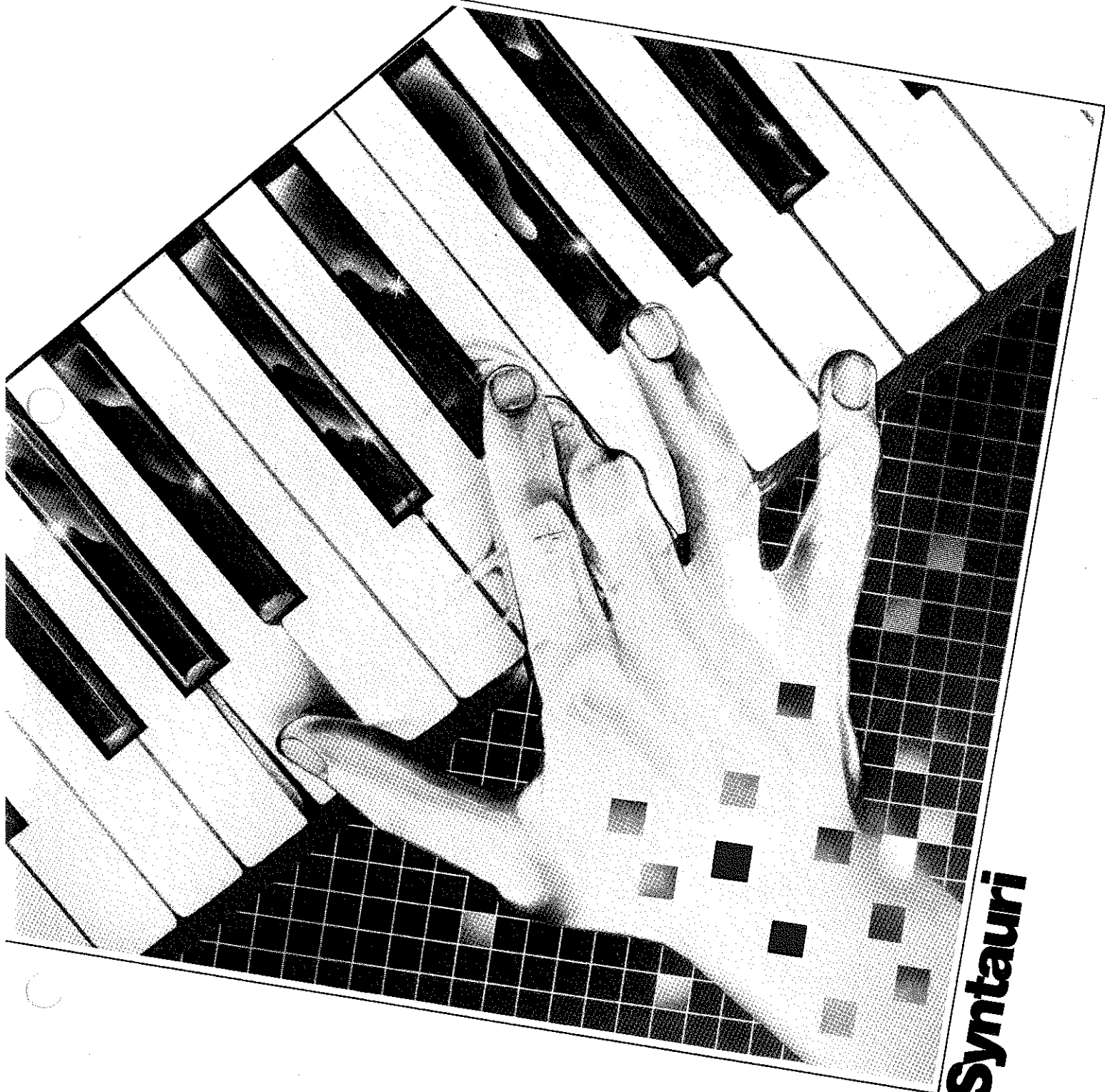