independent LFOs) or programmable waveforms by harmonic addition

PITCH: 5 octave settings (pushbutton selection)
Fine tune, OSC 2 de-tune and OSC 2 octave shift

TRANSPOSE: OSC 2 only or both using keyboard from -7 to +7 semitones

GLIDE: normal, fixed time and automatic (portamento or glissando)

MIX: OSC1/OSC2 balance, NOISE/OSC balance and filter drive/volume controls

FILTER:- two filters can be configured as 24 DB/OCT low pass or high pass or as 12 DB/OCT per side bandpass with variable bandwidth

RANGE: 16Hz to 16KHz with variable "Q" (two peaks)

LFO:- for filter and pitch modulation

WAVEFORMS: triangle, ramp, square and random plus env 2 or keyboard routing

RATE: 0.1 to 30 Hz

MOD. DEPTH: Pitch +/- 7 semitones, Filter +/- entire range

INTRO DELAY: 0 to 8 sec after playing new key

BEND WHEEL:- over 1 octave up or down (max) - programmable amount

MOD. WHEEL:- filter/pitch modulation + or -

Separate filter and pitch amount controls

Wheel modulation provides alternative LFO routing independent of the "Intro" delayed routings

ENV. GEN.1:- for VCA control - wide range ADSR with auto repeat

ENV. GEN.2:- for filter and pitch control - wide range ADSR with auto repeat

Alternatively simplified envelope with trigger delay

Modulation can be inverted

TEMPO:- additional clock for envelope repeats, arpeggiator and sequencer playback

RANGE: 6 to 1800 BPM

TRIGGER:- single, multiple, env 1 and/or env 2 repeat with automatic "gate time" facility and hold

External trigger out

External trigger in with optional 1,2,3,4,6,8,12 or 16 divide

ARPEGGIATE:- up, down or up/down at tempo rate

Choice of "Hands on" or "Memory" playing style

SEQUENCER:- 22 independent sequences with up to 580 events total

Note tie and keyboard controlled legato

Repeat up to 24 times uses only 1 extra event space

Full edit functions (step up and down, insert, delete, replace)

10 sequences can contain chains of the other 12, with optional voice changes (as well as notes)

Single or Loop playback

Real time accompaniment facility

TAPE SAVE:- Cassette interface gives unlimited permanent storage of voices, waveforms and sequences

GENERAL DESCRIPTION

What kind of synthesiser is OSCar?

To answer this question it is best to think of it as three separate things in one case:-

- 1) A general purpose monophonic synthesiser with a wide range of controls for voice creation and playing.
- 2) A memory unit for saving "sounds" which have been set up on the synthesiser so that they can be recalled instantly later on.
- 3) A sequencer with a comprehensive set of controls for creating and altering sequences of notes.

The Synthesiser

The synthesiser part, in many ways, is a very conventional monophonic synthesiser; inspection of the control panel (ignoring all the push-buttons for the time being) will reveal the same basic layout that has become almost "standard" among synthesisers of the modern compact kind which do not require the use of patch-leads to build up a sound. This set of controls is very comprehensive and OSCar is a very versatile synthesiser which can produce sounds ranging from richly musical ones to completely non-musical sound effects. The possibilities are almost endless and it is only by experiment that the full potential of this kind of synthesiser can be appreciated.

The "synthesiser" can be used without even considering the memory and sequencer parts. While it has a very wide range of controls which have to be set up carefully, it has been designed with on-stage performance in mind. Transposing is controlled in precise semi-tones by means of the keyboard and tuning does not drift when things warm up. Modulation effects can be introduced either automatically via the "Intro" delay OR by means of the modulation wheel. Octave selection is made by push-buttons. The arpeggiator allows instant fast arpeggio playing which can be left to play indefinitely using the hold facility. These are just some examples.

In addition to these "performance" facilities, the "duo" mode allows the two oscillators to be separately controlled by playing two keys simultaneously and a fairly unusual waveform building-facility allows the oscillator waveforms to be built up harmonic by harmonic.

The Memory Unit

The second part, the memory unit, is the part which provides the "programmable" facility. It further enhances the "stage-worthiness" of the instrument as it allows all the hard work of setting up voices to be done before a performance. Up to 12 voices and 5 "built-up" waveforms can be saved in this way. If the mains is switched off in the meantime, the contents of the memory remains intact; it will remain the same until it is deliberately changed.

The memory unit also contains 24 "pre-set" voices and 5 "pre-set" special waveforms (in addition to the standard ones) to choose from. These allow the instrument to be played immediately without the need for any voice programming. They are installed during manufacture and cannot be changed. Any pre-set or programmable voice can be modified to any extent, once it has been selected, and the modified voice can be saved (in one of the programmable voice locations) if required.

The Sequencer

The third part, the sequencer, would often be expected as a separately supplied accessory which connects to the synthesiser via control voltage and trigger leads. Since it is built in, these connections need not be considered. The sequencer is comprehensive and far exceeds the capabilities of earlier "analogue" sequencers - in fact there can be up to 22 separate sequences stored in the instrument at the same time.

Any sequence can easily be altered; notes can be changed, added or taken away anywhere in the sequence. Ten of the 22 sequences have additional capabilities; they can contain combinations of the other 12 sequences and voice changes, as well as normal notes and spaces. This allows complete musical pieces to be put together using basic phrases that have been prepared first in such a way that the sequencer capacity (580 events) is used economically. A "repeat event" command is also included, providing further space economy if the sequence contains parts which are repeated.

Like the programmable voice settings and waveforms, sequences are not lost if the mains is switched off.

Permanent storage of voices, waveforms and sequences

If the number of voices, sequences and waveforms that can be stored in the memory inside the instrument is not sufficient, they can be transferred to a cassette using a low-cost cassette recorder, in order to make room for more within the instrument. The information on the cassette is as permanent as any normal cassette recording would be; it can be loaded back into the instrument whenever it is required (over-writing what is already in the memory). Obviously there is no limit to the amount that can be saved this way.

How are all these things operated by just a few controls?

It may appear at first that there are quite a lot of controls on the panel but most of them are concerned with the formation of voices as on a non-programmable synthesiser. There are only 11 "extra" push-buttons to control the selecting and storage of voices, special waveforms and sequences and the cassette functions.

The answer to the question is that the keys of the keyboard have more than one function. Normally, pressing a key simply plays a note in the usual way but if it is pressed while a push-button such as "VOICE" is held down, it is interpreted in a different way. In this example, instead of playing a note, the voice corresponding to that key would be selected. The keyboard is used in a very similar way to transpose the oscillators, select sequences, waveforms and harmonics. The row of numbers above the keyboard helps to identify the keys when they are used for these purposes.

In addition, some of the push-buttons themselves have more than one function, depending on what mode of operation has been selected. For example, the "SEQUENCE EDITING" push-buttons are not only used for editing sequences; they are also used to start and stop sequence playback, to set up the arpeggiator and to control cassette saving and loading.

The idea of using controls which have more than one function may seem strange at first but OSCar is not difficult to use. As with any synthesiser, the control layout has to be learnt but there is no need to master all of it before starting to play. OSCar has more facilities than most synthesisers and it is not necessary to use all of them immediately. In general, the simplest and most obvious functions are the easiest to use.

HOW THE MANUAL IS ARRANGED

The manual is written in such a way that anyone should be able to learn how to use the instrument effectively. It is not really an introduction to synthesisers from square one and if you have no experience of synthesisers at all, it may be worth reading a book on the subject first. However, it is an introduction to OSCar from square one and during the course of learning about the details of the instrument itself, you may pick up enough knowledge to use it to its full potential even if you are not familiar with synthesisers.

If the instrument is new to you, it is advisable to read the next section - SETTING UP, even if connecting up seems a trivial matter. Apart from giving information about the mains and amplifier connections, it also gives details of the memory protection battery which you should be aware of.

Section 3 - STARTING TO PLAY is really for the benefit of those who are not very familiar with synthesisers, particularly programmable ones. It is probably worth any player reading through it at least once as it is designed to provide a basis for using the remaining sections; some of these assume a certain amount of understanding of this kind of synthesiser. It gives step by step instructions, written in an informal way, showing you how to get a lot out of the instrument immediately, even if you have never used a synthesiser before. All of the simple functions are covered and some of the more advanced functions are introduced.

Section 4 - THE CONTROL PANEL gives a "matter of fact" description of what all the controls on the panel do. It does not in all cases describe exactly how to use all of them but where appropriate, references are made to other sections in the manual where further information can be found.

Section 5 - TRIGGER, GATE AND ENVELOPES explains the meaning of these terms, how they work and how they are related. The use of external triggering is explained and details of the required trigger IN and OUT connections are given.

Sections 6 - 10 give full details of all the "special" facilities available. Some of the information given in earlier sections is repeated here but is generally in greater detail.

2. SETTING UP

Mains Supply and Fuse

Fit a suitable plug to the mains lead, observing the standard colour code:-

BROWN is LIVE

BLUE is NEUTRAL

GREEN/YELLOW is EARTH (see note below about earth connections)

If the plug contains a fuse, the usual 13 amp rating is suitable. The rating of this fuse is not critical but it should be higher than that of the fuse in the instrument itself (2 amp or 4 amp - see below) so that if a fault occurs, the fuse in the instrument is the one that blows.

The mains input is initially set for 240 volts AC (50 - 60 Hz) on European models. It is possible to change it to suit a 110-120 volt supply by means of a simple internal wiring change on the mains transformer. If this modification is required, it should be carried out by a suitably qualified person and it would be advisable to clearly mark the instrument "110v" if there is any chance that it will be used again with a 240v supply. PERMANENT DAMAGE MAY RESULT FROM USING AN EXCESSIVE MAINS SUPPLY VOLTAGE.

The mains on/off switch is in a small recess in the left-hand end of the instrument. It is an alternate action switch - push for ON and push for OFF.

The fuse-holder in the instrument is located in a small recess next to the mains switch. It is fitted with a 2 amp semi-delay fuse for a 240v supply or a 4 amp semi-delay fuse for 110v. To remove it, turn the small slotted part of the holder 1/4 turn anti-clockwise using a suitable screwdriver and tip the unit on its end so that the fuse falls out.

If the fuse blows, make sure that the mains input is set correctly before replacing the fuse and trying again. If the fuse blows a second time but the mains voltage is correct, there must be a fault within the instrument. DO NOT MAKE ANY FURTHER ATTEMPT TO USE IT until it has been repaired.

Earth Connections

In some circumstances where the amplifier and synthesiser are both earthed independently, an objectionable "earth loop" mains hum signal can result. If this is a problem, try using two mains sockets which are wired together closely (eg two sockets of the same mains adaptor or wall fitting) to reduce the amount of hum. As a last resort, it may be found advantageous to disconnect one of the earth connections. (If a mains plug is already fitted, check to see if the earth wire has been connected.) Probably the best one to disconnect in this case is the synthesiser earth; the amplifier can then act as a central earth for all instruments that are connected to it. DO NOT LEAVE A BARE EARTH WIRE WHERE IT COULD COME INTO CONTACT WITH ANY OTHER CONNECTIONS either inside or outside the mains plug.

Connection to the Amplifier

The audio output is taken from the front jack socket in the recess on the right-hand side of the unit (identified as "AUDIO" on the control panel).

For connection to an amplifier, a "mono" type of jack plug should be used and the lead should be of the usual screened type.

The socket is of the stereo type so that high impedance headphones can be plugged in directly to the audio output socket for practice or setting up (without needing to change the headphone jack plug wiring). Using high impedance headphones (about 600 ohms or higher) will give a reasonable sound level but low impedance headphones (8-16 ohms) will only give a very low sound level - probably not enough.

Note:- The audio signal is fairly generous and best results with an amplifier will be obtained by turning the amplifier input sensitivity DOWN so that the OSCar volume control can be at a fairly high setting.

Protection of Memory

A small re-chargeable battery is built in to keep the memory "alive" while the mains is not connected. There is no need to be particularly concerned about it but it is just as well to know how long it will stay charged enough to keep the contents of the memory intact.

The mains voltage is constantly monitored so that switching off or mains failure is detected early enough for a controlled shut-down to take place, leaving the memory contents safely intact. (This happens when the mains voltage drops below about 75% of its nominal voltage.)

For EACH HOUR the instrument is actually switched on, the battery will receive enough charge for about another 30 HOURS of memory retention. When the battery is fully charged (after about 100 hours total charging time), the memory will be retained for several months.

When the unit is new, the battery will be only partially charged and it is advisable to leave it on for a day or two if it is not going to be used frequently. After that, a rule of thumb is ONE DAY'S USE PER MONTH should be sufficient to prevent loss of memory. In case there is any doubt, it is always worth saving valuable voices, sequences and waveforms on a cassette. The procedure is described in section 10 of the manual.

The life of the battery itself is several years. If memory loss is suspected after a few years, the battery should be replaced. Replacing the battery is fairly simple but it should be left to a suitably qualified person. Any information stored in the memory will be lost when the battery is changed. Again it is recommended that anything of value is saved on a cassette fairly soon after it has been created.

3. STARTING TO PLAY

If OSCar seems a bit complicated at first, don't be put off. All of the basic functions are easy to use and there is no need to master the whole thing before you start playing. By going through this section, you can start playing right away and become familiar with many of the things that the instrument can do.

How the Controls Work

Most of the controls on the panel are used for forming different sounds and, to a large extent, the way they are used is fairly "normal". However, the controls for selecting voices, transposes, sequences and waveforms require some explanation. The main thing to get used to is the idea of using the keyboard in conjunction with the push-buttons.

The simplest example of this scheme is the selection of a voice. Holding down the "VOICE" pushbutton tells the internal system that the next keyboard key that is pressed is to be interpreted as a voice setting INSTEAD of a note. The same idea applies to setting up an oscillator transpose, selecting a sequence, a special waveform or a harmonic.

Obviously, the keyboard is normally used for simply playing notes and none of these special functions need concern you if no push-buttons are held down. You can learn about each of them separately at the pace that suits you.

Switching On

Connect up to the mains and an amplifier (or headphones) as described in SETTING UP and switch on. What happens?

The centre lamp of the OCTAVE display comes on. Apart from simply confirming that power is on, this tells you that the middle of the five possible oscillator octave settings has been selected. The BEAT lamp may be on or flashing but it is not important. Immediately after switching on, the VOICE of the instrument is determined entirely by the settings of the controls on the panel. Unless the controls are in "sensible" positions, playing the keyboard may not produce any sound or it may produce an unpleasant sound. Turn up the volume control (bottom knob in the MIX section) and try it. The situation where the voice is determined by the control panel is referred to throughout this manual as the PANEL voice and it is normally the best way to start creating a voice from scratch.

Fortunately, it is not necessary to be an expert at setting up synthesiser controls to start playing immediately because OSCar is a programmable synthesiser with a selection of pre-set voices to choose from. For the time being, we can ignore the possibilities of voice creation and move on to the pre-set voices.

Selecting the Pre-Set Voices.

First, make sure that the TRIGGERING switch is in the SG (single triggering) or the MULT (multiple triggering) position and the FUNCTION switch is in the NORM (normal) position. These switches are at the top of the ENVELOPES AND TRIGGERING section. The reason for doing this will be explained later.

Hold down the VOICE button (directly below the volume control) without touching the keyboard. WHILE THE VOICE BUTTON IS HELD DOWN, press C sharp identified as key number "1" on the panel directly above the keyboard and then release both the key and the button.

Playing the keyboard now gives a bright lead sound - this is voice "1".

The PERFORMANCE controls on the left of the keyboard can be used without any further setting up:-

Turning the BEND wheel takes the note pitch up or down by 5 semi-tones. Turning the MOD wheel brings in a small amount of fairly fast pitch MODulation. This is the way the wheels are programmed to operate in this particular voice.

The octave setting can be changed by pressing one of the OCTAVE buttons next to the wheels. The left button moves the octave down by one and the right button moves it up by one. Each time one of them is pressed, another jump takes place until the limit is reached. (Watching the OCTAVE display confirms that the octave

setting is changing.) Selecting voice "1" put the octave to the middle setting initially; this is the way the octave setting is programmed in this particular voice.

Using the same method as before, try out all the pre-set voices (keys 1 to 24), remembering to actually keep the VOICE button down while the voice is being selected. Notice that the initial octave setting and the effect of the wheels is not the same with each voice.

