

Modulus MonoWave User Guide

By Till Kopper

Version 4.07

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[Http://www.Modulus.Wavesynth.com](http://www.Modulus.Wavesynth.com)

0.9 Foreword

You know: every synth comes with a manual, and every manual starts with a foreword. So here it is.

Paul Maddox is the designer, programmer, father, builder, metal worker, debugger, demonstrator, user and distributor of the **MonoWave**. We could start by praising all the goodies the **MonoWave** has, we might even start by telling you an anecdote or two. But to make a short story long, - ahem - to make a long story short, we just decided to sum up the **MonoWave** in a single sentence: Imagine a monophonic, MIDI controllable, 19" rack mountable PPG blue wavetable synth minus the the wavetable scanning, plus a user selectable de-rez, with a classic Moog™ filter ladder and real analogue knobs.

Perhaps a bit too long for a single sentence ?
OK, next try:

The **MonoWave** has balls and a special "oomph" that gives it its unique sound.

We hope you will enjoy the **MonoWave** as much as we, the beta testers, did, do and will.

Switch On:

So my friends, if you're ready for the trip, you are invited to dive into the sound of the **MonoWave**. It is all, to quote Clockwork Orange's hero, Alex, "Bliss, bliss and heaven.... Hear all proper. Hear angel trumpets and devil trombones. You are invited."

Have fun, now it's yours.

(words by Till Kopper, beta tester)

1. Setting up the instrument for the first sounds

- Connect the **MIDI IN** to the MIDI OUT of the keyboard or computer of your choice.
- Connect the **AUDIO OUT** socket with an line input of your mixer or amp.
- Turn the mixer or the amp gain down.
- Connect the **MonoWave's MAINS** socket to a power outlet.
- Power the **MonoWave** on by turning the **VOLUME** knob to the 12 o'clock position.
- The display should now start to show some characters, indicating that the **MonoWave** is powered on.
If it does not, check the power cord and the wall outlet.
- Turn on your amp or mixer.
- Press the * and the **CHN** buttons together to select the MIDI channel display. Change the MIDI channel you want the **MonoWave** to receive on by pressing the rightmost buttons under the display.
The upper button (+) will raise the channel number, the lower button (-) will lower it.
(#14 is selected here as our example)

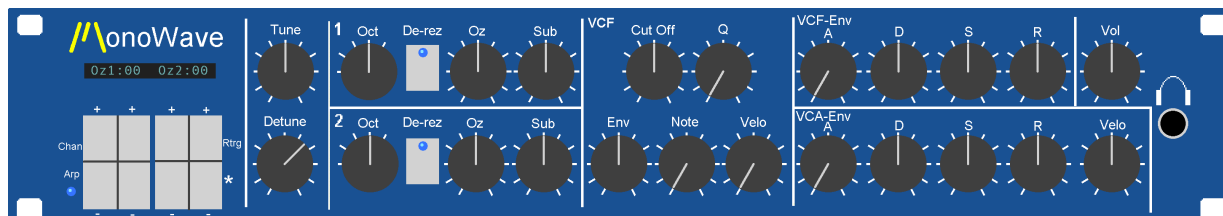
MIDI Channel: 14

- After a few seconds of not pressing any buttons the display message will change to this:

MIDI Channel: *14

This indicates that the setting is stored and won't be lost when the power is removed.

- Now set up a patch like shown here:



- Now press a key on your keyboard and hold it.
- Slowly increase the gain of your mixer or amp until the level is OK for your equipment.
- You should hear the first sound of your **MonoWave** now.
- The MIDI indicator LED near the lower left of the panel will light briefly when you press a key.

Some words about the way the manual refers to the knob settings:

all knobs, except for the oscillators' octave switches, range from 0 (full counter clockwise) to 10 (full clockwise). The 12 o'clock position is the value "5".

Look at the next section for the analogue parameters available or the section covering the digital parameters.

2. The Analogue Sections

The **MonoWave** has the following analogue sections:

- **Tune and detune**
- **Oscillator #1**
- **Oscillator #2**
- **Analogue 24dB Moog Ladder filter**
with envelope, velocity and note tracking control
- **ADSR Filter envelope**
- **ADSR Amplifier envelope**
with velocity on volume control
- **On/Off + Main Volume**

The TUNE Section

- a **TUNE** knob to tune the **MonoWave** to other instruments.
The **MonoWave** has a digital oscillator which will not drift out of tune. Center is normal tuning.□
- a **DETUNE** knob to detune the second oscillator in relation to the first. Center is no detune. Clockwise will increase the pitch of the second oscillator, counter clockwise will decrease its pitch.

