MULTISOUND SYNTHESIZER 64

ROMIK SOFTWARE

MULTISOUND SYNTHESIZER 64.

This synthesizer allows production of a wide range of sounds with ease and a minimum knowledge of the workings of the Commodore 64 and its 6581 sound chip.

This manual should be used with the computer running the Synthesizer, try out each new facility as you come to it. Don't worry about trying out something you do not completely understand as you cannot crash or corrupt the program while experimenting.

To load press SHIFT/RUNSTOP. (cassette version)
LOAD "*", 8, 1 (disc version)

OWNERS OF DISC VERSION: Throughout the manual read disc for tape, wherever tape appears.

CONTENTS

INTRODUCTION

The Synthesizer consists of three screens:-

1. The Special Effects Panel.

2. The Control Panel.

3. KEYBOARD

To switch from one "Panel" to another, press the 'u' key.

The Keyboard is accessed from the Control Panel by pressing '←'

To use the Synthesizer effectively, a rudimentary knowledge of the physics of sound is helpful.

A note consists of four parts: Attack, Decay, Sustain and Release usually referred to as 'ADSR'.

1. Attack
  In the attack stage of the note it rises to its maximum volume. The period of this stage can be varied from 2 Milliseconds (thousandths of a second :m/S), up to 8 seconds (see Fig.1, Table 1).

2. Decay
  In the decay stage of the note the volume falls from the peak to the sustain level. The period of this stage can be varied from 6 m/S. to 24 seconds (see Fig.1, Table 1).

3. Sustain
  The sustain stage of the note is the level at which it remains until released (on the Synthesizer this is held until the key is released).
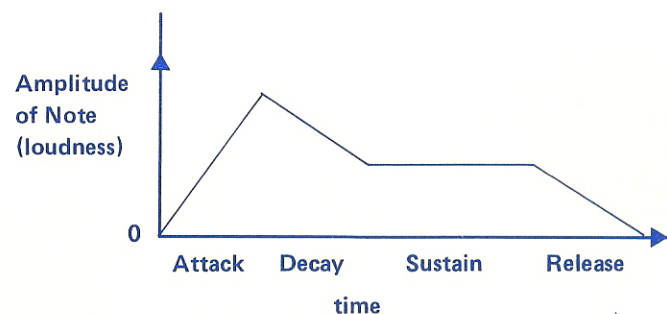
4. Release
  The release stage is the final fading of the note. The timing is as for the decay stage.

Table 1

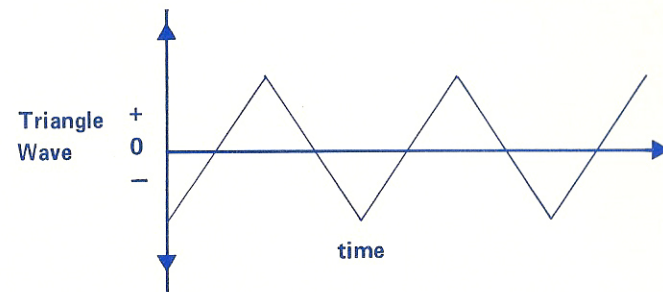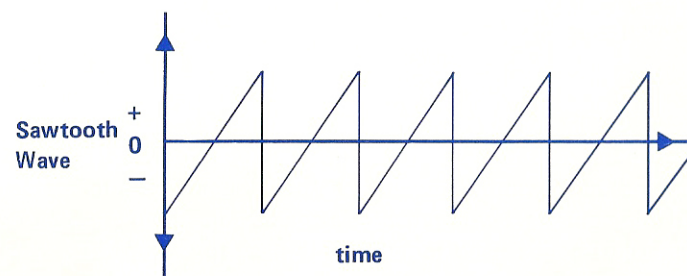| Value	Attack Rate	Decay/Release Rate
0	2 m/S	6 m/S
1	4 m/S	24 m/S
2	16 m/S	48 m/S
3	24 m/S	72 m/S
4	38 m/S	114 m/S
5	56 m/S	168 m/S
6	68 m/S	204 m/S
7	80 m/S	240 m/S
8	100 m/S	300 m/S
9	250 m/S	750 m/S
10	500 m/S	1.5 S
11	800 m/S	2.4 S
12	1 S	3 S
13	3 S	9 S
14	5 S	15 S
15	8 S	24 S