If you do not seem to be getting the right response or if anything unexpected happens, question whether you have done exactly what has been said. You can always get out of trouble by switching the instrument off and on again and then selecting a voice again; the response to switching off and on is always the same as described earlier.

Transposing the Oscillators.

Select voice 1 as before and play a few notes to satisfy yourself that it has been selected successfully. Now hold down the INTERVAL button (second button from the left) and while it is held down, press key "7" (6 near the centre of the keyboard) and then release the key and the button. Playing the keyboard will show that one of the oscillators has moved up a fifth or 7 semi-tones above the other. Notice that there is an area marked from key "-7" to key "7" as TUNE AND TRANSPOSE RANGE. Holding down the INTERVAL button and pressing any key in this range transposes oscillator 2 by that number of semi-tones. (You will see that attempting to get a transpose outside the marked range simply has no effect.)

Once a transpose is set up, it will remain that way until a different transpose is set. If key "0" is used, the transpose is simply NO semi-tones and oscillator 2 returns to the same pitch as oscillator 1. As an added convenience, pressing the INTERVAL button and then releasing it WITHOUT PRESSING ANY KEYS has the same effect as this; it provides a quick way of removing an interval transpose.

In a similar way, the TUNE button (extreme left) can be used with keys in the transpose range to change the pitch of BOTH oscillators. A transpose of both oscillators is called a "tuning transpose" since it effectively re-tunes the whole instrument. Since both oscillators change by the same amount, the effect is less obvious than an interval transpose, particularly if no other instruments are being played at the time. It is most useful for transposing sequences during playback but might also be used for adjusting to inaccurately tuned instruments or to even allow you avoid playing in an awkward sharp or flat key.

Notice that it is possible to have a tuning transpose in operation and not be aware of it if there are no other instruments being played to provide a reference. It is easy to make sure that there is no transpose by simply pressing the TUNE button and then releasing it without pressing any keys - it works in the same way as the interval transpose button.

If required, there can be a tuning transpose AND an interval transpose in operation at the same time. The two functions are quite independent. Try out a few combinations of transpose with different pre-set voices to get familiar with them. Notice that every time a pre-set voice is selected, both of the transposes are initially set to "0" (except on voice 20 which has an interval transpose of 5 semi-tones) because this is the way they were set when the pre-set voices were created. Theoretically, there could have been transposes in any of them.

Modifying (Editing) Selected Voices.

At first, you may want to completely ignore most of the controls on the panel and just use the pre-set voices. It is certainly easy to select them and the range of voices available may be sufficient for a while. However, you will probably not want to be limited to pre-set voices for long.

When the mains was switched on, the voice of the instrument was determined by the positions of the knobs on the control panel. Then, pre-set voices were selected, thus ignoring the positions of the knobs. You may have noticed that after a pre-set voice has been selected, the octave display blinks off every second or so. The purpose of this is to tell you that the knobs on the control panel are not in the right places to produce the sound that you are now able to play. The fact that they are in the wrong positions would not matter at all if you were not interested in modifying the voice but if you do want to alter it, you should be aware of the relationship between the knob positions and the sound which is set up.

The sounds of the pre-set voices are clearly not related to the actual positions of knobs so you may be wondering how they can be used in a sensible way to alter anything. By changing octave settings and by adding transposes to the pre-set voices, you have already modified voices in a simple way. Changing these settings is straightforward; the response is immediate regardless of where the pre-set voice put them.

It is also possible to alter any of the "knob" controls after a voice has been selected. While it is not difficult to do this, it may require some thought to keep track what is happening when they are altered.

Changing the positions of rotary switches (waveform, glide type, LFO waveform, filter type etc.) is fairly simple - just turn the knob to the new position required. To try this out, select voice 1 again. This voice uses the filter in the low pass position but say you want to change it to band pass. Find the filter TYPE knob (top of the FILTER section) and turn it to the second position from the left marked BP for band pass and by playing a few keys, you will immediately hear the difference sound that band pass filtering gives.

But what if the knob is already in the BP position?

Just turn it away from BP (either way) then put it back to BP.

Any of the rotary switch settings can be changed this way. Try a few experiments with the other rotary switches. Don't worry if you get lost because you can always get back to the original pre-set voice simply by selecting it again in the normal way. As before, a sure way to get everything back to "normal" is to switch off and on again if you feel that you have lost control. Also, don't forget to put the TRIGGERING and FUNCTION switches back to the positions specified earlier (SG or MULT and NORM respectively), or you may get some unexpected results after selecting a voice. It is probably better to be adventurous rather than over-cautious because making a mistake simply doesn't matter - especially at this stage when there is no need to worry about accidentally erasing a voice or a sequence.

Changing the position of any of the other knobs (attack, decay, filter frequency, de-tune etc) is slightly different. Remember that after selecting a voice, the knobs will probably all be in the "wrong" positions. It would have been nice if they all turned round to the right places to show exactly how that sound had been created, but this is obviously not possible.

However, by turning any particular control and watching the OCTAVE display, you can find out where the selected voice has put it initially and then you can alter it. To try this out, select voice 1 again and hold down a key so that you hear a steady note. Turn the filter frequency knob (bottom of the FILTER section) and watch the display.

If the knob happened to be in the right position for this voice (about 2/3 of the way round), all that will happen is that the filter frequency will change and you will hear the brightness of the note change. If the knob was set to the left of this position, the display will light up on the left hand side, telling you to turn to the right. As you turn closer to the correct position, more lamps of the display will light up until finally, they are all lit when the correct position is reached. A few small movements of the knob in the right position will cause all the lamps of the display (except the one showing the octave setting) to suddenly go out, indicating that you now have manual control of filter frequency. If the knob is initially on the right hand side of the correct position, the same thing will happen except that the display will light from the right, telling you to turn to the left.

Notice that this special display (called the "EDIT FIND" display) only happens WHILE THE KNOB IS TURNING. It may take a while to get used to it but once it is mastered, it allows you to smoothly change the sound setting after finding out where the knob was set in the first place. To get practice with it, try altering any (or all) of the other controls.

At first, it may be better to ignore the effect that it has on the actual sound of the instrument and just concentrate on using the display to find out where each knob was set by the selected voice. At any point, you can start again by simply selecting a voice again. Once you are used to the idea of finding the knob's position and gaining control of it, you can go back to thinking about the sound of the voice and changing it to suit your requirements. In fact, this is a good way to start creating voices if you are not experienced with synthesizers because you can modify existing voices a little at a time.

Using the Programmable Voices

The 12 programmable voices available from keys "-1" to "-12" have not been mentioned yet. You can try selecting them (using the VOICE button and a key in exactly the same way as for a pre-set voice) but there may not be anything sensible stored in them. To get the idea of storing voices, try this:-

Select the pre-set voice 1 and play a few keys to confirm that it is there. Now press VOICE and STORE (the button next to it) together and WHILE THEY ARE BOTH HELD DOWN press key "-12" (bottom C). Be careful not to release either of the buttons accidentally before pressing key "-12" or the wrong thing may happen. After key "-12" has been pressed, release both buttons and the key. Although nothing will appear to have changed, you have now put a copy of voice 1, the bright lead sound, into the programmable voice location "-12".

You could check this in the following way:- select a different voice like voice 2, the cello sound and play to verify that it is there. Now select voice "-12" and you should get the bright lead sound. If this has not happened, go through the procedure again from the beginning, being very careful to follow the instructions exactly - in particular, don't accidentally let the voice or store buttons go before pressing the key.

Now that you know how to store a copy of one of the pre-set voices, you can then do something much more useful. Select voice 1 again but this time, change it as you were doing earlier. For example, put in an interval transpose, shift the octave setting down one octave and change the filter frequency to give a much softer tone. Now store the sound setting in voice "-12" as above. This new voice can now be selected at any time just as easily as a pre-set voice is selected. Check that it is there in the same way as before. If it didn't work you must have made a simple mistake but it doesn't matter. Just try it again from the beginning until you are happy that it works.

You could have made any number of changes to any one of the pre-set voices and stored it in any of the 12 programmable voice locations. You might like to try a few other experiments along the same lines and build up a number of new voices. Even if the mains is switched off, if the new voice has been stored properly, it will stay there until you change it by storing a new sound in the particular programmable voice. In fact, you can select one of the voices that you have stored, then modify it and store it as yet another programmable voice. There are no restrictions; the simple rule to remember is that regardless of how you arrived at it, the sound you hear when the keyboard is played is the sound that will be stored. Remember also that it is not possible to store anything in voices 1 to 24. It does no harm to try but the pre-set voices will always be the same when they are selected.

What gets stored in a programmable voice?

The answer is the (effective) position of every control on the panel except FINE TUNE, TEMPO, the volume control and the positions of the two wheels. Everything else is stored including the octave setting and both transpose settings. The same applies to the pre-set voices except that they have been set up already.

Using the Arpeggiator.

Whatever voice has been selected, bringing the arpeggiator into operation is just like any other voice modification. To try it out, select a voice 1 and then turn the FUNCTION switch to position 2 - ARP. Hold down a few keys and adjust TEMPO (second on the left of the FUNCTION switch) to adjust the arpeggiator speed. All the keys that are held down will be played in sequence as long as they are held down.

Try it with a few of the pre-set voices. As long as the FUNCTION switch is in the ARP position, the arpeggiator will operate because this switch is only "programmed" when a voice is selected if it is in the NORM position. Actually, none of the pre-set voices set the FUNCTION switch to the ARP position but if the switch is in that position when a voice is selected, it will over-ride whatever the selected voice calls for.

If you want to be able to select a voice which automatically makes the arpeggiator work, all you have to do is get it working with the voice you want and then store the voice in one of the programmable voice locations. Then, with the FUNCTION switch in the NORM position, whenever that programmable voice is selected, the arpeggiator will immediately become active because it was working when the voice was stored. (Remember the rule above - whatever sound is set up gets stored.)

Arpeggiator Options

The way in which the arpeggiator works can be changed in two ways.

1) As you have seen, the arpeggiator only runs through the notes that are actually held down. This is called the HANDS-ON mode for obvious reasons. To make this more apparent, turn the function switch to "A HOLD". This is exactly the same as the ARP position except that HOLD operates as well to keep the note sounding indefinitely even if the keyboard is not being played. Press a few keys and you will see that after releasing them, the arpeggiation stops and just one note can be heard.

Press and release the INSERT button in the SEQUENCE EDITING section. Now the arpeggiator is in the MEMORY (or INSERT) mode. Now, as long as any one key is held down, more notes can be added to the arpeggiation and they will remain there even after ALL the keys are released. After that, pressing any new keys will clear the memory and a new set of notes can be memorised.

To get back to the HANDS-ON (or DELETE) mode, press and release the DELETE button (next to the INSERT button).

2) You will have noticed that notes are stepped through in both directions up and down the keyboard. This can be changed to UP only or DOWN only using the two STEP buttons in the SEQUENCE EDITING section but first, a small caution:-

The STEP→ button is also used to start a sequence playing. To avoid this, always keep at least one key held down when you select the arpeggiator UP mode. All this may seem a lot to remember but it doesn't really matter if a sequence is accidentally started. You can always stop it again with the ←STEP button. With this in mind, try the two different direction modes:-

Press and release the ←STEP button and the arpeggiation will become DOWN only. Hold a few keys down to verify this.

While holding at least one key down (to avoid starting a sequence), press and release the STEP→ and the arpeggiation will become UP only.

To get back to the UP/DOWN mode, hold a key down (for the same reason as before) and press and release both STEP buttons together.

As you might expect by now, the choices of HANDS-ON or MEMORY and UP, DOWN or UP/DOWN that are in operation will also be remembered if the voice is stored for use later on. The choices that were made for the pre-set voices are all the same:- Hands-On and Up/Down.

Different Types of Triggering

Most of the pre-set voices set the TRIGGERING switch to the MULT (MULTiple triggering) position. Multiple triggering causes the envelope generators to operate whenever a new key is played regardless of whether other keys are still held down. This is generally the most useful setting.

It is possible to select single triggering (SG on the TRIGGERING switch); this type of triggering is common on early and low-cost synthesisers and in many cases there is no alternative. Single triggering does not allow the envelope generators to operate if a new key is played while others are still held down. It generally seems a bit limiting after the luxury of multiple triggering but is occasionally useful.

As before, changing the type of triggering is just like any voice modification. Voice 6 is a good choice for demonstrating the effect of different types of triggering; it is a strong "plucked" sound which is highly dependent on the envelope generators for its character.

Select voice 6 and play a few notes. You will find that it always sounds the same however the keyboard is played. Now select SG on the triggering switch (in the usual way) and play again. Unless all the keys of the keyboard are released before playing a note, the strength of the sound is lost. By changing the way in which the keys are played, it is possible to control the attack quality of the note.

Envelope Repeats

It is possible to make the envelope generators operate repeatedly at the rate of the TEMPO clock.

With voice 6 still selected, turn the TRIGGERING switch to "RPT 1". This makes the volume envelope generator (designated as number 1 envelope generator) trigger on each tempo beat. Hold a key down and you will hear part of the attack quality of the sound occurring at a steady rate - adjust TEMPO to change the rate.

Now switch TRIGGERING to "RPT 2" and hold a key down again. This time, the filter envelope generator (designated as number 2) will trigger on each tempo beat and the effect is a different sort of attack quality.

Finally, switch to "RPT 1&2" which makes both envelope generators trigger on each tempo beat; now the effect is the same as repeatedly pressing and releasing a key. It is the same because the action of pressing a key to play a note always triggers both envelope generators (except with single triggering and some keys are always held down as mentioned above).

Envelope repeats are useful for obtaining a regular rhythm which would be difficult to achieve directly by playing on the keyboard. (It is also possible to synchronise the repeats with another instrument like a drum machine - this is dealt with in section 5 - TRIGGER, GATE AND ENVELOPES.)

The TRIGGERING switch is similar to the FUNCTION switch in that its effective position can only be "programmable" if it is in the SG or MULT positions. In any other position, it will over-ride whatever is called for when a voice is selected. Remember to turn it back to one of these positions if you want it to be programmable when voices are selected.

Envelope Repeats with the Arpeggiator

You may have noticed that with many of the voices, the attack quality of the sound was lost when the arpeggiator was used to sequence through the notes held down. This is because the arpeggiator itself does not trigger the envelope generators. However, it is quite possible to trigger the envelope generators automatically at the beginning of each arpeggiator note change by using the envelope repeat facility that has just been described.

Using voice 6 again, bring the arpeggiator into operation by turning the FUNCTION switch as before and try it out. While the arpeggiator is obviously working, the strength of the sound is only apparent when new keys are pressed.

Turn the TRIGGERING to "RPT 1" to make the volume envelope generator trigger on each tempo beat. You will hear that part of the attack quality of the sound has been restored by doing this.

Now switch to "RPT 2" to make the filter envelope generator repeat and the effect is to restore the quality of the sound but in a different way.

Finally, switch to "RPT 1&2" to make both envelopes repeat. This restores the sound to its full original strength.

Suppose that this set-up will be wanted during a live performance. All you need to do is store it in one of the programmable voice locations while it is set up. The arpeggiator and the envelope repeat function are both in operation so that is what will be stored. If this voice is selected later with the TRIGGERING switch at SG or MULT and the FUNCTION switch at NORM, the envelope repeat and arpeggiator functions will immediately come into operation.

Duophonic playing

Selecting the duophonic mode is just as easy as bring the arpeggiator into operation. Whatever voice has been selected, turn the FUNCTION switch to the DUO position.

To try it out, select voice 1, switch to DUO and play a few notes. You will notice that if just one key is pressed, the two oscillators will still play the same note as before but if two are pressed, the two oscillators will play one note each. Its as siaple as that. Try it with a few of the pre-set voices. Naturally, you can store a voice when DUO is in operation and when that voice is selected later on when the FUNCTION switch is in the NORM position, DUO will operate straight away.

Simple Sequences

Although the sequencer has quite a number of controls and functions, it can be used in a simple way:-

Hold down the SEQ and STORE buttons together and while they are both held down, press key "1". This puts the sequencer into the "editing" mode and, at the same time, selects sequence 1. Also, voice 6 is automatically selected because it is the most suitable one for sequence editing.

The OCTAVE display "reverses" (ie the one which is OFF now shows which octave is selected) in order to show that the sequence editing mode is in operation.