The OZ 1 (Oscillator 1) section

- The 4 step octave switch (**OCT**) selects the octave transposition. This is handy if your keyboard does not have the full range or just for quick live changes. The 12 o'clock position is the normal 16" footage.
- the **DE-REZ** button will lower the sample frequency of the digital oscillator by a factor of 4 (256 samples per waveshape will drop to 64 samples) to get a more sexy low-fi sound.
Many old digital synths owe their special harsh sound due to this. Now it's user selectable and at your command.
While this is a digital controller, it is positioned near the analogue section of the oscillators for the ease of use. The lovely blue **LED** inside the button will show you when **DE-REZ** is active. You might have to raise the filter cutoff and play low notes to better hear the effect of **DE-REZ**.
- the **OZ** knob allows you to adjust the oscillator's volume.
- the **SUB** knob allows you to fade in the sub oscillator - a square wave one octave below the main pitch of the oscillator.
By using this wave shape together with the oscillator's normal wave shape, you get a very fat sound.
- The Oscillator may be modulated by the LFO. See below in the "**3. The digital section**" under the heading "**LFO**".

The OZ 2 (Oscillator 2) section

same as the **OZ 1** section.

The FILTER section

- **FREQ** = Lowpass filter cut off point.
- **Q** = Emphasis = Resonance
- **ENV** adds the envelope modulation amount to the cut off frequency.
- **NOTE** adds a voltage according to the note number sent to the MIDI input.
The full counter clockwise position means no key tracking;
fully clockwise gives 200 % tracking. That is, playing an octave above the previous note will raise the cut-off frequency by 2 octaves.
- **VEL** opens the filter according the velocity of played notes. The more you turn this knob clockwise, the greater effect velocity has on the cutoff (until the filter is fully open anyway).
Thus, playing with full force will raise the cut off and make the sound brighter. Playing softly will only alter the sound by a small amount (almost in-audible). This can be very expressive.
- The Filter may be modulated by the LFO. See below in the "**3. The digital section**" under the heading "**LFO**".

The Filter Envelope section

The **MonoWave** has two analogue ADSR-style envelope generators. They are optimised for short but very precisely controlled timescales.

- **A** stands for Attack time,
- **D** for Decay time,
- **S** for the Sustain level,
- **R** for the Release time.

The Amplifier Envelope section

- same ADSR stages as the Filter Envelope.
- **VEL** allows you to change the level of velocity modulation - useful for dynamic control.
If set to zero (full counter clockwise), velocity will have no effect on loudness.
Max (full clockwise) will have maximum velocity effect. That is, near to no volume at all if played very softly. And max volume ("Are you nuts?") if played real hard.
The max volume you may gain will always be the same. This way you don't overdrive or destroy your audio equipment, ears, neighbourhood :-)

- **There is a special hold mode**

(The **ATTACK** phase must be let to finish before)

Set the **DECAY** below **2**.

Turn the **SUSTAIN** above **9**

and the **RELEASE** value above **2**.

All these conditions must be met at the same time.

The last note played will ring endlessly. If you experience a hanging note, check whether you have set the ADSR to hold mode by accident.

The Power On-off / Main Volume Knob

On its full counter clockwise position the **MonoWave** will be turned off. Use this knob to adjust the volume of the **MonoWave** to match the mixer or amp to your needs. The **PHONES** socket volume will be adjusted this way too.

3. The Digital Section

The **MonoWave** has the following digital parameter pages:

- the **Wave Shape selection**
(this is the default)
- the **LFO page**
- the **MIDI channel selection**
- the **Detune selection**
- the **Retrigger options**
- the **Arpeggiator speed and mode selection**
- the **Audition mode**

Wave Shape

The wave shape display is the main page. It is always shown when the **MonoWave** is powered up or during normal playing.



The **MonoWave** features 256 different wave shapes. Typically, analogue synths have 6 or even less waveforms. These wave shapes can be selected independently for **OZ 1** and **OZ 2**.

By pressing the + and - buttons under the digits of the display you can scroll through them by means of banks and numbers. They are numbered using the hexadecimal system. That is, 0 to F for the first digit and 0 to F for the second digit. You may think of 16 banks named 0, 1, 2, 3,..., 9, A, B, C, D, E, and F as the first digit, and the same values as the wave number in this bank.