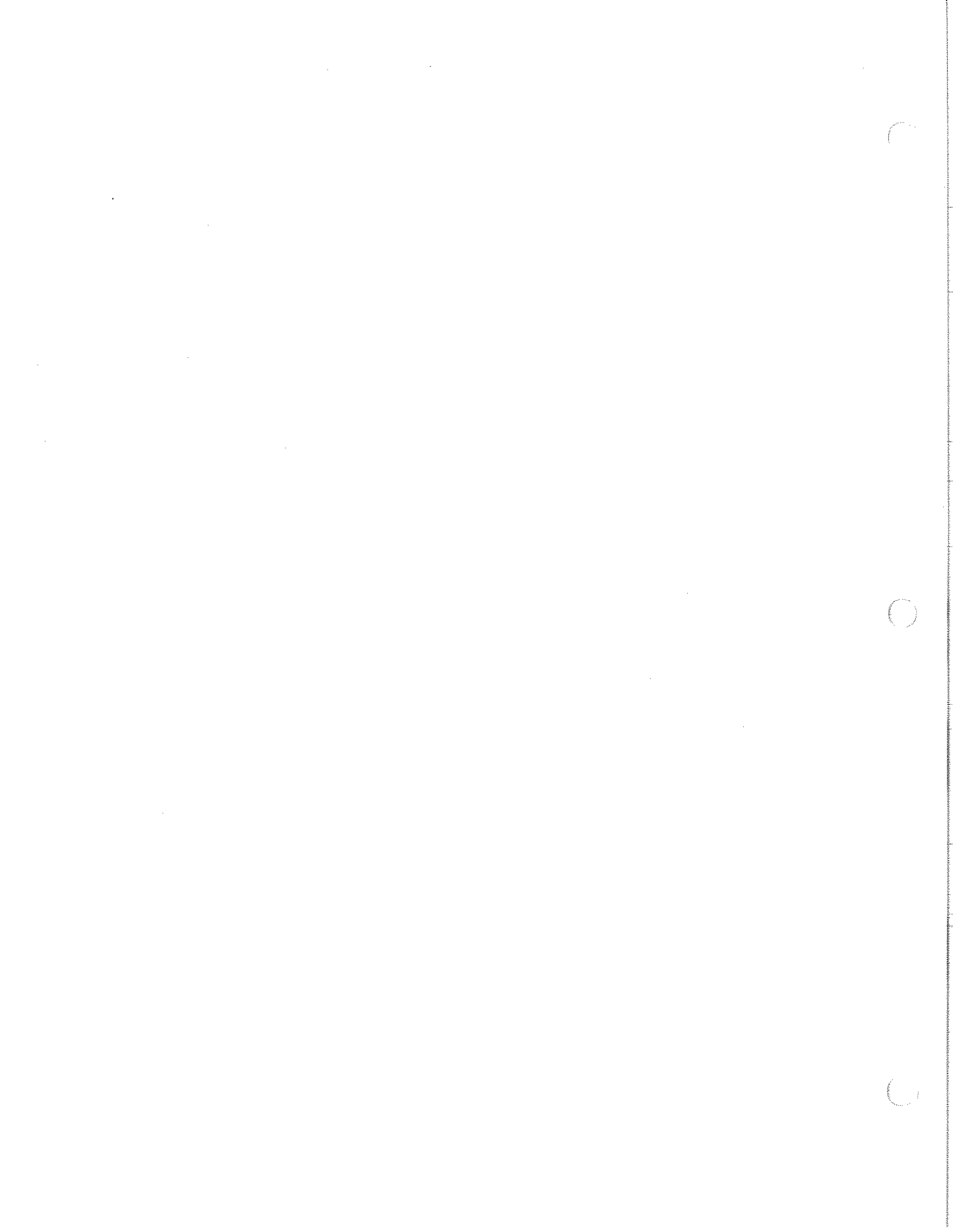# Sounds Trio™