Press the INSERT and DELETE buttons together (in the SEQUENCE EDITING section on the panel). This clears whatever was stored in sequence 1.

Make sure that the FUNCTION switch is in the NORM position (or you will get confusing results). Play a few notes to make up a sequence. If there is no response from the keyboard, read the next paragraph.

(You may be unlucky when the instrument is new. If the entire sequence space is full, playing the keyboard will give no response. You will have to clear some other sequences first. To do this press the SEQ and STORE buttons together and while they are down, press key 2. This selects the edit mode but this time for sequence 2. Clear this sequence as above using the INSERT and DELETE buttons together. Repeat the operation with a few more sequences - say 3,4,5 and 6 - to make sure that you have cleared some sequence space and then go back to the start of this section.)

If you make a mistake while loading in the sequence, you can easily clear the sequence and start again. Rest periods can be put in by pressing the SPACE button (to the left of the keyboard) instead of a key. In the editing mode, rest periods will be heard as "noise"; this is useful for identifying them during editing. When you are happy with the notes and spaces you have put in, press the two STEP buttons together. This takes the sequencer out of the editing mode, and the sequence you have just made up is ready to play.

Press the STEP→ button to start the sequence playing. It will play through once only. Adjust the playing speed with the TEMPO control. If you press the button again WHILE THE SEQUENCE IS PLAYING, it will make the sequence repeat in an endless loop.

You will notice that any notes which were played "legato" style (keys were played without releasing the previous key) will be played back in the same way.

Any voice can be selected in the usual way while a sequence is running. (This applies only to sequences 1 to 12 - see section 8 for more information.)

To stop the sequence playing, press the ←STEP button. If the sequence is looping repeatedly, pressing this button once will let the sequence go on to the end and then stop. If the sequence is playing through just once, pressing the button will stop the sequence immediately. If in doubt, pressing the button twice will always stop the sequence dead on the second press.

If you don't get the right response, go back to the beginning and follow each step exactly. If the instructions are not clear, it may help if you read Section 8 - THE SEQUENCER straight away. Alternatively, you could leave the sequencer until you are generally more familiar with the instrument. When you are ready, section 8 gives full details of all the sequencer functions.

Sequence Accompaniment

Once you have a sequence running successfully, all you have to do to accompany it on the keyboard is select DUO as described earlier:-

Get a sequence running in an endless loop, select a voice and then turn the FUNCTION switch to DUO. The sequence will then play on oscillator 2 only, leaving oscillator 1 free to be played from the keyboard. Section 9 - THE DUO FUNCTION gives further details of sequence accompaniment.

Special Waveforms

The two WAVEFORM rotary switches in the OSC1 and OSC2 sections on the panel allow various "standard" waveforms to be selected. Other waveforms can be selected using the two push-buttons labelled WAVEFORMS (next to the transpose buttons). Selecting them is just like selecting voices except that the waveform buttons are used instead of the voice button.

To try out some special waveforms, select voice 12 - a bright bass sound which uses a sawtooth waveform on oscillator 1 and a pulse waveform on oscillator 2.

While holding the OSC1 button down, press key "-3". This changes oscillator 1 waveform from sawtooth to a distinctive "organ" waveform.

Now do the same thing but using the OSC2 button. This will change oscillator 2 from the pulse waveform to the organ waveform.

To achieve the same result but more quickly, the two buttons OSC1 and OSC2 could have been held down at the same time while key "-3" was pressed, thus changing both oscillators to the organ waveform in one operation.

Using the waveform buttons with any keys from "-3" to "-12" will bring in a different waveform. Try them all to get used to what is available. The waveforms from "-3" to "-7" are fixed; they appear instantly when they are selected. The ones from "-8" to "-12" are built up from fundamental and harmonic sine waves and you will notice that it takes a little time for them to develop after they are selected.

For further information and instructions for creating waveforms, see section 9 - SPECIAL WAVEFORMS

Getting the most out of the instrument

This section should have given you a good start with OSCar. By no means has everything been explained - the idea was to take you through the facilities in an introductory way. The remaining sections in the manual cover all details of the instrument, including what has been said in this section, but they are written in a more formal and factual style. Any information that you feel is missing so far should be found somewhere in the appropriate section.

Having been through this section, if you are still not confident about the instrument, it may be worth reading through the whole manual before going through this section again. It may clarify points that you did not understand the first time round. If you are confident and feel that you can work the rest out for yourself, read the whole manual anyway - you may have missed something useful.

Good Luck.

4. THE CONTROL PANEL

This section gives a description of all the controls on the panel. In order to convey some idea of how the instrument works, the descriptions are set out in groups which represent the major parts of the system. The control panel itself divides the instrument into blocks which are labelled in large letters on the panel. All these main labels are quoted in this section with asterisks on either side in this fashion **** ON THE PANEL **** so that the descriptions can readily be related to the control panel.

Where there are no calibration marks or indications on the controls, minimum settings are fully anticlockwise and maximum settings are fully clockwise.

The descriptions which follow explain what the controls do but do not necessarily explain exactly how to use them to their full extent. In some cases, references are made to other sections in the manual where further information is given. In other cases, using the controls to their full extent is up to you - this is the art of synthesiser programming and playing.

THE KEYBOARD

Although the keyboard may not be thought of as a "control" exactly, there are a few things to note about it. In its normal note playing role, it is a "new note priority" keyboard. This means that when any key is played, it will take effect whatever keys are already held down. This is distinctly different from the keyboards on many earlier synthesisers where only the highest key (high note priority) or the lowest key (low note priority) will play. While there may be some merit in these earlier schemes for certain styles of playing, a new note priority keyboard has a much more responsive feel. When a key goes down, it always takes effect.

The keyboard is also used extensively for functions other than note playing. The keys are numbered on the panel from "-12" (bottom C) to "24" (top C) to help in identifying them when they are used for these purposes. All these special keyboard functions are described in various sections of the manual. The general scheme when the keyboard is used for special functions is as follows:-

- 1) Press a control button (such as VOICE, SEQ etc.) when NO KEYS ARE HELD DOWN
- 2) While the control button IS STILL HELD DOWN, press the appropriate key
- 3) Release the key and the button (in either order)

As long as no push-buttons are held down, the keyboard simply plays notes in the normal way (with certain obvious exceptions such as during cassette saving and loading).

THE OSCILLATORS

The two oscillators are more or less identical. Their pitches are normally both controlled together, either by the keyboard or by the sequencer together with the OCTAVE buttons and all the other controls which affect pitch.

(The exception is when the sequence accompaniment facility is being used. In this case, oscillator 2 is effectively "disconnected" from most of the pitch influences (the keyboard, bend and pitch modulation) and is controlled by the sequencer. Oscillator 1 remains under the control of the keyboard and the other pitch controls. See the DUO part of section 7.)

** OCTAVE ** display

The 5 LEDs (light emitting diodes) show which octave register has been selected by the OCTAVE BUTTONS in the performance controls section. The centre position is the "8 ft" setting. Lower octaves are to the left and higher octaves to the right. The standard footages are displayed thus:-

| | | | | | |
|-------|----|----|---|---|---|
| LED : | 1 | 2 | 3 | 4 | 5 |
| FT : | 32 | 16 | 8 | 4 | 2 |

Most of the time, one of the LEDs is lit to show which octave is selected but they are used to display other information in special circumstances. When this occurs, generally more than one of them is lit and it is obvious that the display is not the normal octave indication.

The circumstances where the display is not the normal OCTAVE display are:-

- During sequence editing, the display is reversed (4 of them are lit and the one which is OFF shows which octave is selected).
- After a pre-set or programmable voice is selected, the octave display is normal but it blinks off briefly every second (approximately) to show that at least one of the controls is not in the right position for the selected voice.
- During voice editing when one of the continuously variable controls is being turned, the display shows where to find its effective position of the control (the "edit find" display).
- During cassette save and load the display shows what is being saved or loaded and indicates loading errors.
- In response to many control operations, there are various blinks to confirm that the function has taken place. These blinks are not really important but it is worth looking for them as they give a positive indication that something has happened.

** ← OCTAVE → ** (to the left of the keyboard)

These two push-buttons are the 'performance' octave controls.

← OCTAVE

The octave DOWN button lowers the octave setting of the oscillators each time it is pressed until the lower limit is reached as indicated by the OCTAVE DISPLAY.

OCTAVE →

The octave UP button raises the octave setting of the oscillators each time it is pressed until the upper limit is reached as indicated by the OCTAVE DISPLAY.

FINE TUNE

This is the normal tuning control of the instrument. It raises or lowers the pitch of both oscillators by as much as 1 semitone. It is not affected when voices are selected.

(For greater shifts in tuning use the TUNE/TRANSPOSE push-button)

** OSC1 ** OSC2 **

WAVEFORM rotary switches

These allow independent selection of waveforms for each oscillator.

Position

- | | | |
|---|--------|--|
| 1 | "∧" | triangular wave |
| 2 | "∟" | sawtooth wave |
| 3 | "□" | square wave |
| 4 | "┐" | variable pulse width wave (width adjusted by "PW") |
| 5 | "PWM" | Pulse Width Modulated wave (depth adjusted by "PW") |
| 6 | "OFF" | (osc 1 only) switches oscillator 1 off |
| | "OSC1" | (osc 2 only) causes oscillator 2 to adopt the same waveform as osc 1 |

ABOUT PULSE WAVEFORMS

Variable pulse width wave and pulse width modulated wave (PWM) are similar. The waveform is like square wave (where each cycle of the waveform is simply high for half the time and low for the other half), except that the high and low times are not necessarily the same.

If they are the same, the pulse width is 50% of the cycle. If the pulse width is very narrow - say 5% - the cycle is high for 5% of the time and low for 95% of the time (or vice versa - it doesn't matter); in fact the sound of this narrow pulse width is very "thin" as you might expect from the narrow appearance of the pulse.

The most interesting sounds are usually produced when something in their make-up is CHANGING and changing pulse width is no exception. When variable pulse width wave is selected, the pulse width can be changed using "PW" but once set, it remains the same (see PW). It will be noticed, however, that WHILE IT IS CHANGING the sound seems to "come alive" in a very noticeable way.

The PWM setting allows you to keep the change going by modulating the pulse width by a slow oscillator, thus perpetuating the lively sound.

PW (pulse width)

This control is only active when one or both of the WAVEFORM select switch is in position 4 or 5 and its function is different in each case:-

Position 4 - variable pulse width. PW adjusts pulse width from 50% of the cycle (ie square wave) when fully anticlockwise down to a very narrow pulse width when fully clockwise.

Position 5 - pulse width modulation. PW sets the AMOUNT of modulation above and below 50% pulse width. The modulating signal is a triangular wave from an independent LFO (one for each oscillator) whose rate depends on the note being played. The rates for the two oscillators are slightly different and are set to give the best effect in most conditions. (LFO and TEMPO rates are not involved and are free to perform other functions.)

Each time the modulation reaches its peak, the pulse width is the same as it would be in the variable pulse width setting.

OCTAVE SHIFT rotary switch

This affects oscillator 2 only. Normally it sets the difference in octaves between the two oscillators by shifting oscillator 2. In position "0" oscillator 2 octave is the same as oscillator 1. Lower octaves are to the left (-1 and -2) and higher octaves to the right (+1, +2 and +3 which is not marked). Once set, the difference in octave is maintained when the OCTAVE BUTTONS are used.

(The exception to this is when the sequence accompaniment facility is being used. In this case, OCTAVE SHIFT controls the oscillator 2 octave setting independently of the oscillator 1 octave (and the OCTAVE display). "0" is always the "8ft" setting.)

DETUNE

This affects oscillator 2 only. It is used to finely adjust the difference in pitch between the two oscillators. The range of adjustment is up to 1 semitone up or down. A small "dead" band in the centre allows the zero point to be found easily.

(For greater displacements between the oscillators use the INTERVAL push-button.)

** SEMITONE **

TUNE/TRANSCOPE push-button

This is used in conjunction with the keyboard to alter the tuning of both oscillators in exact semitones. To do this hold down the TUNE/TRANSCOPE button and press any key in the marked TUNE AND TRANSCOPE RANGE (keys "-7" to "7"). Key "0" gives standard tuning (A=440Hz when FINE TUNE is in the centre). Using keys outside the marked range has no effect.

Note:- the effect of tuning to key "0" can be achieved by simply pressing TUNE/TRANSCOPE and then releasing it without having pressed any key.

INTERVAL push-button

This operates in exactly the same way as the TUNE/TRANSCOPE button except that only oscillator 2 is affected. The "press and release" method of returning to "0" also applies.

(During sequence accompaniment, the INTERVAL button will still operate. It acts as a SEQUENCE TRANSCOPE control, leaving the tuning of the keyboard accompaniment unaffected.)

** WAVEFORMS **

OSC 1 push-button

This is used in conjunction with the keyboard to change the waveform of oscillator 1 to a special waveform. Keys "-3" to "-7" are for pre-set special waveforms. Keys "-8" to "-12" are for programmable waveforms which can be built up using the waveform "edit" facility. Key "0" puts oscillator 1 into the waveform "edit" mode.

OSC 2 push-button

The function of this is identical to that of the OSC 1 button except that oscillator 2 waveform is changed.

These two buttons can be used simultaneously to select the same waveform for both oscillators at the same time.

When one or both of the oscillators is in the waveform "edit" mode, the other markings around the buttons apply (HARMONICS, INSERT, DELETE and CLEAR EDIT!).

See section 9 - SPECIAL WAVEFORMS for a full description of special waveform selection, waveform building and storage.

** GLIDE **

TYPE (of glide) rotary switch

Position:

- 1 "N" (normal) is standard portamento or smooth glide
- 2 "AUTO" allows glide only if the last key played is still down
- 3 "GLISS" (glissando) causes the glide to go in semi-tone jumps
- 4 "FIX N" is normal portamento with fixed time (see note below about the fixed time option)
- 5 "FIX A" is auto portamento with fixed time
- 6 "FIX B" is glissando with fixed time

Note:- The "FIX" (fixed time) settings (positions 4-6) are the same as the first 3 settings except that the glide time over any stretch across the keyboard is always the same for any particular setting of the TIME control.

TIME (of glide)

This adjusts the rate at which the oscillator notes change in response to playing the keyboard (or sequencer). The range of adjustment depends on the type of glide selected:-

from "instant" to 6 seconds PER OCTAVE for glide types 1-3
from "instant" to 1 second OVER ANY NOTE SPAN for glide types 4-6.

SOUND MIX AND VOLUME

The oscillator outputs are mixed together via the oscillator balance control. The oscillator mix is then mixed with the output of the noise generator via the noise balance control. The level of the final mix is adjusted by means of the filter drive control (the volume knob is used for this) before it is fed into the filter.

** MIX **

OSC BALANCE (oscillator balance)

This is a level balance control which sets both oscillators at full level in the centre "=" position. At "1" oscillator 2 is completely OFF and at "2" oscillator 1 is completely OFF.

NOISE BALANCE

This sets the level balance between the oscillator mix (derived from OSC BALANCE) and the noise generator. Both are at full level in the centre "=" position. At "OSC" noise is completely OFF and at "NOISE" the oscillators are completely OFF.

VOLUME

This control has 2 functions. Normally it behaves simply as a volume control. While it is being turned it produces the "edit find" display but this is related to its second function:-

- ADJUSTING THE FILTER DRIVE -

The edit find display mentioned above is showing you where the filter drive is set. (See STARTING TO PLAY or VOICES for an explanation of the edit find display.)

To alter the filter drive, hold the STORE button down (as indicated by the arrow on the panel); this holds the volume steady while filter drive is adjusted. The normal "edit find and release" function operates while you do this. When the STORE button is released, the filter drive is locked in its new position and volume knob resumes its normal volume setting role; the volume will immediately jump to the knob setting.

PITCH BEND AND MODULATION

The principal source of modulation effects is the LFO (low frequency oscillator). It can be used to modulate two things - the pitch of the oscillators and the cut-off frequency of the filter. The amount of effect that the LFO has on pitch and filter frequency is adjustable and there are two distinct ways in which these effects can be introduced:-

- 1) The first way is by means of the automatic "intro" delay. After a key has been played, modulation is introduced smoothly after an adjustable delay and the amount of modulation is adjustable independently of the "wheel" amounts of modulation.
- 2) The second way is the classical way - by means of the MODulation wheel. On this instrument, there is the additional convenience of independent programmable "amounts" of effect on pitch and filter frequency when the MOD wheel is turned.