- 00** = sawtooth;
- 01** = reversed sawtooth
- 02** = sine
- 03** = square
- 04** = triangle
- 05** = pulse, 25%
- 06** = saw, rising and rounded (more analogue)
- 07** = cross over point distorted sawtooth
- 08** = cross over point distorted sine wave
- 09** = 1.+2. harmonic
- 0A** = 1.+3. harmonic
- 0B** = 1.+4. harmonic
- 0C** = 1.+5. harmonic
- 0D** = 1.+6. harmonic
- 0E** = 1.+7. harmonic
- 0F** = noisy/distorted sawtooth

00 to **0F** (the **O** bank) were designed by Paul Maddox
10 to **7F** (banks 1 to 7) and **F0** to **FF** (bank F) were originally from the PPG wave synths (used by kind permission of Waldorf Music)
80 to **EF** (banks 8 to E) are classic digital wave shapes.

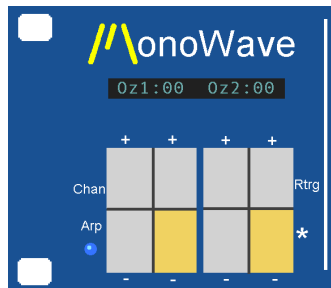
See the [Appendix](#) for a graphical display of all included wave shapes.

LFO

This is the latest addition to the **MonoWave** software: a triangle wave LFO. The routing destinations are a combination of those destinations:

- Oscillator #1** (labelled **1** on the display)
- Oscillator #2** (labelled **2** on the display)
- Filter Cutoff** (labelled **F** on the display)

Press the function button "*" and the button right of the button labelled **ARP** together.



The Display will show something like this:



The "Y" ("Yes") stands for LFO sync on key trigger. That is: the LFO starts a new wave cycle each time a key is depressed (or feeling a little sad). This may be used on filter modulations.

You change the "Y" to "N" ("No": no retrigger = free running LFO wave cycle) by pressing the upper left button under the display. The LFO may be routed to oscillator #1 and/or #2 by setting its number in the display. The two middle buttons in the upper row below the display toggle the display from "1" or "2" to "□". When a number is displayed, the oscillators corresponding to the number will be modulated by the LFO. The mod wheel (the one on your chosen keyboard controller) adjusts the modulation depth as on most synths

built since the minimooog.

The LFO to filter routing is set by the upper right button below the display. Again, the button toggles the display from " F" to "□", where "F" means that modulation is routed to the filter.

The max modulation depth of the filter is set by the keytracking knob labelled " Note". This way you are able to have heavy filter modulation and subtle oscillator modulation combined and controlled by the same mod wheel.

The setting will be automatically saved after a few seconds of not pressing any buttons. The display will show a " *" to tell you it is stored. Then it will switch back to the Wave Shape display page.

The maximum LFO depth (on oscillators and filter) can be controlled via Midi Controller #12. Eight settings are available, spread throughout the range of the controller. The selected value will be stored too during the next storing action the **MonoWave** does. If no Midi Controller #12 is ever sent to it, it will remain on the default value of "1" (max pitch modulation ± 100 cent).

The LFO Speed is set up in the ARP menu while the ARP is switched off. See the **ARP** paragraph below.

Alternatively, you can change the LFO speed by sending the Midi Controller #48 to the **MonoWave**. Transmitted controller data won't change the stored parameter of the **MonoWave**.

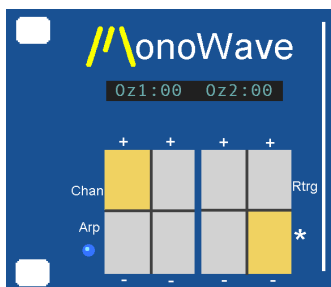
If you found an LFO speed setting you like, you may store or read the value by entering the **ARP** display and read the display. If you haven't changed settings for a few seconds, the **MonoWave** memorises the currently used speed.

The **ARP LED** left to the button below the display label **ARP** will flash according to the speed of the **ARP**. It lights up when the LFO wave cycle becomes positive.

Sorry, but the ARP and the LFO may not be used simultaneously.

MIDI Channel

Press the * and the **CHN** button together to select the MIDI Channel display.



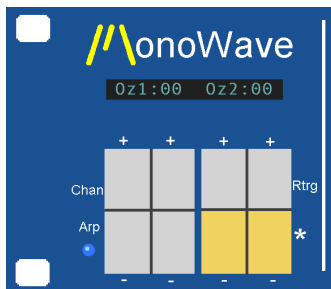
Change the MIDI channel you wish the **MonoWave** to receive on by pressing the rightmost buttons under the display. The upper button (+) will increase the channel number, the lower button (-) will decrease it.