Fig. 1

WAVEFORM

There is a choice of four primary waveforms. The tonal quality, timbre and harmonic content of the sounds produced is selected by changing the waveform.
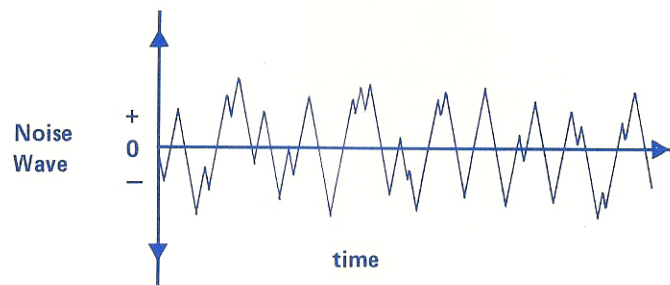
1. Triangle

The triangle waveform produces a hollow sound, similar to a woodwind.
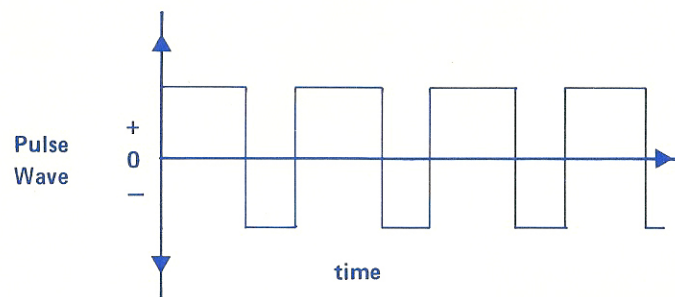
2. Sawtooth

The sawtooth waveform produces a more 'tinny' sound, similar to a plucked string instrument.

3. Noise

The noise waveform causes a random unstructured sound to be produced, this is useful for sound effects such as explosions.

4. Pulse

The pulse waveform is rather more versatile, but to achieve this versatility rather more setting up is required. To ease this, the pulse width parameter has been separated into coarse and fine controls. Pw-hi provides a coarse adjustment, Pw-low a fine adjustment : used together it is easy to set up the pulse waveform to suit your needs.

FILTERS

The filters are used to alter the harmonic content of the sound produced. Three primary filters are available.

1. Hi Pass Filter

The Hi-pass filter allows all notes above the cutoff point to pass unchanged. Notes below the cutoff point, however, are muted at a rate of 6 decibels (db).

2. Low Pass Filter

The Low-pass filter allows all notes below the cutoff point to pass unchanged. Notes above the cutoff point are muted at a rate of 6 db. per octave.

3. Band Pass Filter

The Band-pass filter mutes notes both above and below the cutoff at a rate of 6 db. per octave.

BAND-PASS FILTER

4. Notch Reject Filter

The notch-reject filter works in a slightly different manner to the above three filters. Allowing notes well above and below the cutoff point to pass unmuted, but muting notes at the cutoff. The muting decreases at 6db. per octave.