The amounts of modulation of oscillator pitch and filter frequency from these two routings are completely independent. They can be mixed together either positively or negatively (ie they can cancel each other out).

Pitch bend is a different sort of modulation effect; it simply takes the oscillator pitches up or down like a tuning control. The BEND wheel is the control for this effect and on this instrument, there is a programmable bend wheel "amount" control to set the amount of pitch bend when the wheel is turned.

Firstly, the controls of the LFO itself will be described, then the "INTRO" delayed routing controls, then the wheel routing controls.

**** LFO ****

WAVEFORM rotary switch

This allows selection of the type of signal produced by the LFO. The positions marked KBD, ENV and R are not, strictly speaking, LFO waveforms but they provide a convenient routing for some useful effects.

Position

- 1 "N" triangular wave
- 2 " / " sawtooth wave
- 3 "L" square wave - note that this waveform only gives modulation in one direction (depending on the settings of the various amount controls) since it is most useful for trills where you do not want to lose the basic pitch being played.
- 4 "ENV" (envelope) selects the filter envelope instead of an LFO waveform
- 5 "KBD" (keyboard) selects the equivalent of the keyboard control voltage which would be found on an analogue synthesiser. This allows the keyboard pitch tracking or filter tracking to be altered from their normal settings.
- 6 " R " (random) is a sample and hold of noise which is renewed at the start of every LFO cycle and held steady until the next LFO cycle begins. Use the RATE control to change the rate at which new random levels occur.

RATE (of LFO)

This adjusts the frequency or rate of the LFO from 1 cycle every 30 seconds to 30 cycles per second.

INTRO

This is a time delay control. Every time a new keyboard note is played, any modulation set up on the PITCH MOD or AMOUNT (to filter) controls is instantly reduced to zero. The INTRO control sets the time delay before the modulation starts (and the rate at which it rises to the full amount). The minimum delay is zero and the maximum delay is about 8 seconds. Note that the type of triggering in operation (Single or Multiple) will affect the Intro function reset.

This control does not have any effect on the MODulation wheel or wheel amount settings.

PITCH MOD

This sets the amount of oscillator pitch modulation by the LFO. In the centre "0" it is zero; there is a small "dead" band here to help in finding the zero point quickly. Clockwise rotation gives positive modulation (eg sawtooth is rising or square wave is "up" only) and anticlockwise rotation gives negative modulation. The maximum modulation possible is a 7 semi-tone swing.

This control is independent of any wheel and wheel amount settings but is affected by the INTRO delay.

AMOUNT (of filter modulation)

This sets the amount of filter frequency modulation by the LFO in the same way that PITCH MOD affects pitch modulation. In this case the maximum depth of modulation possible is the full range of the filter.

It is also independent of wheel settings but is affected by the INTRO delay.

** WHEELS **

-BEND- AMOUNT

This adjusts the extent of the pitch bend obtained from the BEND WHEEL from zero to approximately 14 semi-tones up or down when the bend wheel is turned to its extreme (up or down).

-MOD- PITCH AMOUNT

This adjusts the extent of the LFO pitch modulation obtained from the MODulation WHEEL from zero to a 7 semi-tone swing when the MOD wheel is turned to its extreme (positive or negative).

-MOD- FILTER AMOUNT

This adjusts the extent of the LFO filter modulation obtained from the MOD WHEEL from zero to a swing over the full range of the filter when the MOD wheel is turned to its extreme (positive or negative).

THE WHEELS (to the left of the keyboard)

The wheels are the "performance" controls for altering pitch and modulation effects while playing. They are self-centering and in the centre position, they have no effect. Although they may not return exactly to their centre positions after being turned, they have a small "dead" spot in the middle to ensure that they have no effect in the rest position.

BEND wheel

This raises or lowers the oscillator pitches to an extent programmed by BEND AMOUNT control.

MOD (modulation) wheel

This simultaneously controls the amount of LFO modulation of:-

1. PITCH programmed by the wheel PITCH AMOUNT
2. FILTER FREQUENCY programmed by the wheel FILTER AMOUNT

It is not affected by the INTRO delay or the alternative pitch mod. and filter amount controls. Wheel modulation can be mixed in with INTRO modulation if required.

THE FILTER

The filter is somewhat unique in that it is actually TWO FILTERS, each with 12 dB/octave cut-off slope. The cut-off frequencies of the two filters always keep in step but they can be separated from each other by an adjustable amount using the SEPARATION control. This facility allows the best of both the "punchy" effect of a 24 dB/octave filter and the more "rounded" tones possible from 12 dB/octave filter (see SEPARATION).

Use of the "Q" control provides all the usual effects when no separation is applied but the combination of high Q settings AND separation can give a new range of sounds, particularly with BANDPASS filtering where some distinctly "vocal" effects can be obtained.

ABOUT FILTER TRACKING

This deserves some explanation as it is often taken for granted. It is usual for the filter cut-off frequency to "keep in tune" or track with the oscillator frequency (ie the note pitch) so that the amount of filtering with respect to the oscillator note is kept constant. This has generally become accepted as the most useful way to use the filter.

There are, however many application for amounts of filter tracking ranging from over twice the "in tune" amount down to "negative" amounts in unusual cases. The amount of filter tracking can be changed by selecting KBD on the LFO waveform switch and setting up an LFO filter amount. It could be done via the mod. wheel routing but the wheel would have to be held away from centre all the time. The direct filter AMOUNT routing is the best choice, with the INTRO delay set to zero.

**** FILTER ****

TYPE (of filtering) rotary switch

LP - low pass. All frequencies present in the input to the filter which are below the cut-off frequency pass through to the output. Above the cut-off frequency, the amount of signal that reaches the output depends on its frequency; the higher it is, the less of it gets through. If the cut-off slope is steep (24 dB/octave), the reduction in the signal is greater than it would be with a more gentle slope (12dB/octave).

In this setting, both filters work as low pass to give a 24 dB/octave slope (when there is no separation).

HP - high pass. This is the same in principle as the low pass setting except that frequencies above the cut-off frequency are passed through and those below are reduced.

In this setting, both filters work as high pass again giving 24 dB/ octave (no separation).

BP - band pass. In this setting, one filter works as low pass and the other as high pass. The combination allows frequencies between the two cut-off frequencies to pass through. Above and below, the signal is reduced at 12 dB/octave.

The separation control adjusts the width of the band. If the "Q" control is turned up when separation is applied, the resonant peaks of the two filters are not at the same frequency and this can clearly be heard in certain circumstances.

Positions 4 - 6 labelled as "NO TRACK" are the same as the first three positions except that the filter does not track with oscillator 1. Note that the KBD setting of the LFO waveform switch can still be used to provide adjustable filter tracking.

SEPARATION

This adjusts the difference between the two filter cut-off frequencies from zero (fully anticlockwise) to about 4 OCTAVES' separation (fully clockwise).

In "LP" and "HP", zero separation makes the two filters work together as one 24 dB/octave filter. As the separation is increased, the effect is to decrease the cut-off slope towards 12 dB/octave.

In "BP", increasing separation increases the band width of the filter.

FREQUENCY (of cut-off)

This is the "manual" control for the cut-off frequency of the filters. The range of adjustment is the entire audio spectrum (from less than 16Hz to over 16 KHz).

Both filters are changed together, maintaining any "separation" that has been set up. LFO modulation, envelope transients and "tracking" are superimposed on this basic setting.

Q (or resonance)

This affects the behaviour of both filters in the vicinity of their cut-off frequencies. With Q set fully anticlockwise (no resonance), the filters behave as described above in the TYPE of filtering section.

If the Q is high, then signals at frequencies close to the cut-off frequency are magnified to an extent that depends on the Q setting to produce a resonant effect. In the extreme (Q almost fully clockwise), the filters actually oscillate at their cut-off frequencies, thus producing a note even if the oscillators are turned off.

The effect of a high Q setting and modulation or envelope control of the cut-off frequency is to strongly accentuate the changes in cut-off frequency. For example triangular wave LFO modulation produces the familiar guitarist's WAH-WAH effect.

Since two independent filters are involved, any separation of their cut-off frequencies produces two distinct resonances - particularly with band pass filtering.

AMOUNT (of envelope filter modulation)

This sets the amount of filter frequency modulation by the filter envelope generator (designated as envelope generator 2) from zero to the full range of the filter in either direction. In the centre "0" position there is a small "dead" band to help in finding the zero point quickly.

The cut-off frequency sweep caused by envelope modulation can only be above or below the manually set filter FREQUENCY for any particular setting of the amount control. It will sweep above for a positive setting (clockwise) and below for a negative setting (anti-clockwise). The manual FREQUENCY control must be set to a suitable initial starting point.

THE ENVELOPE GENERATORS AND TRIGGERING FACILITIES

There are two envelope generators and they are more or less identical. Each one has four controls:- attack, decay, sustain level and release. Envelope generator number 1 (the upper set of controls on the panel) is internally connected to the "VCA" (voltage controlled amplifier) and hence controls the volume of sound. Number 2 is primarily used to control the filter cut-off frequency as the arrow on the panel suggests. It can also be routed via the LFO waveform switch enabling transient oscillator pitch effects if required. The two sets of are not actually labelled "volume" and "filter" but it can be seen from the arrows pointing towards the filter that the lower set controls the filter envelope. There are several ways in which the envelope generators can be triggered. Normally they are triggered by playing the keyboard but there are a number of alternative ways including repetitive triggering by the TEMPO clock.

The operation of the envelope generators is described in more detail in section 5 - TRIGGER GATE AND ENVELOPES and the information which follows is restricted to basic facts about the controls themselves.

** ENVELOPES AND TRIGGERING **

- VOLUME ENVELOPE GENERATOR - (number 1)

ATTACK

adjusts the time taken for volume to rise from zero to its full level (for any given volume control setting), after a trigger has occurred and while the "gate" signal is present. The range of adjustment is from less than 1 millisecond to over 15 seconds. The volume rises linearly (unlike the decay and release which are exponential).

DECAY

adjusts the time taken for volume to decay from its full level (the level reached in the attack phase) down to zero, directly after the attack has finished as long as the "gate" signal is present. The range of adjustment is from less than 1 millisecond to over 60 seconds to complete the full change in volume. If sustain level is set above zero, the decay will stop when the sustain level is reached, thus shortening the decay period.

SUSTAIN LEVEL

sets the volume level at which decay stops. This level is maintained while a key is held down OR while automatic GATE TIME is operating (ie while the "gate" signal is present).

RELEASE

adjusts the time taken for volume to fall from the sustain level back down to zero. The range of adjustment is from less than 1 millisecond to over 60 seconds to cover the full volume change (from maximum to zero). If the release starts at less than the maximum level, the release time is correspondingly shortened.

The release starts after (all) the keys have been released OR after automatic GATE TIME has finished - if it is operating (ie when the "gate" signal disappears).

- FILTER ENVELOPE GENERATOR - (number 2)

The four controls have the same effect on filter frequency as those of the volume envelope generator have on volume except for the following differences:-

ATTACK is exponential like the decay and release and the range of adjustment is from less than 1 millisecond to over 60 seconds.

If SUSTAIN LEVEL is set to zero (fully anticlockwise), there is an adjustable DELAY period between triggering and the start of the attack. In these circumstances, the RELEASE control is used to set the DELAY time instead of having its normal function. The range of adjustment of the delay is from zero to 1 second.

Note that if all keys of the keyboard are released OR if automatic gate time finishes (ie "gate" disappears) before the DELAY is over, the attack will not start.

- TRIGGERING, TEMPO, GATE TIME AND FUNCTION -

TRIGGERING rotary switch

The positions of this switch that would normally be used are SGL for single triggering or MULT for multiple triggering of the envelope generators. In these two positions, both envelope generators are triggered together.

Also, in these two positions, the TRIGGERING function is programmable. In other words when a voice is selected, the effective position of the switch is set to whatever was programmed in the voice memory. In the remaining four positions it is NOT programmable; the switch position will over-ride the effective position that the selected voice contains. However, if a voice is stored, the position of the switch will always be memorised and will take effect if the voice is selected with the switch in either the SGL or the MULT position.

In the three "RPT" (repeat) positions, either or both of the envelope generators is triggered by the TEMPO clock:-

"RPT 1" the volume envelope is triggered by the TEMPO clock

"RPT 2" the filter envelope is triggered by the TEMPO clock

"RPT 1&2" both envelopes are triggered by the TEMPO clock

In the "EXT" position, both envelopes are triggered by external trigger pulses. Also, the TEMPO knob acts as an EXTERNAL TRIGGER DIVIDE control as indicated above the knob. The choice of dividing factors is marked:- 1,2,3,4,6,8,12 or 16.

TEMPO

This controls the speed of repeated envelope triggering, arpeggiation and sequence playback. The range of adjustment is from about 1 beat every 4 seconds to 32 beats per second.

In the fully anticlockwise position marked "EXT", the tempo clock stops operating and the EXTERNAL TRIGGER IN jack socket connection becomes active. All the functions which would normally be governed by the tempo clock are now operated from external trigger pulses. This is simply an alternative way of obtaining external triggering but without restricting the TRIGGERING switch to the "EXT" position. Obviously it prevents the use of external trigger dividing.

If the TRIGGERING switch is set to "EXT", the TEMPO control becomes an EXTERNAL TRIGGER DIVIDE control as explained above.

GATE TIME

This control is active during envelope repeats and sequence playback. Its main purpose is to simulate the "key held down" time of normal playing during sequence playback. The range of adjustment is from 30 milliseconds to 8 seconds.

BEAT lamp

comes on at each TEMPO clock pulse or, if external triggering is being used, at each trigger pulse. It and stays on during automatic GATE TIME.

FUNCTION rotary switch

- NORM** (normal) is used for normal monophonic playing. With the switch in this position, FUNCTION is programmable (when a voice is selected).
- ARP** (arpeggiator) brings the arpeggiator into operation at any time except when a sequence is running.
- DUO** (duophonic) changes the oscillator keyboard assignment so that two notes can be played simultaneously. If a sequence is playing, it allows accompaniment of the sequence to be played on the keyboard.

Positions 4 to 6 are the same as the first three positions except that an indefinite HOLD is provided WITHOUT AFFECTING TRIGGERING. The effect of HOLD is to simulate the effect of holding down a key of the keyboard. It would be used for example to leave the arpeggiator playing in the MEMORISE mode while another instrument is being played.

In the NORM position, the effective position of this switch is programmable. In other words the FUNCTION can be altered by selecting a voice. In any of the other positions, FUNCTION is NOT programmable. The actual position of the switch over-rides voice memory settings, like the TRIGGERING switch in any positions other than SG or MULT. If a voice is stored, the position of the switch will always be included in the stored voice but will only take effect if the switch is in the NORM position when the voice is selected.