MIDI Channel: 14

The setting will be automatically saved after a few seconds of not pressing any buttons. The display will show a " *" to tell you it is stored, then it will switch back to the Wave Shape display page.

Detune

Press the function button "*" and the button left of it together to enter the **DETUNE** mode page.



The display will show:

Detune: fine

or

Detune: semi

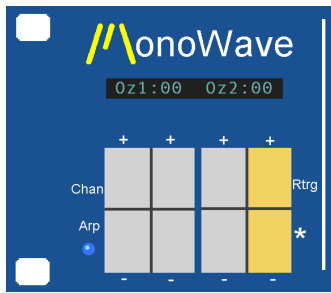
If **FINE** is selected by the buttons below the display, the detune knob will have a narrow range. This is ideal for slow beating detuning effects.

SEMI allows you to transpose the second oscillator by +7 / -8 semitones (+700 / -800 cents).

The setting will be automatically saved after a few seconds of not pressing any buttons. The display will show a " *" to tell you it is stored, then it will switch back to the Wave Shape display page.

Re-Trigger

Here, you can change the way the **MonoWave** triggers. Press the * and **Rtrg** buttons (the two buttons on the very right side of the button matrix) at the same time.



The display will show:

Re-trigger? [Y]

where "Y" means "Yes". If you select this value by using the rightmost + and - buttons, the **MonoWave** will retrigger on each incoming note, regardless of whether the last note is still pressed. This is the mode most often used by synths nowadays (due to the polyphonic nature of most of them).

The other possible setting is:

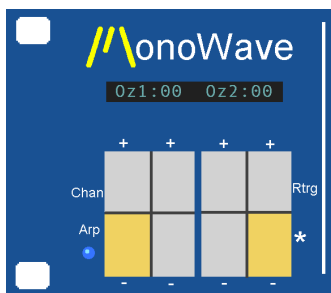
Re-trigger? [N]

where "N" means "No". In this case, the **MonoWave** will not retrigger on an incoming note if the last note is still pressed. This allows legato playing the way the Moogs used to be.

The setting is automatically saved after a few seconds of not pressing any buttons. The display will show "*" to tell you it's stored, then it will switch back to the Wave Shape display page.

ARP

Enter the ARP Mode display by pressing * and the button near the **ARP** label.



The Display will show something like:

Spd: M16 On: As

Spd (speed):

You may enter and memorise the speed (tempo) by setting its value directly, or by using the **modwheel**. Thus, the speed may be controlled by sending **mod wheel** data to the **MonoWave** while its running. However, when the **MonoWave** is set to be synced to MIDI clock, the modwheel (obviously) no longer controls the speed.

If you found a tempo you liked by using the **modwheel**, you may enter the **ARP** mode and do nothing to make the **MonoWave** memorise the current speed used.

The *unsynced* tempo ranges from **10** to **FF**. Again, these are hexadecimal values. In addition to the mod wheel tempo setting, you can also set the tempo by using the 4 leftmost buttons. The left + and - buttons change the first digit; the right ones change the last digit.

The tempo is stored automatically if no buttons are pressed for a while as described in the Wave Shape section (a * indicates storage and the display returns to the Wave Shape display).

In addition to the unsynced speed settings, you can select the following synced-to-MIDI values here:

M01, M02, M03, M04, M06, M08, M12, M16, M24, M36, M48, M96:

The "M" stands for "synced to MIDI".

The number is the fraction of a whole note that each note of the ARP is played. **M04** means a quarter note per whole note, i.e., 4 notes to the bar (4/4 time).

There are 6 different **ARP** modes to choose from:

- **A:**
The notes are played in the order you pressed them. Legato playing style.
- **As:**
Same as above, but in a more staccato playing style.
- **B:**
The notes are played in the order you pressed them, then the whole sequence is repeated transposed by an octave above. Legato playing style.
- **Bs:**
Same as above, but in a more staccato playing style.
- **C:**
The notes are played in the order you pressed them, then each note is repeated transposed by an octave above. Legato playing style.
- **Cs:**
Same as above, but in a more staccato playing style.

The **ARP** starts playing when you press a key (in non-MIDI sync mode).

The ARP LED triggers to the beat of the ARP notes to help you. This feature isn't available if the **MonoWave** is set to sync to MIDI clock.