NOTCH-REJECT FILTER

CHAPTER 4

USING THE CONTROL PANEL

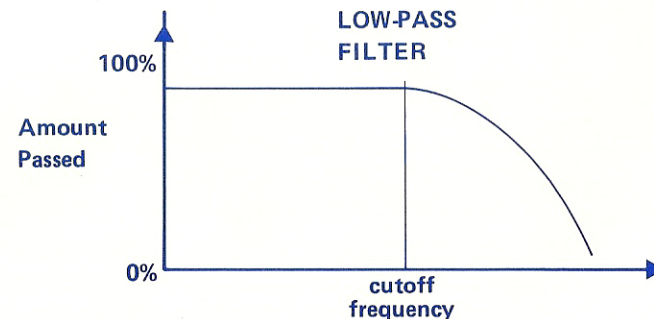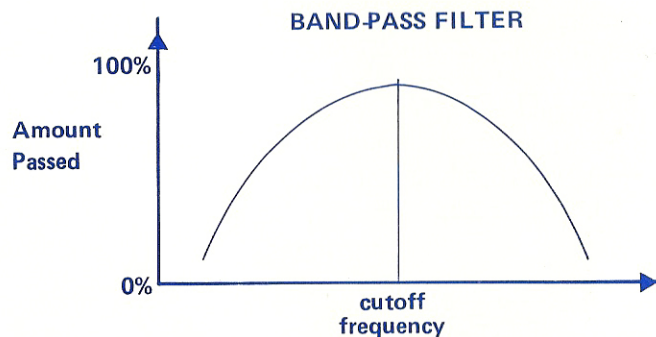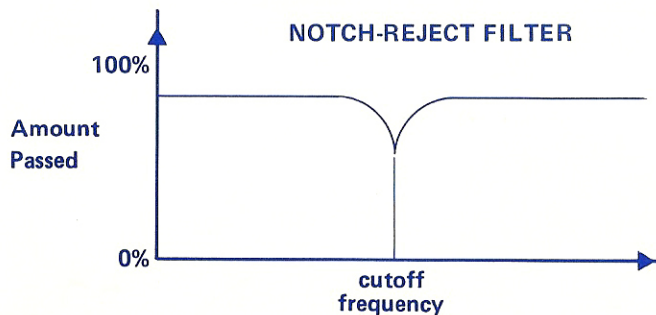The Synthesizer has two Control screens: the Special Effects Panel, and the Control Panel.
On loading, the Special Effects Panel is displayed. To switch between the Control and Special Effects Panel press the 'u' key.

On the top line of the Control Panel, the waveform selected and filter type are shown:

Wave (£) :- Triangle Filter (↑) off

The symbols £ and ↑ select the waveforms and turn the filter on and off respectively.

Below the top status line is a sequence of bar settings for Envelope (ADSR) Control.

```
     00            00            00            00
1 –  –        2 –  –        3 –  –        4 –  –
  –  –          –  –          –  –          –  –
  –  –          –  –          –  –          –  –

 Attack        Decay        Sustain       Release
```

To adjust Attack, Decay, Sustain and Release press the keys 1, 2, 3 and 4 respectively.
This will increase the levels of each. The two digits above the scale will increase accordingly. To decrease the levels press 'shift' and '1', '2', '3' and '4' respectively.

Below the ADSR Controls are four columns defined as Pw-hi, Pw-low, Fo-hi and Fo-low. These are the coarse and fine Controls for pulse width and cutoff frequency selection (see pulse wave and filter sections for a more complete description of these).

The third row of Controls has just two bar settings. These are for adjusting overall volume and filter resonance. They are set in the same way as described for the ADSR Controls above.

The resonance of the filter adjusts the degree of muting applied.

Next to the volume and filter resonance controls is a list of filters with 'mode +' below. Pressing the '+' key cycles through the filter types. Next to this are the words Keyboard, Control, FPS-0 with 'input ←' below. Pressing the '←' key switches between the Control and Keyboard modes.
FPS is considered later in Chapter 5.

Keyboard Mode is the Mode in which sounds are actually produced.