Utility software that creates waveforms
for the alphaSyntauri® digital synthesizer

**Syntauri**

SoundsTrio

    The SoundsTrio software package contains three utility
software programs for creating waveforms: DrawWaves, B-3,
and autoPulse. Included are two diskettes, SoundsTrio
Wavemaker and SoundsTrio Waveforms. The SoundsTrio Wavemaker
diskette has on it autoPulse, DrawWaves, and B-3. SoundsTrio
Waveforms has already created waveforms from autoPulse and B-3,
and two B-3 preset masters.
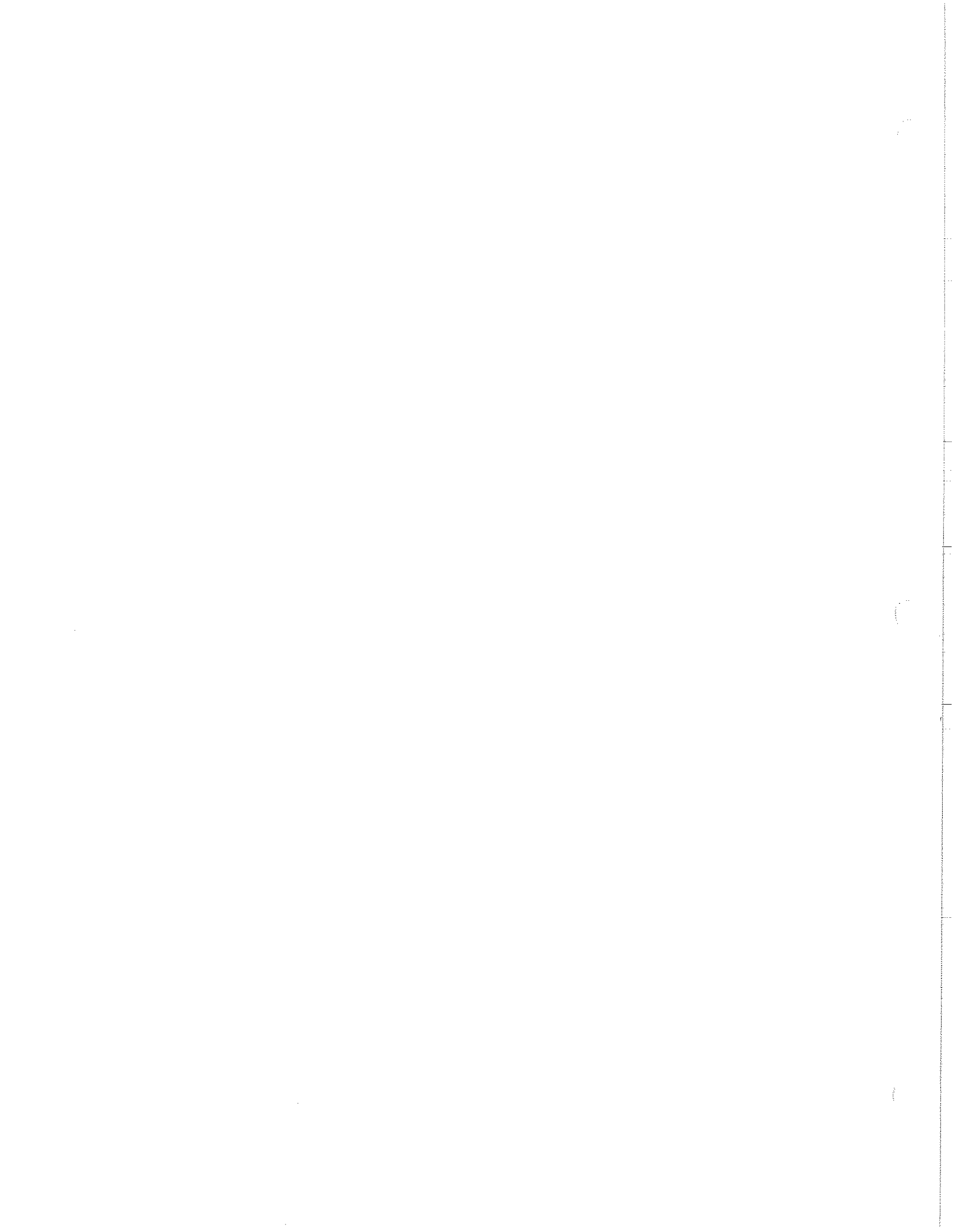
Draw Waves

Getting Started:

Turn off your Apple and insert your Sounds Trio Wavemaker diskette in your disk drive. Now power up your Apple and the MENU will appear. Enter 3 to display the Draw Waves menu. To run a program, enter 1,2 or 3. To exit enter 4 to return to the main menu.