In the case of MIDI sync (speed settings "Mxx") it will start playing if you're up to 1/16th after the beat, else it will wait until the next beat is due before starting. This ensures that your sequence is always in time with MIDI clock. You could call it an "**ARP** start quantiser".

Sending the sustain pedal MIDI CC causes the **MonoWave** to hold the played ARP notes even after all keys have been released. Without this controller being sent, the ARP will be silent after you release the last pressed key.

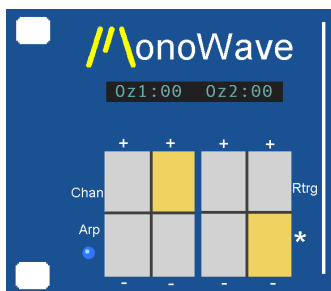
The sustain will make the **MonoWave** react as if you're are still holding the keys you pressed to make the **ARP** pattern. That is, if you press a few notes and press and hold the sustain pedal before lifting all fingers, you can enter more notes into the 32 notes long **ARP** memory of the **MonoWave**. This is good, isn't it?.

Sorry, but the ARP and the LFO may not be used simultaneously.

Audition

This is a special mode you will most likely use rather seldom. It's a way to make the **MonoWave** to play a sustained note without having a MIDI source connected to the **MonoWave** at all.

Press the function button "*" and the button to the right of the button labelled **CHAN** together.



The Display will show something like this:

Note:C Gate:Off

By pressing the two buttons below the "**Off**" shown in the display, you select whether the **MonoWave** reacts as if a key is pressed. Of course, you have to set up an audible sound with sustain to hear the selected Note, which is in the mid range of a normal MIDI keyboard.

You can change the note's pitch by selecting a new note within a scale of 1 octave by pressing the two buttons below the note's name. If you want to change the octave, select it by turning the rotary octave switches in the oscillator sections.

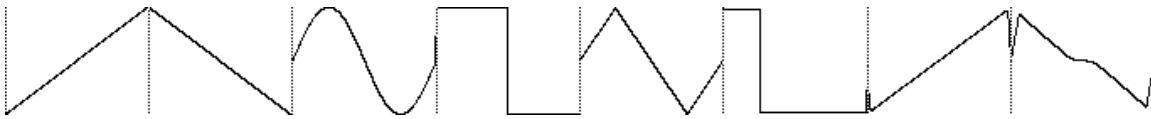
In this mode, LFO as well as arpeggiator are deactivated.

To exit the **Audition** mode and return to the Wave Shape display, press the "*" button.