Keyboard Mode cannot be accessed through the Special Effects Panel. The Keyboard is set up as follows:-

Key	1	2	3	4	5	6	7	8	9	0	+	−	£	CLR HOM
Note		C#	D#		F#	G#	A#		C#	D#		F#	G#	A#

Key	q	w	e	r	t	y	u	i	o	p	@	*	↑
Note	C	D	E	G	A	B	C	D	E	F	G	A	

Key	a	s	d	f	g	h	j	k	l	:	;	=
Note			C#	D#		F#	G#	A#		C#	D#	

Key	z	x	c	v	b	n	m	,	.	/
Note	B	C	D	E	F	G	A	B	C	D

Pressing a key will produce the note shown below it, e.g. pressing 'd' will produce C# (C sharp).

Octave Selection
From the 8 octaves available a range of three must be initially selected, which can be played from the Keyboard. Initial selection is made in the Control Panel. The keys z - n select the lower octave.

Key	z	x	0	u	b	n
Octaves available	1-3	2-4	3-5	4-6	5-7	6-8

Whilst in Keyboard Mode the keys 's' and 'a' shift the available range up and down, giving the user the full 8 octave range for playing.

PLAYING MODES

When selecting a playing Mode, press the activating key whilst in the Control Panel. The next key pressed should be the first note. This will cause the display to change to that of the Keyboard. When a note is played a marker will appear on that key on the screen.

Foreground playing modes

1. Keyboard playing mode.
This Mode is selected by pressing the 'f' key whilst in the Control Panel. The Synthesizer will act simply as a keyboard.

2. New tune creation
This Mode is selected by pressing the 'a' key whilst in the Control Panel. Anything previously in the foreground memory is overwritten. The new tune is stored exactly as played, including spaces and note duration.

3. Append tune
This Mode is selected by pressing the 'd' key whilst in the Control Panel. It works in the same manner as New Tune Creation, except that instead of erasing the tune previously in memory; the new tune is added to the end of the previous one.

4. Auto-spaced new tune creation.
This mode is selected by pressing the 'q' key whilst in the Control Panel. It is similar to New Tune Creation except that the computer inserts its own note duration and space timing. The speed at which the computer spaces the notes is controlled by the PI delay scale on the Special Effects Panel (1 = very fast, 255 = very slow). An extra space can be inserted whilst playing by pressing the '1' key.

5. Auto-spaced append tune

This Mode is selected by pressing the 'e' key whilst in the Control Panel. It is similar to Append Tune, but the computer provides the timing.

6. Play back Mode (I)

This mode is selected by pressing the 's' key whilst in the Control Panel. When Keyboard Mode is entered the tune stored in the foreground memory will be played by the computer.

The parameters in the Control and Special Effects Panels may be changed and the tune played back. Experimenting with the parameters can cause a tune to sound completely different to when originally played.

7. Play back Mode (II)

This Mode is selected by pressing the 'w' key whilst in the Control Panel. It is identical to play-back Mode (I); but the overall play-back speed may be varied using the '<' and '>' keys.

This is the FPS function located at the bottom right hand corner of the Control Panel. The '<' key decreases the FPS value, while '>' increases it. The FPS value defaults to 64 but may be varied from Ø to 245. Ø is extremely fast, 245 very slow.

Background playing mode

In addition to the foreground tune discussed above, a background tune can be simultaneously played by the computer.

This can be a drum routine. Either one of the built-in routines (keys F1 - F8), or a user devised drum sequence. Alternatively a short repetitive tune may be used (up to 85 notes).

To set up a background tune set the ADSR, pulsewidth and octave values on the Control Panel as discussed earlier. Then press the 'g' key to transfer to the background generator.

Still in the Control Panel, press either the 'h' key or the 'y' key. These record the background in the same manner as foreground modes 2 and 4 respectively.

The background tune is then enabled by the 'k' key. The ';' key disables it.

Pressing 'l' allows the background tune to be heard in either the Control or Special Effects Panel. Pressing ':' stops the tune.

A total of nine background tunes may be stored in the computer's memory. It is only possible, however, to play one background tune at a time.

To save a background tune into one of the background memories press the '*' key. The border will flash until a key from 1-9 is pressed. The tune being saved into the background memory chosen, overwriting any tune previously stored there.

