1

INTRODUCTION

It is assumed that the reader will have a knowledge of synthesiser terminology but most of this will have been picked up from the construction notes for the modules and some of this is re-iterated in Section 3 of this manual which describes the facilities found on each module. Likewise it would obviously help a great deal if the reader was acquainted with some of the basic aspects of sound but the level required is not very high - it is a bit like driving a car; as long as you know how to steer it, the knobs to touch and the 'rules' you will get along fine and you do not need to know how the thing works, although sometimes the latter helps!

The DIGISOUND 80 is fully described in the general leaflet on the synthesiser and its general specification will not be repeated here. The main point to remember is that it is designed with a 'plug in anything to anywhere' capability so that no damage will occur if you connect any of the 3.5mm sockets together. Thus you are free to experiment with safety and the worst that is likely to happen is some non musical outputs or perhaps no output at all until you locate the wrong connection.

Another aspect we wish to stress is that the control inputs to the modules mostly accept 0 to +10 volt signals and where panel space permits an attenuator is put on the input of the control signal. In some instances such attenuators have by necessity been omitted and hence we have the 80-5 Processor module which provides, among other things, external attentuators and distributors. While the control inputs can accept the full 10 volt range if you modulate them over this range with sharp signals, such as pulse and sawtooth waveforms, then some control breakthrough may occur. The same effect will usually happen with the most expensive electronic equipment, namely, if you rapidly take it back and forth over its full range then some undesirable effects are likely to occur. In other words, there is a difference from 'bench' patching, where you may simply be plugging an output of one module to the input of another to explore its effect, and patching for a musical effect where often a gentle modulation gives the best results. Likewise if you connect a 'sharp' waveform to a VCA or VCM in a static patch then there may be a small residual signal at minimum control level. Again, in practice, when one is playing the synthesiser the waveforms are often 'softened' by filtering which immediately reduces the level of residual signal. Furthermore the sound output is rarely allowed to fall to complete silence. If you require absolute silence then it can be obtained by various techniques. In a modular synthesiser you have the capability to push the modules to their limits, and beyond, whereas in a pre-patched synthesiser the same situation cannot arise since it limits the users range of control. In summary, keep a distinction between playing the synthesiser and playing with the synthesiser.

A monophonic synthesiser is one of the simplest instruments to play. A control voltage derived from the keyboard electronics is connected to a voltage controlled oscillator (VCO) to determine the pitch and the resulting waveform is fed into a voltage controlled amplifier (VCA) where the sound is shaped by an envelope shaper whose control signal also comes from the keyboard. This set-up will produce notes directly related to the keyboard but the resulting sound will be very uninteresting as we are all accustomed to listening to more complex spectra. We have to examine ways in which the resources of the synthesiser can be utilised to provide useful musical and other sound structures.

The first step is to alter the timbre of the note so that the sound will be pleasing to the ear and the simplest approach is selective filtering of the harmonics in the waveform from the VCO. Filtering is extremely effective, and often the only technique employed in small synthesisers, but the use of additive and subtractive synthesis techniques are advantageous. For example, the sine wave from the same VCO can be added to, or subtracted from, the filtered sawtooth wave to vary the level of the fundamental frequency in a more controlled manner. Alternatively, other VCO's may be used to boost or cut the partials or even introduce some inharmonics. It has been demonstrated that the warmth of a piano tone is due to the fact that the upper partials are not exact harmonic relationships of the fundamental frequency. Naturally the use of these more sophisticated techniques requires a larger synthesiser system and there is a trade-off between striving for near perfection, which costs money, and a sound which is acceptable. The latter applies whether one is concerned with imitative synthesis of a

conventional instrument or creative synthesis of a 'new' sound.

Another feature to overcome is the monotonous nature of simple synthesiser patches, much of which arises from the precision of electronics in contrast to the craftsmanship, use of natural materials and environmental effects which have a major influence on the sound of conventional instruments. Again there are some very simple techniques which are incorporated into many synthesisers for imparting a more dynamic character to the sound. One can, for example, connect an envelope shaper to the voltage controlled filter (VCF) so that the timbre of a note is changing for at least part of the duration of a note. Other techniques include amplitude modulation (tremelo), frequency modulation (vibrato), phasing or pseudo-phasing, pitch bending and dynamic control of pulse width (pulse width modulation).

Reverting to the piano, a high quality grand will have about one hundred parts per key and the resultant sensitivity to velocity and pressure provide the player with a wide range of dynamic control. These keyboard features can be simulated electronically - at a price - but for many applications it is unnecessary. The important point to remember is that our aural responses have become accustomed to complex sound structures with a wide dynamic range. Thus if one does not have velocity and pressure sensitivity on the keyboard then it is a matter of using more cost effective resources to achieve a dynamic character for electronically created music.

The purpose of this manual is to provide the user of the DIGISOUND 80 synthesiser with information which will enable the best results to be obtained from the equipment, in particular exploring some of the aspects touched upon above. We present a brief outline of the principal use of each module and follow this up with diagrams of applications that involve several that are inter-connected or 'patched' together. The fact that one device can control another in some way is what allows a synthesiser to produce an exceptionally wide range of sounds. We do not attempt to provide a list of specific sounds, which the user will later be able to produce for himself, but rather to illustrate certain standard patches and techniques. This progresses to more advanced developments which may be used as building blocks for the creation of novel sounds as well as providing a basis for a more thorough understanding of sound synthesis in general.

Finally, we advise the reader to work through the manual from the beginning. This is particularly important in Section 4 which builds up in a progressive manner and if you attempt a patch part of the way through without at least studying the earlier parts then you may find it very difficult to interpret.