4. Appendix

Waveshapes

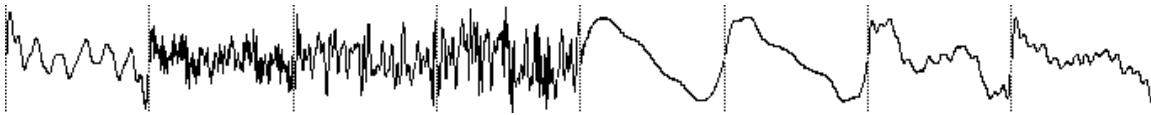
wave shapes 00 to 07



wave shapes 08 to 0F



wave shapes 10 to 17



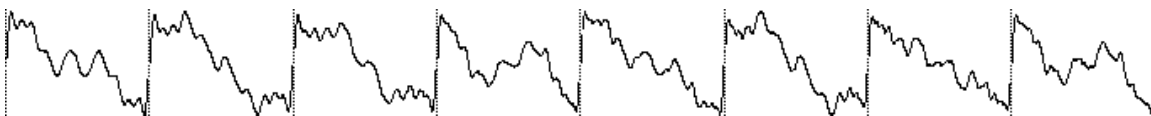
wave shapes 18 to 1F



wave shapes 20 to 27



wave shapes 28 to 2F



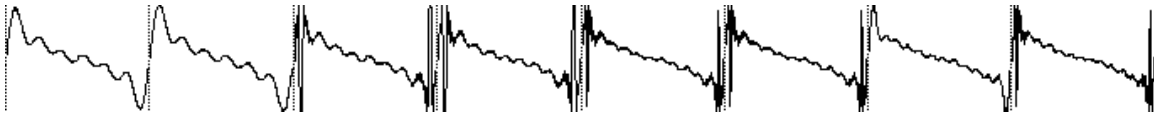
wave shapes 30 to 37



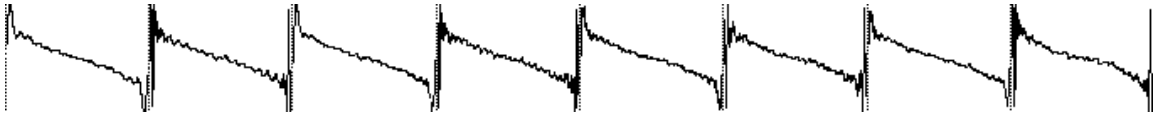
wave shapes 38 to 3F



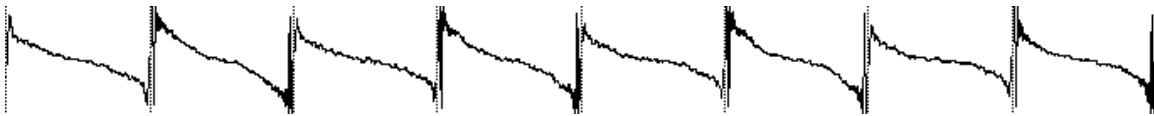
wave shapes 40 to 47



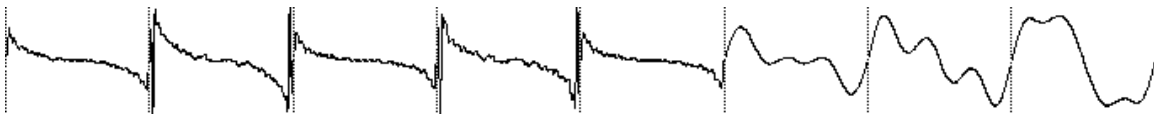
wave shapes 48 to 4F



wave shapes 50 to 57



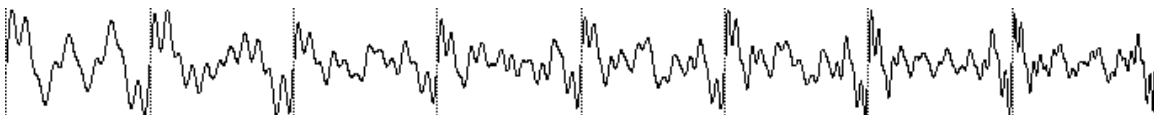
wave shapes 58 to 5F



wave shapes 60 to 67



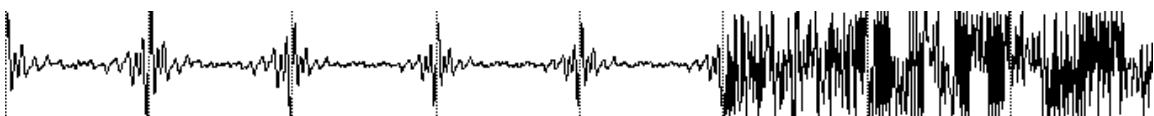
wave shapes 68 to 6F



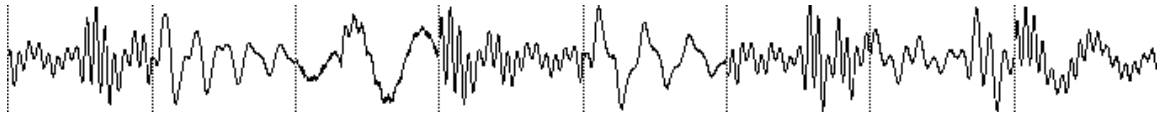
wave shapes 70 to 77



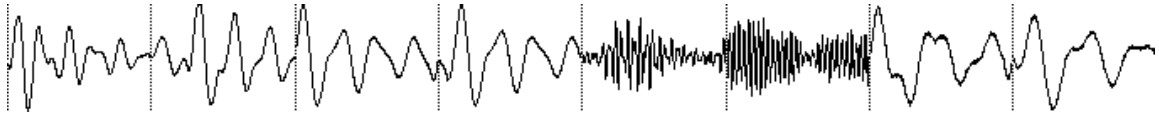
wave shapes 78 to 7F



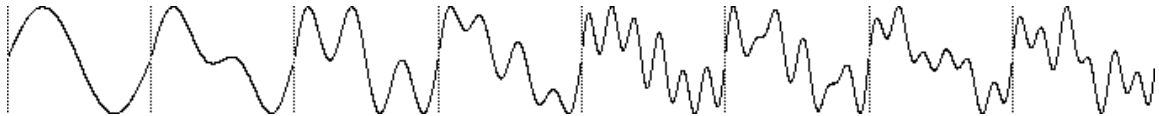
wave shapes 80 to 87



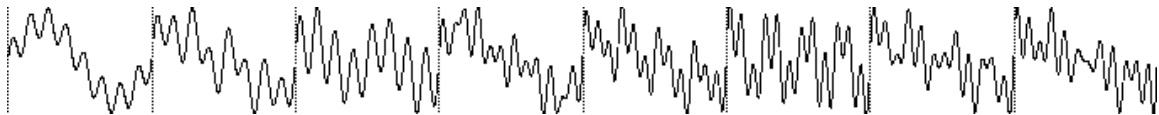
wave shapes 88 to 8F



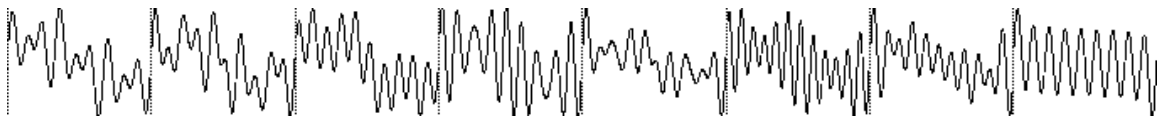
wave shapes 90 to 97



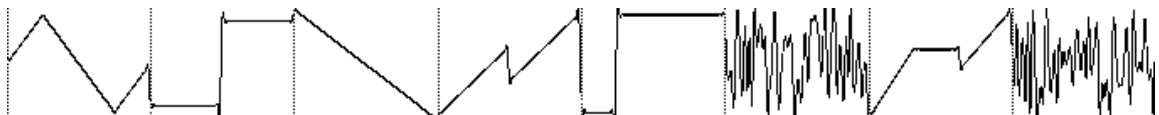
wave shapes 98 to 9F



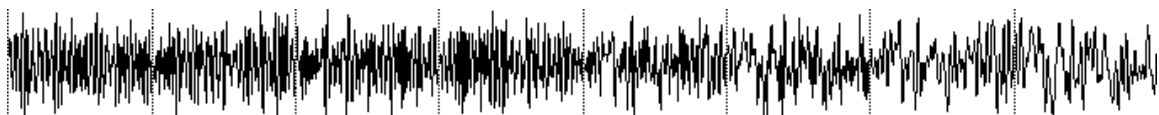
wave shapes A0 to A7



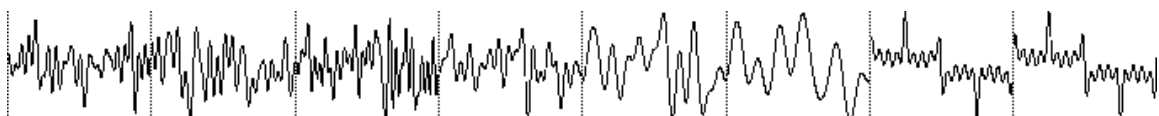
wave shapes A8 to AF