See section 7 - ARPEGGIATOR, DUO & HOLD for more information about this switch.

~~~~~ THE STORE AND RECALL AND SEQUENCE EDITING SECTIONS ~~~~~

All the functions of these remaining controls are described in detail in other sections. Most of the controls have several different functions and they are all briefly listed here.

** STORE AND RECALL **

VOICE push-button

is used in conjunction with the keyboard to select and store voices. Its use is fully described in section 6 - VOICES.

STORE push-button

is used in conjunction with other buttons for saving voices and waveforms and for starting a sequence edit. Its use is described in the appropriate sections. It is also used while FILTER DRIVE is being adjusted (see ADJUSTING FILTER DRIVE in the ** MIX ** section).

SEQ (sequence) push-button

is used in conjunction with the keyboard to select or edit sequences. See section 8 - THE SEQUENCER.

** SEQUENCE EDITING **

For sequencer functions, see section 8 - THE SEQUENCER

For cassette functions, see section 10 - CASSETTE SAVING AND LOADING

For arpeggiator functions, see section 7 - THE ARPEGGIATOR, DUO & HOLD

REPEAT EVENT push-button

is used in sequence edit with the keyboard to enter repeats into sequences. It can be used on its own to jump to the end of the sequence being edited.

INSERT push-button

is used during sequence editing in combination with sequence entry commands to ADD events to the existing sequence. It is also used with the DELETE pushbutton to clear the sequence being edited.

It is used with other buttons to set the CASSETTE SAVE/LOAD function into the "ready" state.

It is also an ARPEGGIATOR mode control, used to select the MEMORY mode.

DELETE push-button

is used during sequence editing to delete one event from the sequence OR with the INSERT button as mentioned above.

It can be used in the CASSETTE SAVE/LOAD "ready" state to cancel items ready for saving or loading.

It is also an ARPEGGIATOR mode control, used to set the HANDS-ON mode.

←STEP (step down) push-button

is used during sequence editing to step back through the sequence OR with STEP→ to end the edit.

In sequence repeat, it sets playback to SINGLE.

In sequence single playback, it STOPS the sequence.

In the CASSETTE SAVE/LOAD "ready" state, it starts LOADING.

It is also an ARPEGGIATOR mode control, used to select direction of play.

STEP → (step up) push-button

is used during sequence editing to step forward through the sequence OR with ←STEP to end the edit.

In sequence standby, it STARTS a single play of the sequence from the beginning.

In sequence single playback, it sets indefinite REPEAT playback.

In the CASSETTE SAVE/LOAD "ready" state, it starts SAVING.

It is also an ARPEGGIATOR mode control, used to select direction of play.

SPACE pushbutton (to the left of the keyboard)

is used during sequence editing to enter rest periods into the sequence.

It can also be used when the ARPEGGIATOR is running in the MEMORY mode while inserting notes into the memory.

Except during sequence editing, pressing the space button triggers the envelope generators.

5. TRIGGER, GATE AND ENVELOPES

GENERAL EXPLANATION

In many cases, particularly to those familiar with synthesisers, triggering and gating and their effects are self-evident activities requiring little explanation. However, since the OSCAR has a variety of triggering options, some of which are novel, this section starts with an explanation of where these signals come from and what they do.

Trigger and Gate Signals

The TRIGGER is an "instantaneous" event; its purpose is to start the ATTACK phase of envelope generators and usually to make the oscillator pitches change to whatever note is demanded (whether it is a normal keyboard note, the next arpeggiator note or the next sequencer note).

The source of the trigger signal can be the KEYBOARD, the built in TEMPO CLOCK or an EXTERNAL source such as a drum machine or another synthesiser (via the external trigger socket - see EXTERNAL TRIGGERING).

The GATE is an "ON or OFF" type of signal. It determines the activity of the envelope generators after they have been set to attack by the trigger signal. (The gate is a purely internal signal in this instrument and it need only be considered for the sake of understanding the system.)

When the trigger is being produced from the KEYBOARD, the gate is "on" or "open" while ANY key is held down. If the trigger is coming from the TEMPO CLOCK (ie during sequence playback or envelope repeats), then after each trigger, the gate is "on" for a length of time set by the GATE TIME control. In other words GATE TIME simulates the effect of holding keys down for a certain length of time. (The BEAT lamp is lit during this automatic gate time.)

Envelope Generators

There are two envelope generators. One is for controlling the volume of sound (the upper attack - decay - sustain level - release group on the panel). The other controls the filter cut-off frequency. They are almost identical in operation; after a trigger, the following sequence of events (in the order of the control panel layout from left to right) is started:-

ATTACK is the rate at which the full volume (or full sweep of filter frequency) is attained.

DECAY is the rate at which it falls back to sustain level.

SUSTAIN LEVEL is the level that persists as long as the gate is "on".

RELEASE is the rate at which it falls back to zero after the gate goes "off".

If the gate goes "off" during the attack or decay phases of this sequence, the release phase starts immediately if the output of the envelope generator is below sustain level. If it is above sustain level, the course of events depends on the settings of the decay and release rates; if the release rate is faster, then release takes over immediately but if the decay rate is faster, the output drops to sustain level at the decay rate and then falls to zero at the release rate. This arrangement gives the best results in most circumstances.

The filter control envelope has an extra facility:- if the sustain level is set to zero, the release function is sacrificed for a pre-attack DELAY function (the time between the trigger and the start of the attack phase). A delayed filter sweep can, for example, be used to obtain an "echo" type of effect. The release control is used to set the delay time.

In these circumstances, the output of the envelope generator always falls at the DECAY rate whether the gate is on or off. If the gate goes off before the delay is over, the attack phase will not start.

The Tempo Clock

This is an independent oscillator used specifically for producing regular trigger pulses and for timing the arpeggiator and sequence playback. TEMPO controls its speed (unless it is fully anticlockwise - see EXTERNAL TRIGGERING).

The BEAT lamp displays each pulse even if the tempo clock is not being used.

Note that if "gate time" is greater than the tempo clock period, the BEAT lamp will be lit all the time.

TRIGGER SELECTION

The trigger (and gate) signals which operate the volume envelope generator, the filter control envelope generator and changes of note need not be from the same source. For example, while the keyboard is controlling notes and the volume envelope, the filter envelope can be triggered by the tempo clock or by an external trigger.

The choice is made with the TRIGGERING select switch. Out of all the combinations possible (some of which would not be practical), the most useful ones can be selected.

The normal settings of the TRIGGERING select switch are SG (single) or MULT (multiple) triggering.

SG both envelope generators are triggered from the keyboard every time a key is played as long as NO OTHER KEY IS DOWN.

MULT same as SG except that the trigger occurs every time ANY key takes effect.

Use either of these positions if programmable triggering is required - see the note below.

In the remaining 4 positions, one or both of the envelope generators is triggered by the tempo clock or by an external trigger. They are usually used for special effects.

RPT1 (repeat envelope 1) - the volume envelope generator is triggered on every TEMPO clock pulse as long as a key is held down. (The filter envelope is still triggered by the keyboard and the triggering is multiple as defined above.)

RPT2 (repeat envelope 2) - the filter envelope generator is triggered on every TEMPO clock pulse unconditionally. (The volume envelope is still triggered from the keyboard and the triggering is multiple as defined above.)

RPT1&2 (repeat envelopes 1 and 2) - both envelope generators are triggered by the TEMPO clock. The effect is a combination of "RPT1" and "RPT2" combined.

EXT both envelopes are triggered by external trigger pulses. The effect is similar to the "RPT1&2" setting except that the function of the TEMPO clock is replaced by external trigger pulses.

When the volume envelope is in a "repeat" setting (RPT1, RPT1&2, or EXT), instead of holding down a key to keep the repeats going, the HOLD facility can be used (see section 7 - ARPEGGIATOR, DUO & HOLD for more information).

IMPORTANT NOTE:- If the TRIGGERING switch is in any of these four positions (repeats or external), it will not be affected when voices are selected. This allows voices to be selected without losing "special" triggering set-ups. However, if a voice is STORED the position of the switch will be memorised and will take effect when the stored voice is selected (as long as the switch is in SG or MULT when the voice is SELECTED).

EXTERNAL TRIGGERING

Connections and Signal Specifications

Separate connections are provided on the interface TRIGGER/SAVE jack socket for trigger in and out. The socket is of the STEREO type:-

TRIGGER OUT comes from the RING connection.

TRIGGER IN goes to the TIP connection.

The RING connection is normally at 0 volts. A 4 millisecond duration +5 volt pulse is produced every time the VOLUME envelope generator is triggered.

A trigger IN pulse applied to the TIP connection should be not less than 4 milliseconds duration and there should be at least 30 milliseconds between the negative edge of the pulse and the positive edge of the next. Triggering occurs on the positive edge. Reliable triggerering can take place at over 20 beats per second.

It is also possible to trigger from an AUDIO signal such as "sync" pulses on a multi-track tape recorder. A variety of different kinds of audio signal can be used eg bass drum beats, snare drum beats etc. To obtain satisfactory results, it is worth experimenting with different signals and levels. Consider the possibility of using bursts of tone or noise from OSCAR himself - the envelope repeat facility could be used to obtain regular timing.) The audio level entering the trigger IN connection should be at least 2 volts RMS.

Note:- As TRIGGER IN is through the TIP connection, a normal "mono" jack plug can be used if trigger out is not required.

Using External Triggering IN

There are two ways of using trigger pulses from an external source.

1) Direct Trigger

If TEMPO is turned fully anticlockwise to the "EXT/1" position then the function of the TEMPO CLOCK is simply replaced by the external trigger pulses regardless of the position of the TRIGGERING select switch. This is the simplest way and is recommended for normal use. It allows any of the TRIGGERING switch functions to be used with an external trigger.

2) Divided Trigger

To use EXTERNAL TRIGGER DIVIDE, the TRIGGERING switch must be in the EXT position. All triggering will then be derived from a divided down version of the incoming trigger pulses.

The TEMPO control acquires a new function in this mode. Its rotation is split into 8 equal zones, each giving a different dividing factor as shown on the panel (1,2,3,4,6,8,12,16 going in a clockwise direction). The knob should be positioned roughly in the CENTRE of the relevant zone.

To reset the dividing function so that the NEXT external pulse will produce a trigger, press the "SEQ" button then release it. (Same as the sequencer "reset" function.)

The divide function allows, among other things, economical use of sequencer space in set-ups where the sequence note only needs to change on every other beat of the basic timing signal for example.

VOICE CONTROL SUMMARY

Switching On

Switching the instrument on automatically selects voice "0", the PANEL voice. It has the same effect VOICE + key "0" as below.

Selecting Voices

Set TRIGGERING to "SG" or "MULT" and set FUNCTION to "NORM" if normal programmable response is required for these switches.

VOICE + key "0" selects the PANEL VOICE and sets up the following things:-

OCTAVE to 8 ft (centre LED of display)
TUNE/TRANPOSE to "0" (A=440Hz)
INTERVAL to "0" (same semi-tone as OSC 1)
FILTER DRIVE to 2/3 (start of thickened line)
ARPEGGIATOR to UP/DOWN and HANDS-ON
Oscillator Waveforms to WAVEFORM switches settings (ie they will not be special waveforms)
(This is identical to switching instrument off/on)

VOICE then release selects the special (PANEL) voice. It is the same as selecting voice "0" or switching on except that the "set-up" above does not take place. Instead the parameters above are restored to what they were when the PANEL voice was last used.

VOICE + key "1" to "24" selects one of the 24 PRE-SET voices

VOICE + key "-1" to "-12" selects one of the 12 PROGRAMMABLE voices

Storing Voices

VOICE + STORE + key "-1" to "-12"

stores all (effective) control settings (except WHEEL POSITIONS, FINE TUNE and TEMPO) in that voice location. The previously stored voice in this location will be overwritten. (Voices "1" to "24" cannot be re-programmed and storing in voice "0" has no effect)

Editing Selected Voices

After voice selection, the panel controls are inhibited from taking effect until they have been individually released:-

PUSH-BUTTON functions (transpose, octave etc) respond immediately to any changes.

ROTARY SWITCH functions (oscillator waveform, glide type, LFO waveform etc) respond immediately the switch is disturbed from its present position. The TRIGGERING and FUNCTION switches will only be inhibited if they are in their programmable positions.

CONTINUOUSLY VARIABLE CONTROLS (de-tune, wheel amounts, balance controls etc) must be turned to their effective positions using the EDIT FIND display to release them. To alter FILTER DRIVE, hold the STORE button down.

Creating Completely Original Sounds

Select the PANEL voice to release ALL the controls from the inhibited state and set them all manually.

6. VOICES

THE SCOPE OF THE INSTRUMENT

There are several ways in which the instrument can be used to produce different sounds. The simplest way is to use the 24 PRE-SET voices; they can be set up instantly and no special knowledge or experience is required to use them. Between them, they cover a wide range of types of sound and give a good idea of the sort of variations that are possible.

Alternatively, it is possible to select one of the PRE-SET voices and modify it. The modified pre-set voice can then be stored in one of the 12 PROGRAMMABLE voice locations and once stored, it will be just as easy to select as a pre-set voice. Taking things a little further, the programmable voice that has been produced in this way can be selected, modified and stored again, either in a different programmable voice location or in the same one as before (thus over-writing what is already there). In fact, you can go on modifying as much as you like until the sound is what you want.

Finally, you can create voices of your own from scratch. If you have no experience of synthesisers, you may find it only too easy to get "lost" when trying to do this but rest assured that you are not the only one who has had difficulty. The only way to learn is to persevere and get used to the instrument and what it can do.

At any time, the sound which has been set up is "captured" precisely when it is stored in one of the 12 programmable voice locations. It does not matter how the sound was obtained in the first place; it could be a modified voice or a completely original one (or even a completely un-modified pre-set voice). Programmable voices can be called up any number of times and will remain unchanged until they are re-programmed. They will not be lost when the instrument is switched off.

A summary of the functions discussed in this section is on the opposite page.

WHAT HAPPENS WHEN THE POWER IS SWITCHED ON

When the instrument is first switched on, voice "0" is automatically selected. This is the PANEL voice; it is entirely determined by the positions of the controls on the panel. Unless the controls are in "sensible" positions, playing the keyboard may not produce any sound at all or it may produce unpleasant sounds (don't forget to turn the volume up).

In this condition, the instrument is like any NON-programmable synthesiser; all the usual controls (and more) are available for voice formation and you have complete freedom to experiment with a vast range of sounds.

More about the PANEL voice later.

SELECTING VOICES

Each of the 37 keys of the keyboard has a different voice associated with it. The row of numbers above the keyboard is provided to help in identifying the keys.

The keys marked "1" to "24" are for the PRE-SET voices. To select one of them, hold down the VOICE button (in the STORE AND RECALL section) and WHILE IT IS HELD DOWN, press one of these keys. Then release the key and the voice button. The selected voice will now be ready to play.

Note that the TRIGGERING and FUNCTION switches will only be programmed when a voice is selected if they are physically set in their "programmable" positions:-

TRIGGERING positioned at SG (single) or MULT (multiple)

FUNCTION positioned at NORM (normal)

In any other positions, the actual knob setting of the switch concerned will over-ride the settings which the voice memory contains. The reason for this arrangement is to allow special "set-ups", such as arpeggiate with envelope repeats, to be maintained when voices are selected.

Keys "-1" to "-12" are for the programmable voices; they are selected in exactly the same way as pre-set voices. If these voices have not already been programmed, they may not produce a proper sound (as with the panel voice when the controls are not set in sensible positions). When the instrument is new, it is quite possible that none of them will produce a decent sound initially.

THE PANEL VOICE

The PANEL voice (voice "0") is selected in the same way that pre-set or programmable voices are selected except that key "0" is used. Doing this has exactly the same effect as switching the instrument off and on again. Either way, certain things get "set up" automatically:-

- The centre OCTAVE is selected
- Transpose settings go to "0"
- Filter Drive is set to about 2/3 of its maximum level (start of the thickened line)
- The Arpeggiator mode is set to UP/DOWN and HANDS-ON
- Waveform select reverts to the waveform switches (ie NOT a special waveform)

The reason for this is to set these things at a good starting point before any work is done to build up a sound. If the meaning of this automatic setting up is not clear, ignore it until you are more familiar with the instrument.

Once the controls on the panel have been set up, voice "0" could be treated as a thirteenth programmable voice. However there is a slight limitation here because the automatic set-up described above takes place. This may not be a problem in some circumstances but you may not want the centre OCTAVE setting or "zero" transpose for example. To get over this, there is another way to select the PANEL voice; simply press the VOICE button and release it (without pressing any keys). It has the same effect as selecting voice "0" except that the octave, transpose, arpeggiator mode and waveform selection are left as they were WHEN THE PANEL VOICE WAS LAST USED.

The word (PANEL) is written under the voice button to remind you of this function. (Note the brackets round the word). Again, this can be ignored initially if it is not fully understood; you may find it useful later on.