To load a previously stored background tune press the '@' key. The border will then flash until a key from 1-9 is pressed. The selected tune will be transferred to the present background memory, leaving the original unaffected.

Drum Mode

The Synthesizer has eight built in drum routines. These are selected whilst in the Control Panel and act as the background tune. Consequently a normal background tune and a drum routine may not be played simultaneously.

To set up the background as a drum routine: adjust the Control Panel to produce a drum-type sound (Appendix A contains a set of suitable levels). Depress the 'g' key to set up the background generator then press one of the functions keys F1-F8 for one of the pre-recorded drum routines.

To enter a user-devised drum routine press the 'h' or 'y' key as above. Play the drum routine as a normal background tune then re-enter the Control Panel. On next entering Keyboard Mode the drum routine will play automatically.

Background tempo

To increase the tempo press the crsr-left key, to decrease press the crsr-down key.

CHAPTER 6

THE SPECIAL EFFECTS PANEL

On this screen are three headings, 'Oscillator 3', 'Special' and 'I/O Control'. (Halfway down the screen is a heading 'Panel Commands': below this heading is a summary of commands used in the Control Panel Mode).

The Special Effects Panel enables the user to set up sound effects using ring modulation, synchronisation and sweeping.

The most important effect is that of sweeping which may be either oscillator or envelope sweeping.

Oscillator sweeping

When oscillator sweeping is selected the output of oscillator 3 is added to the foreground note.

If triangle wave is selected on oscillator 3 then the triangle output will be added to the note being played.

Similarly with sawtooth and noise waveforms.

The range of sweeping is set by the OSScale.

Envelope sweeping

Envelope sweeping acts in a similar manner to oscillator sweeping but the ADSR position of the envelope of oscillator 3 is added instead of the oscillator frequency. This output is scaled by 'ENScale'

To turn on or off any of the sweeping modes use the key in white to the left of the respective mode.

OsSw	This adds the output of oscillator 3 to the foreground note being played.
EnSw	This adds the output of oscillator 3's envelope to the foreground note being played.
FoSw	This adds the output of oscillator 3 to the cutoff frequency of the filter on the foreground note being played.
FenSw	This adds the envelope output of oscillator 3 to the cutoff frequency of the filter on the foreground note being played.
PosSw	This adds the output of oscillator 3 to the pulse width of the foreground note being played.
PenSw	This adds the envelope output of oscillator 3 to the pulse width of the foreground note being played.
RosSw	This adds the output of oscillator 3 to the resonance of the filter on the foreground generator.
RenSw	This adds the envelope output of oscillator 3 to the resonance of the filter on the foreground generator.

Any combination of the above may be used.

Setting up oscillator 3

Set up the attack and decay for oscillator 3 by pressing the '1' and '2' keys respectively. They are on scales of 0-15 (increasing past 15 cycles back to zero).

The frequency is expressed in Hertz. To increase the frequency press the '3' key, to decrease press 'shift' and '3'.

Waveform is selected by pressing the '4' key.

Pulse-width is increased by the '£' key. 'shift' + '£' decreases the pulse-width.

Ringmodulation (RING)

Ring modulation replaces the triangle waveform output of the foreground generator by a ring-modulated combination of the foreground generator and the output oscillator 3.

This produces non-harmonic overtone structures for mimicking the ringing of a bell or gong. It is turned on and off by the '5' key.

Synchronisation

This adds the waveform output of the foreground note to the waveform of oscillator 3. It is turned on and off by the '6' key.

LOADING AND SAVING TUNES ON TAPE (I/O CONTROL)

On the Special Effects Panel there is a section labelled I/O Control. This is used for loading and saving foreground and background tunes to tape.

Save tune.

This saves the foreground tune to tape.

On pressing the '9' key the message 'are you sure (y/n)' appears. Pressing 'n' aborts. If 'y' is pressed then the message 'input filename—" appears. Type in the name of the tune (maximum 15 characters) followed by <return>. If a '←' is included then the save will be aborted.