Description and Use:

DRAW WAVES contains 3 programs:

1.) POINTS

2.) LINES

3.) VECTORS

These programs have been designed to allow you to create new and exciting waveforms for your alphaSyntauri synthesizer.

POINTS (program #1) and LINES (program #2) allow you to draw a waveform using game paddle #1. By holding the <REPEAT> key and any other key EXCEPT <RETURN>, a number will be displayed at the lower left portion of the monitor. This represents the value of paddle #1 which will be put into memory when you hit <RETURN>. The number displayed at the lower right portion of the screen tells you which point in the waveform you are about to plot. The first point you will plot will be 'Ø' and the last will be '255'. By holding the <REPEAT> key at the same time, you will be able to plot consecutive points very quickly. This technique required a little practice to get the results desired so don't despair if it seems a bit difficult in the beginning.

VECTORS (program #3) allows you to draw waveforms using straight lines. The waveform is constructed by specifying an X, Y coordinate, where X is the point in the waveform table and Y is the value of the point. For example, to create a triangle wave you would input the following:

INPUT REQUEST   YOUR RESPONSE
Enter the starting value: 127
Input point, value (X,Y): 64,255
Input point, value (X,Y): 192,0
Input point, value (X,Y): 255,127

You will notice that the starting point and ending point are both equal to 127. I recommend this procedure in making your waveform to reduce DC offset at the DAC of the oscillator boards.

autoPulse

Description

The **autoPulse** program allows you to make precise representations of pulse waves with duty cycles between 0 and 50% with a user defined number of harmonics.

Waveforms

Any complex waveform may be broken down into its' individual parts or sine harmonics. Certain standard waveforms have a known harmonic content. Some of these formulas are:

Sawtooth: $1/P$ all harmonics
Triangle: $1/P^2$ odd harmonics only
Sine: $1/P$ 1st harmonic only
Square: $1/P$ odd harmonics only

For example, to build a sawtooth wave the relative harmonic structure is:

1/1 or 100%   Harmonic 1
1/2 or 50%   Harmonic 2
1/3 or 33%   Harmonic 3
1/4 or 25%   Harmonic 4
etc.
where 'P' is the partial number.

Necessity

Why is **autoPulse** useful?

1. Pulse waves are found in many acoustic instruments such as the string family and the woodwind family.
2. Pulse waves are a common sound source in electronic music.

An important point to realize is that the harmonic content of a pulse wave is directly related to its' duty cycle. A 50% pulse wave will sound very 'hollow' or clarinet like whereas a 5% pulse will sound very 'nasal' or double-reed like.

This difference is due to the vast difference in the harmonic content of each waveform. It would take a great deal of time and effort to calculate which harmonics would appear in a given pulse wave and what their amplitudes would be. A computer, however, lends itself quite nicely to this task.

Running the Program

First boot the Sounds Trio Wavemaker diskette. A display menu will appear; enter a 1 to display the autoPulse menu then type "2" to run the program. The program will ask you for the following input:

1.   The location of your M.C. boards.
2.   The name you wish to use for saving your waveform.
3.   The duty cycle (Ø - 5Ø%).
4.   The number of harmonics for the waveform.

After you have input all of the above, the program will build the waveform and ask you to insert a diskette to save the waveform.

The program will then ask if you wish to make another waveform. If you reply no the program will end. Otherwise the program will restart so that you may continue.

Why a Different Number of Harmonics

In the world of digital synthesis it is known that the frequency response of the instrument is SR/2 or 1/2 the sampling rate.