STORING VOICES

Storing a voice for use later on is very similar to selecting a voice except that the STORE button is used as well. Hold down the VOICE and STORE buttons at the same time and while they are BOTH held down, press one of the keys from "-1" to "-12". Whatever sound is set up at the time will be saved and can be recalled later by using the same numbered key (with the voice button alone) as described in SELECTING VOICES. The settings of TRIGGERING and FUNCTION will always be stored but will only be faithfully reproduced on selecting the voice later on if these switches are set in their programmable positions as described above.

The stored sound may have been obtained by starting from scratch with the PANEL voice or by selecting a pre-set or programmable voice and modifying it (see EDITING VOICES). Either way, the sound that gets stored is the sound that you can hear at the time the storing is done.

(Attempting to store a voice in one of the PRE-SET locations (1 to 24) will simply have no effect; it is not possible to permanently change what is stored in these voice locations. Storing in voice "0" will also have no effect.)

EDITING VOICES

Whenever a pre-set or programmable voice is selected, the positions of all the controls on the panel (except the few that are not stored as part of a voice) play no part in the selected voice. They are inhibited from taking effect so that the selected voice can operate properly. (In the case of TRIGGERING and FUNCTION, this only applies if they are in the programmable positions.)

The octave display blinks about once every second to show you that at least some of the panel controls are not in the right positions to produce the voice that has been selected.

Unfortunately, there is no visible indication of where the controls should be to produce the sound of the selected voice. (Ideally, they would all wind themselves round automatically to the correct positions every time a voice was selected to show exactly how the voice was formed in the first place - this would be difficult to do!)

Instead, they are "inhibited" from taking effect but it is possible to release them individually from this inhibited state so that the voice can be adjusted, control by control, until the desired sound has been formed. If any controls happen to be in the right position corresponding to the voice just selected, they will not be inhibited and will respond immediately to any adjustment.

Any controls that are not in the right position (the chances are that most of them will not be), must be released from the inhibited state before adjustment can take effect. The way in which a particular control is released depends on what type of control it is. There are three types:-

ROTARY SWITCHES:- Changing any rotary switch setting (filter TYPE, osc1 or osc2 or LFO WAVEFORM, glide TYPE etc) is fairly straight-forward as the change takes effect immediately. As soon as the switch is disturbed, its new position will be the active one. Note that if one of the switches is already in the position you want, (eg you want BAND PASS filtering and the filter TYPE switch is already set to "BP") then turn the switch either way to release it then return it to its original position - the required one.

PUSHBUTTON CONTROLS:- eg OCTAVE, TUNE/TRANPOSE, OSC2 INTERVAL etc. take effect immediately. The "inhibited" condition does not really apply to these controls since they are, in effect, always "locked" in their selected positions. Simply select what is required - it will always work.

THE REMAINING CONTROLS such as ATTACK, DECAY, WHEEL AMOUNTS, FILTER FREQUENCY etc:- A special facility is provided to enable you to find the "effective" positions of these controls before changing them:-

-THE EDIT "FIND" DISPLAY-

Watch the OCTAVE DISPLAY while turning one of these controls. If the LEDs on the left-hand light up, this tells you to turn clockwise to find the effective setting. Correspondingly, if they light up on the right-hand side, it tells you to turn anti-clockwise to find the active setting. As you turn the knob TOWARDS the correct position, more LEDs will light up until finally, ALL of them are lit when you are very close to it. A few small movements of the knob when all the LEDs are lit will "release" it and the FIND display will suddenly disappear - now the control will respond to adjustment.

If the FIND display did not appear at all, the knob must have been in the correct position to start with.

It may seem a little difficult to use at first but when you get the hang of it, it will enable you to find the correct position very quickly. By knowing where the control was set before any adjustment is made, you are not left in the dark about how it was used to in the voice which was selected. Also, it allows smooth changes to be made; if the control was released immediately it was turned, the sudden "jump" to a new setting might cause an undesirable sound.

(This process is referred to in other sections as "EDIT FIND AND RELEASE")

Once a control has been released in this way, the FIND display will not operate on this particular control again until a voice is selected. Selecting a voice always inhibits the controls (except those which happen to be in the correct physical positions for the settings which the selected voice establishes) and will cause any "edited" settings to be lost.

STORING THE NEWLY FORMED SOUND

At any stage in the process of editing, the new sound can be stored in one of the programmable voice locations using the procedure described earlier in STORING VOICES. Don't forget to do the storing operation if the sound is required for later use; immediately a new voice is selected or the instrument is switched off, all the editing work done will be lost if the sound is not stored first. Also remember that storing a voice in any particular location ("1" to "12") will wipe out what was there before.

Important note:- When storing "edited" voices, do not falter on the voice button before the chosen programmable voice key is pressed or the special (PANEL) voice mentioned earlier may accidentally be selected. In fact, selecting the PANEL or (PANEL) voice - the distinction is made by the brackets round the word - simply releases ALL the controls so that the entire control panel determines the sound of the instrument. An "edited" sound is made up partly of settings that you have made by hand and partly of settings that are still inhibited. By accidentally selecting (PANEL), all the inhibited settings would be lost.

Every time a voice is selected, all the controls will be inhibited again (except the ones that happen to be in the right positions) and the editing procedure can be started again from the beginning.

If ALL of them have been released, the OCTAVE display will stop blinking. (If, by chance, all the controls had been in exactly the right positions, the blinking would not have started.)

CREATING ORIGINAL VOICES

The meaning intended here is creating voices from scratch rather than starting with a pre-set or programmable voice and editing it. All that is required is to select the PANEL voice (voice "0") and take it from there. The special (PANEL) voice could be selected instead but it is not such a good starting point as some of the settings (transpose, arpeggiator mode and waveform mode) may not be immediately obvious.

Using it this way is just like using any non-programmable synthesiser and it obviously requires some understanding of all the voice forming controls. This method is recommended if the full potential of the instrument is going to be realised but it may take some practice to get used to the controls. All the usual controls that would be expected of a non-programmable synthesiser are there.

The more unusual facilities like the waveform building feature are simply additional but do not have to be understood before starting on voice creation from square one. The other sections in this manual provide all the details required to understand all the facilities of THIS INSTRUMENT. Although this may not be enough for a complete stranger to synthesisers, it is worth studying the whole manual before resorting to a book about synthesisers or help from an expert.

See section 10 - CASSETTE SAVING AND LOADING for permanent storage of voices.

7. THE ARPEGGIATOR, DUO & HOLD

THE FUNCTION SWITCH - Manual and Programmable Operation

Although the arpeggiator, duo and hold functions are not particularly related, they are grouped together in this section because they are all brought into play by means of the function switch. Before these three functions are described, the ways in which the switch can be used will be explained.

If the switch is in the NORMAL position (fully anti-clockwise), then its "effective" position is programmable. That is when a voice is selected, the function will be set according to how it was operating when that particular voice was stored. If it is in ANY other position, the function will be determined by the switch itself regardless of any changes that selecting a voice would bring about if the switch were in the NORM position. (This is similar to the TRIGGERING switch which is only programmable in the SG and MULT positions.)

This arrangement allows any of the five function combinations - arpeggiator or duo with or without hold, or hold by itself - to be maintained when voices which contain other FUNCTION settings are selected (eg all of the pre-set voices select the NORM position).

Remember that when a voice is STORED, the effective switch function will always be included in the stored voice. When the voice is selected later on with the switch in the NORMAL position, the effective switch position AT THE TIME OF STORING will immediately come into play. If you don't want the arpeggiator, duo or hold to operate initially when the voice is selected, don't forget to switch FUNCTION back to NORMAL before storing the voice.

HOLD

The three most clockwise positions of the FUNCTION switch give the same functions as the other three positions except that the "gate" (described in section 5 - TRIGGER, GATE AND ENVELOPES) is kept on. It has the same effect as holding keys down on the keyboard indefinitely.

THE ARPEGGIATOR

Set the FUNCTION switch to "ARP" or "A HOLD" (if indefinite hold is required). Every key held down will now be played in ascending or descending order, depending on the particular ARPEGGIATOR MODE selected.

If required, the keys played can be memorised so that the arpeggiation continues without holding the keys down. Four of the SEQUENCE EDITING push-buttons have additional functions to set the mode of operation. They will only affect the mode if the arpeggiator is actually operating.

Speed Adjustment and Triggering

The arpeggiator speed is adjusted by the TEMPO control in the same way that sequencer playback and envelope repeat speeds are adjusted. If external triggering is being used, the arpeggiator speed will also be governed by the external trigger pulses.

While it is running, the arpeggiator itself does not trigger the envelope generators each time the note changes. Any of the envelope repeat positions of the TRIGGERING switch can be used allowing the choice of automatic triggering of either or both envelope generators, each time the note changes. Section 5 - TRIGGER, GATE & ENVELOPES gives details of the automatic triggering options.

Setting Direction of Play

Direction is set by the two STEP buttons in the SEQUENCE EDITING section:-

- ←STEP (then release) sets repeated descending play (DOWN MODE).
- STEP→ (then release) sets repeated ascending play (UP MODE).
- ←STEP→ (then release) sets alternate ascending/descending play (UP/DOWN MODE).
(both step buttons)

When setting the direction of play, remember that the STEP buttons are also used for starting and stopping sequence playback. To prevent the sequencer from starting, hold down at least one key of the keyboard while the arpeggiator direction is being set.

Hands-On Mode or Memory Mode

This is set using the INSERT and DELETE buttons in the SEQUENCE EDITING section:-

- DELETE (then release) sets the arpeggiator to the HANDS-ON mode.

In the Hands-On mode, the arpeggiator will only run through the keys which are actually being held down. If a key is released, it will not be present in the arpeggiation the next time round. (If all the keys are released, the oscillators will lock onto the last arpeggiator key that was playing. Whether this is heard or not will depend on the envelope generator settings and whether HOLD is being used.)

This is the best mode for "live" playing as the keyboard responds directly to changes on the keyboard.

- INSERT (then release) sets the arpeggiator to the MEMORY mode.

In the Memory mode, you can continue adding more notes into the arpeggiator memory as long as AT LEAST ONE KEY or the SPACE BUTTON is held down.

After ALL keys (and the space button) have been released, the next key or the space button will clear the memory, ready for a different set of notes to put in.

This mode is most effective when HOLD is operating (or with a very long volume envelope release time). It allows the instrument to carry on playing un-attended so that another instrument can be played in the meantime. As soon as a different set of notes is required, they can be keyed in; this immediately clears the previous set of notes.

The TUNE and INTERVAL transpose controls can also be used without disturbing the arpeggiator memory as long as the transpose button is held down BEFORE the key in the transpose range is pressed.

Arpeggiation in Stored Voices

When a voice is stored, the current arpeggiator MODE selection will be stored as well as the position of the FUNCTION switch.

Note:- the PANEL voice and all the PRE-SET voices initially set the arpeggiator modes to UP/DOWN and HANDS-ON.

THE DUO FUNCTION

Duophonic Keyboard Playing

Set the FUNCTION select switch to "DUO" or "D HOLD" (if indefinite hold is required). Now, if two keys are played, both notes will sound (one oscillator each).

If ALL the keys have been released, then playing one key alone will still force both oscillators to the same note. This makes it easy to alternate between unison and harmony by keyboard control only.

Although DUO does not give truly duophonic performance, it broadens the potential of the instrument by enabling keyboard controlled harmony which is not normally possible on monophonic synthesizers. However, it is worth considering the following things.

It may not be easy to keep track of which oscillator is playing which note in the DUO mode but the rule to remember is that after the all keys have been released, the first key pressed "holds on" to oscillator 1 until that key is released.

The usual system in polyphonic synthesizers is a certain number of "voice blocks" which are assigned to keys as they are played. Normally all the voice blocks would be set to the same sound for obvious reasons but if they were not the same, it would be hard to keep track of which key was playing which sound. Bearing this in mind, DUO normally gives best results with both oscillators set to the same waveform, OCTAVE SHIFT set to "0", INTERVAL to "0" and DETUNE not too far from "0". This will make the two oscillators sound the same.

The FILTER TRACKING (if it is operating) is tied to oscillator 1. Since both oscillator notes pass through the same filter, it is likely that a voice with a critical filter setting will not give consistent results (unless the keyboard playing style is watched carefully). Using a "NO TRACK" type of filtering will generally give a more consistent duo response.

Sequence Accompaniment

If a sequence is running (see the next section) and the DUO function is selected, the keyboard can be played while the sequence is running. To make this possible, the sequence is played on oscillator 2 via an additional "basic" volume envelope, leaving oscillator 1 to be played through the main system.

In these circumstances, the ONLY controls settings which affect the sequence voice are:-

| | |
|--------------------|---|
| OSC 2 WAVEFORM | any waveform can be selected |
| OCTAVE SHIFT | which now becomes an INDEPENDENT octave control ("0" is the 8 ft setting) |
| INTERVAL | which now acts as SEQUENCE TRANSPOSE |
| DETUNE | which fine tunes the sequence (it would normally be set to "0") |
| OSCILLATOR BALANCE | adjusts the sequence/accompaniment balance |
| TEMPO | adjusts playback speed (it can still be used for envelope repeats on the accompaniment). External triggering can be used |
| GATE TIME | extends the "basic" volume envelope sustain time |
| TUNE and FINE TUNE | still operate on BOTH oscillators (ie both the sequence and the accompaniment) |

Note that selecting a voice still affects all these settings (except FINE TUNE and TEMPO). This means that the complete set-up for both the sequence sound and the accompaniment sound can be stored in one programmable voice location.

As long as a sequence is running and the FUNCTION switch is in either of the DUO positions, the accompaniment set-up is maintained; the keyboard and all the other controls (bend, LFO, filter, envelopes etc.) can be used without affecting the sequence.

When the sequence stops; the normal DUO keyboard playing function is resumed.

SEQUENCER SUMMARY

*** EDITING ***

Entering the Editing Mode.

SEQ + STORE + key "1" to "12" puts selected sequence into EDITING mode at the END of the
OR "15" to "24" existing sequence (and selects voice 6)

Clearing the Selected Sequence

INSERT + DELETE together clears the selected sequence
(CLEAR SEQ) (get the insert button down first)

Entry Commands - any sequence

PLAYING A KEY when no others are down enters a NORMAL NOTE
PLAYING A KEY before releasing the previous key enters a LEGATO NOTE
STEP → while holding down the previous key enters a TIED NOTE
SPACE when no other keys are down enters a REST PERIOD (and plays noise in editing mode)
REPEAT EVENT + key "1" to "24" enters a REPEAT PREVIOUS EVENT by key number -1
times (repeats play as TOP C)

Entry Commands - chain sequences only

VOICE + key "-12" to "24" enters a VOICE CHANGE (a "dummy" rest period identifies it in the editing mode).
SEQ + key "1" to "12" enters a SIMPLE SEQUENCE into the chain.

Step and Jump Commands (not entered into the sequence)

←STEP (then release) steps back and plays one event
STEP → (then release) steps forward and plays one event
(Keep either button down for repeated stepping at TEMPO rate)
SEQ then release (RESET) causes a JUMP to the START of the sequence.
REPEAT EVENT then release (JUMP TO END) causes a JUMP to the END ready for more events to be entered.

Delete, Insert and Replace

DELETE removes the event that has just been entered or played
INSERT + ENTRY COMMAND adds the event BEFORE the one just played using the step commands.
REPLACING EVENTS the event just played during stepping is REPLACED by the next ENTRY command.

Checking Simple Sequences Without Entering Them.

SEQ + key "-1" to "-12" plays back the sequence without entering it and without changing edit status.

Ending the Edit

PRESS THE 2 STEP BUTTONS SIMULTANEOUSLY (marked END EDIT) or
SELECT A DIFFERENT SEQUENCE READY TO PLAY (ie SEQ + key) or
START EDITING ANOTHER SEQUENCE (ie SEQ + STORE + key)

*** PLAYBACK ***

Normal Playback from the Standby Mode

SEQ + key "1" to "12" selects a sequence in the STANDBY mode ready for playback
OR "15" to "24"

STEP → (START/REPEAT) starts a SINGLE play or sets REPEAT if sequence is already playing
←STEP (SINGLE/STOP) cancels REPEAT if operating otherwise STOPS playback immediately
SEQ then release (RESET) RESETS the sequence to the start WITHOUT AFFECTING THE PLAYBACK STATUS.

"Immediate" Playback of the Simple Sequences

SEQ + key "-1" to "-12" plays one of the simple sequences immediately WITHOUT AFFECTING PLAYBACK STATUS.
Subsequent "immediate" plays can follow on directly.

8. THE SEQUENCER

INTRODUCTION