Load tune.

This works as for saving a tune but is activated by the 'Ø' key.

Save back.

Follow the 'save tune' instructions, but activate using the '+' key instead of the '9' key. This will save the current background tune to tape.

Load back.

This is activated by the '—' key and will load a background tune from tape. It can be transferred to any one of the nine background memories by the procedure described under setting up background tunes.

Merging tunes from tape.

Follow the load instructions as above, but use the 'w' and 't' keys to activate for foreground and background tunes respectively.

A) DRUM SOUNDS

B) SPECIAL EFFECTS

C) BIBLIOGRAPHY

APPENDIX A — Drum Sounds

These are sample values for a drum type sound. Improvise around these for different types of drums.

Using the Control Panel

Set: Wave   = Noise
     Attack   = 2
     Decay   = 2
     Sustain   = 0
     Release   = 0
     Octave   = 2 ('x' key)

or as above but:
     Attack   = 4
     Decay   = 6

APPENDIX B — Special Effects examples

1.

Using the Control Panel

Set: Wave   = Pulse
     Attack   = 5
     Decay   = 12
     Sustain   = 0
     Release   = 9
     Filter   = on
     Pw-hi   = 6
     Pw-low   = 0
     Fo-hi   = 7
     Fo-low   = 0
     Filter   = High-pass

Using the Special Effects Panel

Set: Attack   = 10
     Decay   = 9
     Frequency = 60 Hz.
     Wave   = Triangle
     Pulse   = 80
     Osscale   = 1/2
     Enscale   = 2

2.

Using the Controi Panel

Set: Attack   = 04
     Decay   = 10
     Sustain   = 00
     Release   = 05
     Filter   = off

In the Special Effects Panel

Set: Attack   = 00
     Decay   = 12
     Enscale   = 16
     Ensw   = on

3.

Using the Control Panel

Set: Attack   = 00
     Decay   = 00
     Sustain   = 15
     Release   = 00
     Pwhi   = 07
     Wave   = pulse

(On this effect try changing the waveform for some very different sounds).

In the Special Effects Panel

Set: Ossw   = on
     Frequency = 300 Hz
     Osscale   = 1

4.

Using the Control Panel

Set: Attack   = 00
     Decay   = 00
     Sustain   = 10
     Release   = 15
     Pwhi   = 07
     Pwlo   = 01
     Fohi   = 07
     Res   = 05
     Filter   = on

In the Special Effects Panel

Set: Fossw   = on
     Possw   = on
     Frequency   = 10 Hz
     Osscale   = 4

5.

Using the Control Panel

Set: Attack   = 04
     Decay   = 02
     Sustain   = 11
     Release   = 10
     Filter   = off
     Wave   = triangle

In the Special Effects Panel

Set: Frequency   = 200 Hz
     Ossw   = on
     Osscale   = 1/1

This produces a flute like sound.

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6.

Using the Control Panel

Set: Attack   = 00
     Decay   = 09
     Sustain   = 00
     Release   = 08
     Wave   = pulse
     Filter   = on
     Filter type   = low pass
     Pwhi   = 07
     Pwlo   = 01
     Fohi   = 07
     Folo   = 01
     Res   = 06

In the Special Effects Panel

Set: Ossw   = on
     Osscale   = 1/4
     Frequency

This produces a piano like sound.

Enter keyboard mode and play a tune to hear the sound of the above effects. Re-enter the Special Effects Panel and try adjusting one parameter at a time to appreciate the effect of each feature.

APPENDIX C — Bibliography

The programmers reference guide gives a good but very technical explanation of the sound capabilities of the 64.

Pete Gerrard's forthcoming title "Will you Still Love me when I'm Sixty-Four" *(published by Duckworth)* despite it's title, is useful for those wishing to explore more completely the sounds the 64 can make.

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