The Mountain Computer Music System ^{tm} has a sampling rate of 32,ØØØ hertz, therefore its' frequency response is 16,ØØØ hertz. Any frequency generated above 16 khz will appear as an inharmonic function. This is known as 'foldover' or 'aliasing'. If many harmonics are generated above 16 khz, the net result will sound very distorted in higher registers.

In some applications, this is a desired effect; however, in most cases it is not. In order to avoid this you could use a waveform with many harmonics in lower registers and waveforms with few harmonics in higher registers.

For example, if you were using a waveform to produce a double bass several octaves below middle C, you might use a pulse wave with 40 or 50 harmonics. On the other hand, if you were re-creating violins several octaves above middle C you might only use a pulse wave with 10 or 20 harmonics in order to avoid foldover.

Waveforms

In addition you will find included on the Sounds Trio Waveform diskette a number of waveforms. These have been made for your use with the ALPHA SYSTEM. The name format for these waveforms is as follows:

Wave:PXX% YYH

where XX is the duty cycle and YY is the number of harmonics.

Besides the sine wave on the diskette (needed for program execution) the waveforms are:

5% to 50% duty cycles in 5%
Increments and 10 to 40
Harmonics in 10 harmonic increments

B-3 Wave Maker

Description

The B-3 Wave Maker program allows you to precisely simulate the mixing of harmonics to produce the sounds of a Hammond B-3 organ.

History

The B-3 has long been a staple of modern church music. In the last few decades it has also gained much popularity in contemporary music including gospel, R&B, and Rock & Roll.

You might say that the B-3 was the most primitive synthesizer By mixing different harmonics of different amplitudes it is possible to simulate orchestral timbres.

Unlike modern synthesizers however, the B-3 had no provisions for complex envelope generation. The organist could, however, use the volume pedal to create a certain degree of dynamic expression.

The B-3 contains two sets of drawbars for each of the organ manuals, upper and lower. Each set of drawbars contains nine individual drawbars. Each drawbar corresponds to a particular harmonic and is similar to a volume control.

The value range for each drawbar is from 0 to 8 where 0 is off and 8 is the maximum loudness. By mixing the drawbars the organist creates his or her individual timbres.

At the bottom of each manual there is one octave of keys in inverse colors - hence the white keys are black and the black keys are white. These keys are referred to as 'preset' keys. Each of the keys between C# and A natural are preset at the factory. The C natural key is the 'cancel' key. The A# key and the B natural key correspond to the two sets of drawbars for that manual.

These factory 'preset' sounds are included on the Sounds
Trio Waveform diskette as:

        WAVE:B-3 XX Y

where XX is UM for upper manual
            LM for lower manual
            and Y is the 'Preset' key

Preset Masters

In addition to the upper and lower manual waveforms there are
two preset and wave masters contained on the Sounds Trio Waveform
diskette. They are:

        PRESET MASTER:B-3 UPPER
        PRESET MASTER:B-3 LOWER

These two preset and wave masters contain the waveform and
envelopes to enable you to load the standard B-3 presets to your
Alpha system just like any other preset master.

Percussion

The B-3 contains the provision to generate a percussive tone
with each key depression.

There are two harmonics available for this purpose. They are
the 2nd and 3rd harmonics. On the Sounds Trio Waveform diskette
 you will find two harmonics for this function. These are stored
as:

        WAVE:2nd HARM
        WAVE:3rd HARM

By loading one of these waveforms in the percussion channel
and setting up a 'piano-like' envelope you may duplicate the
percussion effect of the B-3.

Running the Program

First boot the Sounds Trio Wavemaker diskette. A display menu will appear; enter a 2 to display the B-3 WaveMaker menu then type "2" to run the program. The program will ask for the following input:

1. The location of your M.C. board.
2. The values for the 9 drawbars.
3. The name you wish to use for saving your waveform.

At that point the program will ask if you want to build another waveform. Any response other than yes will end the program.

Conclusion

I hope this documentation has provided you with enough information to use this system to its' maximum potential.

If you have any questions or problems direct your correspondence to:

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