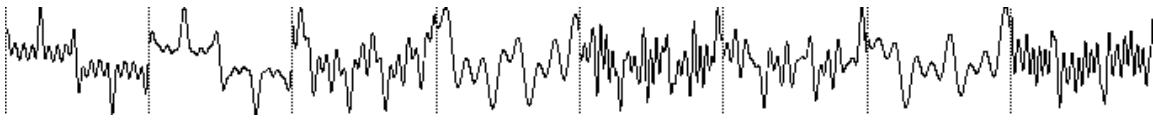
wave shapes B0 to B7



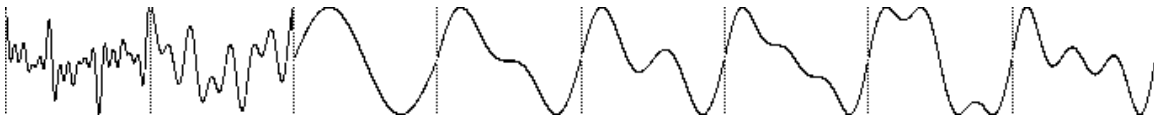
wave shapes B8 to BF



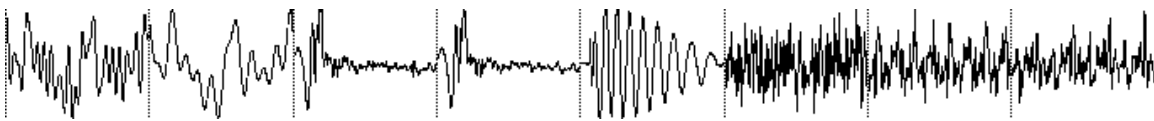
wave shapes C0 to C7



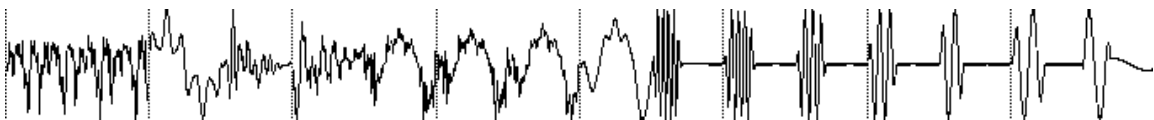
wave shapes C8 to CF



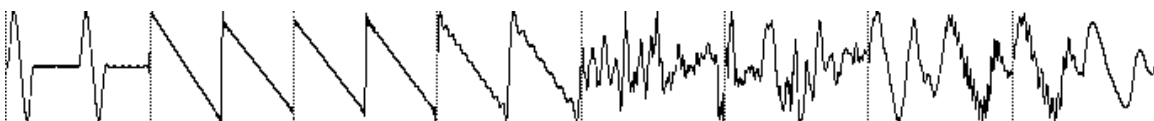
wave shapes D0 to D7



wave shapes D8 to DF



wave shapes E0 to E7



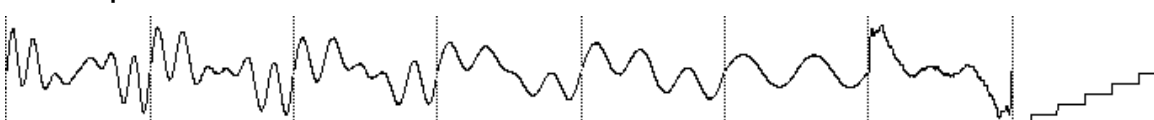
wave shapes E8 to EF



wave shapes F0 to F7



wave shapes F8 to FF



5. Schematics and Specifications

Schematics

(Attached to back of the printed manual)

Specifications

- Mains input: 110V - 240V ac 50/60 Hz, auto sensing power supply
- Max power consumption: 30 W
- Headphone socket: best if used with 32 ohms impedance
- Audio out:
 - Monophonic 6.3 mm (1/4") socket
- ROM waves:
 - 8bit depth
 - 256 samples per cycle
 - **DE-REZ** reduces cycle to 64 samples
- ADSR timing range:
 - Attack: 6 - 820 msecs
 - Decay: 16 - 6000 msecs
 - Release: 16 - 6000 msecs
- Dynamic range: about 90dB
- Midi Note Range: C#-2 to C6
- MIDI note offs: recognises real note offs as well as velocity note offs

All specifications are subject to change without notice.

MIDI Implementation Chart