The sequencer is a comprehensive section for storing notes, spaces, chains of sequences and voice changes which can later be played automatically.

22 independent sequences can exist at the same time in the sequencer memory; a total of 580 "event" spaces are available to be shared between them. Any one sequence can be up to 255 events in length. The total space available may not seem particularly large if considered as 580 simple notes but large sequences usually call for some repetition of phrases. In fact the EFFECTIVE capacity is many thousands of notes assuming that a reasonable amount of repetition is involved.

The first 12 sequences (labelled SEQUENCES 1-12 on the panel) are restricted to notes, spaces and note or space repeats. They should be the first choice for simple sequences. The next 10 sequences (labelled CHAINS 15-24 on the panel) can be used in EXACTLY the same way but they can contain voice changes and any of the sequences in the 1-12 group as well as notes and spaces IN ANY ORDER OR COMBINATION.

Notes within sequences can be extended (tied) over any number of beats such that no envelope trigger occurs between them. Similarly notes can be carried over to the next with no triggers in between (legato phrasing).

To create sequences, it is necessary to enter a special SEQUENCE EDITING mode in which you have complete freedom to create, examine and change the selected sequence but you cannot accidentally alter or erase any others. In the editing mode, "events" can be deleted, replaced or inserted until the individual sequence maximum (255) or the total storage space (580) is reached. If space runs out, another sequence must be shortened or cleared altogether to make room but it can be saved on tape first. (see section 10 - CASSETTE SAVING AND LOADING)

During editing, any of the simple sequences (1-12) can be played to remind you what is there, without leaving the selected sequence editing mode.

For convenience, a suitable voice for sequence editing (voice 6) is automatically selected when editing is started and the OCTAVE DISPLAY reverses (ie octave is indicated by the LED which is OFF) as a reminder that you are in the editing mode.

Note that the use of the STORE button for sequence editing is slightly different from its use in storing voices or waveforms. The action of "storing" a sequence actually takes place WHILE it is being edited; it is not a separate operation which has to be done after editing.

Once sequences have been created, they will remain in the sequencer memory even if the mains is switched off. The only way to change them is to edit them individually. Any sequence can be selected instantly, ready to play. Playback speed is governed by the internal TEMPO clock or by external trigger pulses (from a drum machine for example). If required, the external trigger pulses can be divided down by various factors to make the best use of sequencer event space in circumstances where the basic external triggering rate is a multiple of the required sequencer playing rate (see section 5 - TRIGGER, GATE AND ENVELOPES).

While a sequence is playing, the GATE TIME control allows the "on" period (simulated "key down" time) of each note to be adjusted. (This is in addition to the normal envelope controls.)

GETTING AQUAINTED WITH THE SEQUENCER

There are quite a few sequencer commands to learn about. After reading through this section, it may seem very complicated but don't be put off. If you are worried by the number of commands available, go through the sequencer part of section 3 - STARTING TO PLAY first to get used to it. The facilities available are designed to make the sequencer easy to use once it has been mastered but it may well seem just the opposite at first.

If you feel that you are not getting the expected results, the best thing to do is start again. Enter the editing mode, clear the sequence, put a few notes and spaces in, end the edit and play it back. Use the simple sequences at first and forget about stepping through the sequence, inserting and deleting, repeat commands etc until you are confident that you can at least get something working. Read the explanations of the various

commands carefully and treat them literally and exactly. They do exactly what is said - no more and no less. There is no need to use all of them by any means to get quite complicated sequences playing.

CREATING AND EDITING SEQUENCES

When power is first applied, the sequencer is in the STANDBY mode ready to play sequence 1. Before entering the editing mode to create or edit a sequence, set up the following things:-

set the FUNCTION switch "NORM" (other settings can give confusing results)
set TEMPO to about the "2 o'clock" position (fairly fast tempo)
set GATE TIME to about the "9 o'clock" position (fairly short gate time)

Entering the Sequence Editing Mode.

SEQ + STORE + key "1" to "12" puts one of the simple sequences into the EDITING mode.

-OR-

SEQ + STORE + key "15" to "24" puts one of the CHAIN type of sequences into the EDITING mode.

In either case, voice 6 is selected automatically and you are ready to add more events on to the END of whatever sequence is already there. The following sequence editing commands are now available:-

Clearing the Selected Sequence

INSERT + DELETE together ERASES THE ENTIRE SEQUENCE - be careful !!
(CLEAR SEQ)

(Note that it is better to get the insert button down FIRST otherwise the delete function will operate and play the deleted event. This does not really matter but the deleted event might be something inconvenient like a voice change!)

Clearing a sequence is only possible in the editing mode and only the selected sequence can be cleared.

Beware that when the instrument is new, there could be anything already stored in the sequences. You could try playing them all first; there may be some sequences there that have been used to test the system but they may just contain random events which will not play sensibly. Whatever is there, it is probably a good idea to clear all of them. Clearing individual sequences is explained above. There is no command available to clear all the sequences in one go (for safety reasons). Each of them will have to be put into the editing mode and cleared in turn.

Entering Events into the Sequence

The term "event" is used to describe anything that can be stored in a sequence. The events that can be stored in the simple sequences (numbers 1-12) are notes (normal, tied or legato), spaces or repeats commands. The events that can be stored in chain sequences (numbers 15-24) are all these PLUS voice changes and any of the simple sequences.

Like clearing a sequence, the following of functions are only possible in the editing mode and only operate on the selected sequence.

1) - ENTRY COMMANDS AVAILABLE IN ANY SEQUENCE -

PLAYING A KEY when no other keys are down:

enters a normal note into the sequence. The note plays normally as it enters the sequence.

PLAYING A KEY before releasing the previous key

enters a LEGATO note into the sequence. The note plays legato style as it enters the sequence. Any number of notes can be run together this way.

STEP→ while holding down the previous key

extends the previous note for another beat (adds a TIED note). No change is heard in the note but the BEAT lamp flashes to confirm the entry. The note can be extended any number of times but the "repeat event" command can be used to save space if a very long tied note is required.

SPACE when no other keys are down

enters a space (rest period) into the sequence. In the editing mode, a burst of NOISE is heard to help in identifying spaces during subsequent editing. During playback, it produces the proper effect.

REPEAT EVENT + key "1" to "24"

enters a "repeat previous event" command into the sequence. The number of repeats makes the TOTAL up to the key number selected (eg key "4" gives 3 repeats). In the editing mode, the number of repeats (key number less one) are sounded out as beats of TGP C. During playback, it produces the proper effect. ANY event can be repeated using this command.

2) - ENTRY COMMANDS ONLY AVAILABLE IN CHAIN SEQUENCES -

VOICE + key "12" to "24"

enters the selected voice into the sequence including the PANEL voice if required. The special (PANEL) can also be entered by pressing VOICE then releasing it. In the edit mode, as well as the voice change taking place as it enters the sequence, a "dummy" rest period and a flash of the BEAT lamp occur. This helps in identifying voice changes during subsequent editing. Any number of voice changes can be entered anywhere in the chain.

SEQ + key "1" to "12"

enters one of the SIMPLE sequences into the CHAIN sequence. The simple sequence is played out immediately it enters the chain.

3) - STEP AND JUMP COMMANDS - (available any time during editing)

The step and jump commands are for moving around in a sequence before changing, inserting or deleting events or for simply checking the sequence. They are not entry commands and do not affect the sequence itself.

←STEP then release

steps back one event in the sequence and plays it in the same way that it played when it was being entered. When the beginning of the sequence is reached, it has no effect.

STEP→ then release

steps forward one event in the sequence and plays it as with the step back command. Note that when stepping forward through a sequence FROM THE BEGINNING, the first step plays the SECOND event in the sequence; it is not possible to hear the first event using this command (use the "step back" command to obtain the first event).
When the end of the sequence is reached, it is possible to make ONE MORE FORWARD STEP beyond the last event in the sequence. Nothing is played but the BEAT lamp will flash. If more events are to be added to the sequence, it is important to make this final step or the last event will be REPLACED by the next entry command.

REPEATED STEPPING

To step repeatedly, do not release the step button. The initial press steps through one event as above but after "missing a beat" (to simplify single stepping) the sequence begins to play at the normal rate as long as the step button is held down. Adjust TEMPO to give the required playing speed. This is useful for stepping quickly through a long sequence.

SEQ then release (marked as RESET)

causes a JUMP to the START of the sequence. Nothing is played but subsequent use of the step commands will reveal that the jump has been made. It is useful for rapidly moving to the beginning of a long sequence without having to play through it. (This command can also be used in sequence playback for cueing sequence and drum machine start-ups.)

REPEAT EVENT then release (marked as JUMP TO END)

causes a JUMP to the END of the sequence. Like the "jump to start" command nothing is played and its purpose is to move rapidly to the end of the sequence, after stepping through and checking etc. After using this command, the situation is just the same as after entering the editing mode - ie ready to add more events to the end of the sequence.

4) - DELETE, INSERT AND REPLACE FUNCTIONS - (available any time during editing)

DELETE

removes the event that has just been entered or played out using the step commands. The deleted event plays to confirm the operation. Unless the deleted event is the last in the sequence, all the events that come after the deleted one are shifted back one beat to "fill in" the gap.

INSERT + any valid ENTRY COMMAND in 1) and 2) above

adds the event into the sequence immediately BEFORE the event just played using the step commands. If it is used during normal entries (ie at the END of the sequence), it makes no difference to the entry command. The event plays out or takes effect in the normal way as it enters the sequence. All events in the sequence that come after the inserted one are shifted forward one beat.

Note that voice changes and simple sequences can be INSERTED into chains. For example to insert a voice change, hold down INSERT and VOICE and then press the appropriate voice key.

REPLACING EVENTS

During stepping through a sequence, the event just played can be replaced by any other event by simply "playing over it" with a new ENTRY command. The total number of events in the sequence remains the same. THIS IS NOT THE SAME AS INSERTING which puts an additional event into the sequence.

‡ REMEMBER ‡

After stepping through a sequence checking or modifying, you may want to step forward to the end to carry on entering. To do this you must go ONE STEP BEYOND the last event (as mentioned in the STEP AND JUMP section) otherwise it will be replaced by the next entry command. When stepping beyond the last event, a "dummy" LED beat confirms that this has happened. A "safe" alternative is to use the JUMP TO END command (press and release REPEAT EVENT).

*** THERE WILL BE NO RESPONSE IF THE SEQUENCER SPACE RUNS OUT ***

While sequences are being created or edited, remember that the sequence space is limited in two ways:-
The individual sequence length cannot exceed 255 events.

The total of ALL the sequences and chains together cannot exceed 580 events (design changes may affect this total by a small amount).

In either case, when the limit is reached, there will be NO RESPONSE when the attempt is made to enter another event into the sequence. Another sequence will have to be shortened or cleared completely to make room for further entries.

If a very long sequence with no repeating is required, it will have to be split up into 2 or 3 parts. The parts can be joined using the chaining facility which will itself need 2 or 3 events.

If any passages in the sequence are repeated, the chances are that space can be saved by using the REPEAT EVENT command or by chaining simple sequences together. Generally it will be found easier in the long run to break the required sequence down into the simplest and shortest possible phrases and then chain them together. Doing it this way will also make economical use of the space available. A bit of forward planning should be well rewarded.

5) - CHECKING EXISTING SIMPLE SEQUENCES WITHOUT ENTERING THEM - (available at any time)

If you have forgotten what sequences are stored in the 1-12 group, they can be played without affecting the sequence being edited by using the MINUS keys with the sequence button:-

SEQ + key "1" to "12"

plays back the selected sequence without entering it and without changing the editing status in any way. (Adjust TEMPO for a suitable playing speed.)

The sequencer remains in the editing mode and in the same sequence number. It can be used when ANY sequence (simple or chain) is being edited. If a simple sequence (1-12) is being edited at the time, it can be used to test that sequence itself without coming out of the editing mode.

Ending the Edit

When the sequence being edited is finished, it is necessary to come out of the editing mode before the instrument can be used again in the normal way. Alternatively, you can go straight into editing a different sequence. The three possibilities are:-

1) PRESS THE 2 STEP BUTTONS SIMULTANEOUSLY (marked END EDIT)

This puts the sequencer into the STANDBY mode leaving it ready to play the sequence just edited (or for normal keyboard playing).

- OR -

2) SELECT ANOTHER SEQUENCE READY TO PLAY (ie SEQ + key)

The only difference between this and the first method is that the sequencer will be ready to play the newly selected sequence instead of the one that has just been edited.

- OR -

2) START EDITING ANOTHER SEQUENCE (ie SEQ + STORE + key)

This has exactly the same effect as starting an edit from the STANDBY mode. The octave display will blink OFF to confirm the operation.

PLAYING SEQUENCES

When power is first applied, the sequencer is in the STANDBY mode and sequence 1 is ready to play. STANDBY merely signifies that the selected sequence is READY FOR PLAYBACK. The sequencer is always in this mode when it is not playing or editing.

Selecting a Sequence Ready for Playback

SEQ + key "1" to "12" selects a simple sequence ready for playback but does not actually start it playing.

- OR -

SEQ + key "15" to "24" selects a CHAIN type of sequence in the same way.

In either case:- If a sequence is playing it will stop.
The octave display will blink all ON if the sequence selected is a DIFFERENT one from the currently selected sequence.

Starting and Stopping Playback

STEP → (START/REPEAT) STARTS the sequence from the beginning if it is not already playing and will make it play through once only.

- OR -

sets it to REPEAT INDEFINITELY if it is already playing through a SINGLE play.

←STEP (SINGLE/STOP) cancels the REPEAT function if it has been set but lets the sequence continue playing to the end.

- OR -

STOPS the playback immediately if the repeat function is not operating.

SEQ then release (RESET) unconditionally RESETS the sequence to the start WITHOUT AFFECTING THE RUN OR REPEAT STATUS.

This function is useful for correct "starts" when external triggering is used. Take the example where a drum machine is being used and a sequence is playing to the tempo of the drum machine. If the drum machine is stopped, this will leave the sequencer stuck in the middle of a sequence. To start from the beginning again, all that is necessary is to do a sequencer RESET and then start the drum machine again from the beginning of the rhythmic pattern.

Note that if the EXTERNAL TRIGGER DIVIDE facility is being used, the RESET command sets up the divider so that it will produce an internal trigger on the NEXT incoming trigger pulse.

"Immediate" Playback of the Simple Sequences

By using the MINUS keys with the SEQ button, any of the simple sequences (1-12) can be played immediately. This operates in the same way as it does in the edit mode where it can be used to check the existing simple sequences. It does not alter the status of sequencer at all and can be used at ANY time, even when a sequence is playing in the "normal" way.

SEQ + key "-1" to "-12"

plays one of the simple sequences immediately without the use of the normal START/STOP buttons. It does not affect the status of the sequencer.

If an "immediate" play is already running, it will set up another one which will follow on directly the first one has finished. This can be kept going indefinitely but only ONE "immediate" play can be entered while another is already running.

If a sequence is playing in the "normal" way, it will interrupt it immediately. When the "immediate" play has finished, the normal playback will be resumed.

Note that if the "normal" playback is a chain and a "chained" simple sequence is currently running, the "immediate" play that has been requested will only start when the chained simple sequence has finished.

9. SPECIAL WAVEFORMS

WHAT WAVEFORMS ARE AVAILABLE

Standard waveforms can be selected independently for the two oscillators using the WAVEFORM switches in the "OSC 1" and "OSC 2" sections of the panel. If oscillator 2 select switch is set to "OSC 1", then oscillator 1 select switch will control both oscillators waveforms. This is described in section 4 - THE CONTROL PANEL.

In addition to these standard waveforms, it is possible to select one of 5 special PRE-SET waveforms or 5 PROGRAMMABLE waveforms that have been created by addition of fundamental and harmonic sine waves. The waveform selection for the two oscillators is completely independent; for example if oscillator 1 is set to a standard sawtooth waveform, oscillator 2 can be set to a programmable waveform or can be used to edit a programmable waveform. There are no restrictions - any combination of waveforms is possible.

SELECTING SPECIAL PRE-SET WAVEFORMS

OSC 1 + key "-3" to "-7" selects one of the 5 PRE-SET waveforms for oscillator 1

OSC 2 + key "-3" to "-7" selects one of the 5 PRE-SET waveforms for oscillator 2

To save time, if the SAME pre-set waveform is required for both oscillators, the two waveform buttons can be held down at the same time while the appropriate waveform key is pressed:-