Model: Modulus MonoWave

Date: September/08/2002
Version: 4.07

Function		Transmitted	Recognized	Remarks
Basic Channel	Default	X	1	Memorized
	Changed	X	1-16	
Mode	Default	X	X	No Modes supported
	Messages	X	X	
	Altered	X	X	
Note Number	True Voice	X	1-96	*1
		X	0-108	
Velocity	Note ON	X	O	
	Note OFF	X	X	
After Touch	Key's	X	X	
	Ch's	X	X	
Pitch Bend		X	O	
Control Change #	1	X	O	Modulation depth / ARP speed *2 LFO max depth Osc 1 Waveshape Bank (0-F) Osc 1 Waveshape Number (0-F) Osc 2 Waveshape Bank (0-F) Osc 2 Waveshape Number (0-F) LFO Speed Sustain Pedal
	12	X	O	
	16	X	O	
	17	X	O	
	18	X	O	
	19	X	O	
	48	X	O	
	64	X	O	
Prog Change	True #	X	X	No Programs available
		X	X	
System Exclisiv		X	X	No MIDI Out provided
System Common	Song Pos	X	X	
	Song Sel	X	X	
	Tune	X	X	
System Real Time	Clock	X	O	MIDI Clock Start, Stop, Continue
	Commands	X	O	
Aux Messages	Local ON/OFF	X	X	
	All Notes OFF	X	O	
	Active Sense	X	X	
	Reset	X	O	
	All Sound OFF	X	O	
Notes:		*1: Osc 1 & 2 octave switches serve as transpose. The 12 o'clock position is non transposing. *2: Mod wheel controls ARP speed only when ARP mode is on (and ARP is not set to MIDI clock sync), otherwise it controls LFO modulation depth		