OSC 1 + OSC 2 + key "-3" to "-7" selects the same pre-set waveform for both oscillators.

(Also note that if oscillator 2 WAVEFORM select switch is EFFECTIVELY in the "OSC 1" position, it is only necessary to select a special waveform for oscillator 1. The oscillator 2 waveform will follow automatically. This will only happen if the switch position is effectively in this position: the voice "inhibit" function (see section 6 - VOICES) could be operating on the WAVEFORM switch if a voice has been selected and it WILL operate when a special waveform is selected. Although this can be useful when you are thoroughly familiar with the instrument, it can give confusing results and it is generally easier to see what is happening if the "OSC 1" position of the switch is avoided.)

The 5 pre-set waveforms are:-

- "-3" FULL ORGAN waveform containing square wave signals in 6 octaves.
- "-4" HARPISCHORD waveform containing sawtooth plus additional high frequency components.
- "-5" STRONG LEAD waveform - a complex pulse waveform with a powerful percussive sound.
- "-6" DOUBLE PULSE waveform with a slightly "ringing" sound.
- "-7" TRIPLE PULSE waveform - a more exaggerated version of the double pulse waveform.

When these waveforms are selected, they will appear virtually instantly although the time taken for the FULL ORGAN waveform may be just noticeable.

SELECTING PROGRAMMABLE WAVEFORMS

The procedure is exactly the same as for selecting the special pre-set waveforms.

OSC 1 + key "-8" to "-12" selects one of the 5 PROGRAMMABLE waveforms for oscillator 1

OSC 2 + key "-8" to "-12" selects one of the 5 PROGRAMMABLE waveforms for oscillator 2

All the rules for the pre-set waveforms apply. The two oscillators can be set to different waveforms or they can be set simultaneously to the same waveform by holding down both waveform buttons etc. However, the programmable waveforms take some time to develop. This is explained further on in CREATING WAVEFORMS.

Even if the PROGRAMMABLE waveform locations have not been programmed, there will probably be something interesting there. Try them out!

GETTING BACK TO THE SWITCH WAVEFORMS

This is just like the voice editing procedure for "releasing" the waveform switches when they are inhibited after a voice has been selected. Simply turn the appropriate WAVEFORM switch to the desired standard waveform. Disturbing the switch makes it release the special waveform. (See EDITING VOICES in section 6 - VOICES.)

CREATING WAVEFORMS

Firstly it is advisable to enter the WAVEFORM EDITING mode so that the waveform being created can be heard as it develops. (This is not essential and there are advantages in NOT using the waveform edit mode - see RAPID WAVEFORM CREATION.)

Also it is advisable, but not essential, to put both oscillators into the edit mode OR to turn down the one you are not editing (using the OSCILLATOR BALANCE control).

The method recommended is to use both oscillators - slightly detuned, set a long volume release time, select the bottom octave, low pass filter almost fully open and a fairly low "Q". Alternatively, to get something going quickly, select voice 13 (or 12) and set the FUNCTION switch to "N HOLD".

Entering the Waveform Editing Mode

OSC 1 + key "0" puts oscillator 1 into the WAVEFORM EDITING mode.

OSC 2 + key "0" puts oscillator 2 into the WAVEFORM EDITING mode.

This is just the same as selecting one of the pre-set or programmable waveforms and all the rules are the same. In this case, it is recommended that BOTH oscillators are put into the editing mode. (Use both buttons together to do it in one go.)

There will be a short delay while the "edit" waveform is installed; the OCTAVE DISPLAY blinks showing various phases of the internal waveform building process. If you have followed the recommended voice settings and HOLD is operating, you will hear the waveform building up if it is not already cleared.

Clearing the Edit Waveform

You will probably want to clear the "edit" waveform before starting:-

OSC 1 + OSC 2 (together) then release clears the "edit" waveform
(CLEAR EDIT)

Again there will be a delay while the waveform clears - if the note was playing, you will hear it disappear. You are now ready to insert or delete harmonics.

Inserting and Deleting Harmonics

The two waveform buttons have different functions when they are used with keys "1" to "24", namely to INSERT and DELETE harmonics. These functions are marked underneath the buttons. The labels INS and DEL will be used in this section since we are dealing with the harmonics in waveforms rather than selecting the waveforms themselves.

INS + key "1" to "24" inserts the harmonic of the selected order (1-24)

"1" is the fundamental or basic note
"2" is twice the fundamental frequency
"3" is three times fundamental frequency
etc.

DEL + key "1" to "24" deletes the harmonic of the selected order (if it is present).

Each time a harmonic is inserted or deleted, the waveform is re-constructed. If the note is playing you will hear the new waveform as it develops. (Again the octave display will blink while this happens.)

The LEVEL (or volume) at which each harmonic sine wave is installed depends on the order of the harmonic:-
the fundamental goes in at full level (same as any standard waveform)
key "2" (double the frequency) is at half the fundamental level
key "3" (3 times the frequency) is at one third of the fundamental level

.
.
key "24" (24 times the frequency) is at 1/24 of the fundamental level

Any harmonic can be inserted REPEATEDLY until its level matches that of the fundamental:-
the fundamental can be inserted once
key "2" can be inserted twice

.
.
key 24 can be inserted 24 times

Similarly, any harmonic can be deleted repeatedly (if it is present) until its level is back down to zero.

Using this repeated insert facility, you can build up the higher harmonics to "unnaturally" high levels and this can produce unusual and interesting waveforms. Note that the fundamental itself does not have to be present; this also contributes to interesting results.

A guide to Waveform Building

Generally, the full potential of these waveforms is obtained by playing in the lower octave registers. As a guide to the sort of sounds that can be obtained, if the harmonics are confined to lower orders (say between the fundamental and the 10th harmonic), the sounds have a "bell-like" quality.

If just a few adjacent harmonics like 5,6 and 7 and no fundamental are used, a "ring-mod" sort of sound is obtained. In fact, these "ring-mod" like sounds produced in this way are generally more useful than those produced in the usual way (rapid LFO modulation of pitch or filter frequency) because the quality of the sound is maintained over the whole keyboard. The only way this could be achieved using LFO modulation would be if the LFO frequency tracked with the keyboard.

If a random selection of harmonics is used, particularly with a lot of high harmonics at high levels, the sound has a harsher (but not dis-chordant) quality.

The most unusual sounds are obtained when there are considerable "gaps" in the spectrum. For example, a few harmonics closely grouped together at the bottom end (say 1,2 and 3), a few around the middle (say 9,10 and 11 entered a few times) and a few at the top (say 22,23 and 24 entered about 10 times each) will produce a waveform which would not normally be encountered from a "natural" source. Nevertheless it still sounds very musical.

The best thing is to experiment and get used to the sort of sounds produced by different kinds of combinations of harmonics. Also bear in mind the possibilities of the two oscillators running together, particularly when they are slightly de-tuned. This gives a much more lively effect than one oscillator alone or both running at exactly the same pitch.

Storing the Edited Waveform

When you are happy with the edited waveform, it can be stored for later use.

GSC 1 or OSC 2 + STORE + key "-8" to "-12"

stores the "edit" waveform in that PROGRAMMABLE waveform location ready for selection at any time later on. (The waveform already present will be overwritten.)

Note that EITHER waveform button can be used for storing; it makes no difference which one is used. The waveform stored is not assigned to any particular oscillator and it can be selected later for either oscillator.

Also note that you have not left the edit mode and the edit waveform is still intact. To leave the edit mode simply select any other waveform in the normal way as described earlier in this section.

RAPID WAVEFORM CREATION

When you are familiar with the results of waveform creation, it is possible to save the time it takes to enter the edit mode, wait for the waveform to be constructed after every harmonic insert or delete etc.

The procedure is actually exactly the same except that you are doing it "blind" - if you don't need the reassurance of hearing the waveform develop, it is a much quicker method. During building a waveform this way, the intermediate steps of waveform processing are not carried out (hence the time saving) and it is NOT possible to hear the waveform or store it until the EDIT mode has been called up. Follow this procedure:-

OSC 1 + OSC 2 then release ALWAYS clears the edit waveform even if it is not selected on either
(CLEAR EDIT) oscillator.

INS + key "1" to "24" ALWAYS inserts the chosen harmonic.

DEL + key "1" to "24" ALWAYS deletes the chosen harmonic.

You can tap in harmonics as fast as you like until maximum levels are reached but you must keep track of what you have done if a specific harmonic content is required. Even if you make a mistake the resulting waveform will probably be a pleasant surprise!

DON'T try to store the waveform at this stage as it is not fully processed yet.

Finally enter the edit mode (one or both oscillators - it doesn't matter)

OSC 1 and/or OSC 2 + key "0" sets up the WAVEFORM EDIT mode and the "edit" waveform is constructed. If the
note is playing at the time, it will be heard building up.

Now, the waveform can now be played or stored in the normal way.

See section 10 - CASSETTE SAVING AND LOADING for permanent storage of waveforms.

10. CASSETTE SAVING AND LOADING

WHEN TO USE THE SAVING AND LOADING FUNCTIONS

The instrument itself can hold a certain number of programmable waveforms, voices and sequences even when the mains is switched off. If the memory protection battery is fully charged, the information will be retained for a few months. It may be that this amount of storage for this length of time is sufficient for your purposes and you may never need to use the cassette saving facility.

However, if the amount of space in the instrument or the memory retention time are not sufficient or if you wish to keep a permanent record of the programming work you have put in, then this facility can be used to provide unlimited permanent storage.

SAVING is the process of storing the programme information in the instrument on tape, in a digital form. LOADING is the process of re-programming the instrument with this saved information; it over-writes what is already there. The tape recorder used for this could be of any kind; it could be a cassette recorder or a reel-to-reel recorder. In fact, a cassette recorder is likely to be the least reliable method but saving and loading does not require very high quality recording. The convenience of a cassette recorder therefore makes it the best choice.

CONNECTIONS AND SIGNAL LEVELS

The TRIGGER/SAVE jack socket provides the connections for cassette saving and loading. The socket is the STEREO type:-

- The SAVE output to the recorder comes from the RING connection.
- The LOAD input from the recorder goes to the TIP connection.

The SAVE output signal is a series of 0 to +5 volt pulses and the source impedance is 4 Kohms approximately. The signal is suitable for a DIN type of input but signal and impedance matching are not critical. Generally, the input will be considerably "overloaded" but this will not cause damage to input circuitry and, within reason, it gives the best results. Even a microphone input can often be used.

The LOAD signal from the recorder should be at least 2 volts peak to peak and not greater than 10 volts peak to peak. A direct DIN type of output is NOT suitable. Use the LOUDSPEAKER or EARPHONE signal - cassette recorders usually have a 3.5 mm jack socket output that is suitable.

If you are choosing a cassette recorder for this purpose, no more than about £20 needs to be spent but make sure that it has external input and output connections and that the output level is sufficient to drive headphones at a fairly high level.

The usual cause of trouble in saving and loading (assuming that sufficient recorder output level is available) is BAD TAPE. If the tape is creased or the oxide has worn off in places or it is just inconsistent in response, there may be errors in loading. Use a fairly new tape if possible.

Rather than worrying about all the problems that could occur, just try it - if you get the connections right in the first place, it shouldn't give you any trouble. Before making any serious recordings of information you wish to keep, make sure the system works first.

SAVING AND LOADING

Information is saved in three groups - all programmable waveforms, all programmable voices and all existing sequences. It is NOT possible to save individual waveforms, voices or sequences but it IS possible to select any combination of the three groups for either saving or loading.

The type of information saved will subsequently be recognised on loading. Information of a certain type can therefore be extracted from a tape containing information of all three types spaced closely together.

The approximate saving or loading times are:-

| | |
|----------------|------------|
| 5 Waveforms | 5 seconds |
| 12 Voices | 12 seconds |
| Full sequencer | 17 seconds |

Preparing to Save or Load

Four of the buttons in the SEQUENCE EDITING section are labelled in a small "cassette functions" panel. The names in this small panel will be used here.

Whether you want to save OR load, decide what information you are interested in - WAVEFORMS, VOICES, SEQUENCES or any combination of these.

Hold down the "ready" button. While it is held down, press:-

| | | |
|------|-----------------------------------|--|
| | OSC 1 or OSC 2 (waveform buttons) | for the 5 PROGRAMMABLE waveforms |
| -OR- | VOICE | for the 12 PROGRAMMABLE voices |
| -OR- | SEQ | for ALL existing sequences |
| -OR- | STORE | for waveforms, voices and sequences all together |

As soon as any of these are pressed, the OCTAVE DISPLAY acquires a new function to show the status of the save or load.

From left to right, the 5 LEDs represent:-

| | | | | |
|-----------|--------|-----------|--------|-------|
| 1 | 2 | 3 | 4 | 5 |
| WAVEFORMS | VOICES | SEQUENCES | SEARCH | ERROR |

The first three simply show which items are going to be saved or loaded.

SEARCH and ERROR both flash at this stage to alert you to the save/load function. (Nothing can be played on the instrument now.)

As long as the "ready" button is held down, other items can be entered in any order to build up the list of items to be saved or loaded.

In a similar way, while holding down the "cancel" button, items can be deleted from the list to be saved or loaded. (It doesn't matter how many times items are entered and cancelled.)

If necessary, the save/load function can be terminated:-

"ready" + "cancel" terminates the save/load function and restores the instrument to its normal state.
("escape")

Saving

When the list of items to be saved is ready:-

##FIRST## start the Cassette Recorder in the RECORD mode. If the cassette is at the beginning, wait for the leader tape to pass through.

Then press "save" to start the digital information. (The direction of the arrow above the button signifies data going out through the jack socket.)

Whatever has been selected will be saved in the above order from left to right. While the data for each item is being sent out, the appropriate LED will flash to show what is being saved. When one item is finished, its LED will go off and the next will start flashing until everything required has been saved.

SEARCH flashes during saving (but it has no special significance) and ERROR remains on.

When the save is completed, the save/load function is terminated automatically, the OCTAVE DISPLAY reverts to its normal function and the instrument can be played again.

The Cassette Recorder can be stopped immediately.

Loading

When the list of items to be loaded is ready:-

Press "load" to activate the information input. (The direction of the arrow above the button signifies data coming in through the jack socket.)

SEARCH will now flash until valid data is being received.

ERROR will go off.

(The save/load function can still be terminated at this point if necessary.)

Start the Cassette Recorder playing back at a point just before the data to be loaded. If you are in any doubt, start at the beginning of the entire SAVE that contains the required information. Information of the wrong type will be ignored.

As each "block" of data on the tape (waveforms, voices or sequences) is encountered, it is identified. If it corresponds to one of the types selected for loading, SEARCH will stop flashing and the data will be loaded in. The appropriate LED will flash while information is being accepted.

When the block of data is all loaded in, SEARCH will start to flash again if there are more items still to be loaded in.

The order in which the blocks of data are stored on the tape does not matter; they will simply be loaded in as they occur.

(If the data is of the wrong type, "SEARCH" will continue to flash while it plays back. Whenever SEARCH is flashing, the save/load function can be terminated in the usual way - ie press "ready" and "cancel" at the same time.)

When all loading is complete, the save/load function terminates automatically, the OCTAVE DISPLAY resumes its normal function and the instrument can be played again.

Don't forget to stop the Cassette Recorder!

Loading Errors and Failure to Load

If an error occurs in the load, ERROR will blink on but the load will probably continue. The item concerned should be loaded in again afterwards. To do this, the save/load function has to be started again from the beginning (but only for any items where errors occurred).

If loading errors persist, it is probably the tape that is causing the problem. Try a different place on the cassette or a different cassette altogether. Alternatively, it could be that the signal level from the recorder is marginally too low or the speed stability of the recorder is very poor. Listening to a music tape should confirm satisfactory speed stability but the overall speed could be steadily falling if the batteries are going flat. This would also cause the problem.

If there is simply no response at all during loading, the level of signal coming from the recorder is probably much too low. Experiment with different volume control settings. If the recorder has a tone control, it is probably best to set it to maximum treble; again, do a few experiments with different settings. You can always try listening to the digital information to check that it is there in the first place. It should come through at a very high audio level.

Note:-

If the data stops WHILE A BLOCK IS BEING LOADED (say the cassette sticks or the jack plug is removed), the loading process will get "stuck" waiting for more data and the necessary synchronisation with the incoming data will be lost. This can also happen if the quality of the recording is very poor.

If this happens, the display will stop flashing. It is then NOT possible to continue loading and the instrument must be switched off and then on again to escape from this situation. Any items that were successfully loaded will NOT BE LOST.

The load session can then be repeated from the beginning for any items that were not loaded successfully.