Manual
midiclock

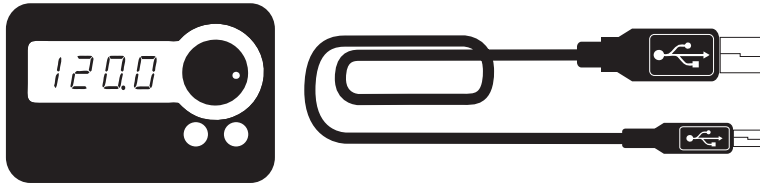Function, Utilization and technical Details

Simply play together.

00

Box contents

Included in the box are a *midiclock*, a USB cable (1.8m, A/B) and this manual.

01

Hello!

Congratulations for purchasing your *midiclock*. With this tool you are able to completely control the tempo of your live-sets, your performance or improvisation.

It's easy now to sync multiple DAWs and sequencers with a uniquely low jitter, control the tempo, and start and stop your gear whenever you want. The *midiclock* opens up new possibilities for you to interact with other artists.

Please read this manual carefully and follow the advice to be rewarded from the beginning with a great and powerful tool!

Have fun and simply play together,

Maximilian Rest & Rudolph Maier

Quick Start Guide

If you use a software-sequencer, please adjust the correct settings to compensate the latencies. For further information, please consider chapter **04** - 'Hints for synchronisation with MIDI Clock'. Set your required tempo with the rotary encoder and confirm by pressing it down. If all devices are connected and ready for playback, you can start by pressing 'Play/Pause'.

To get started with the *midiclock*, you need at least a sequencer, a computer running a software-sequencer or any other instrument that is able to sync to a MIDI clock signal.
Connect the devices as pictured. Set them into MIDI slave mode according to their respective manuals if necessary so that they can sync to MIDI clock.

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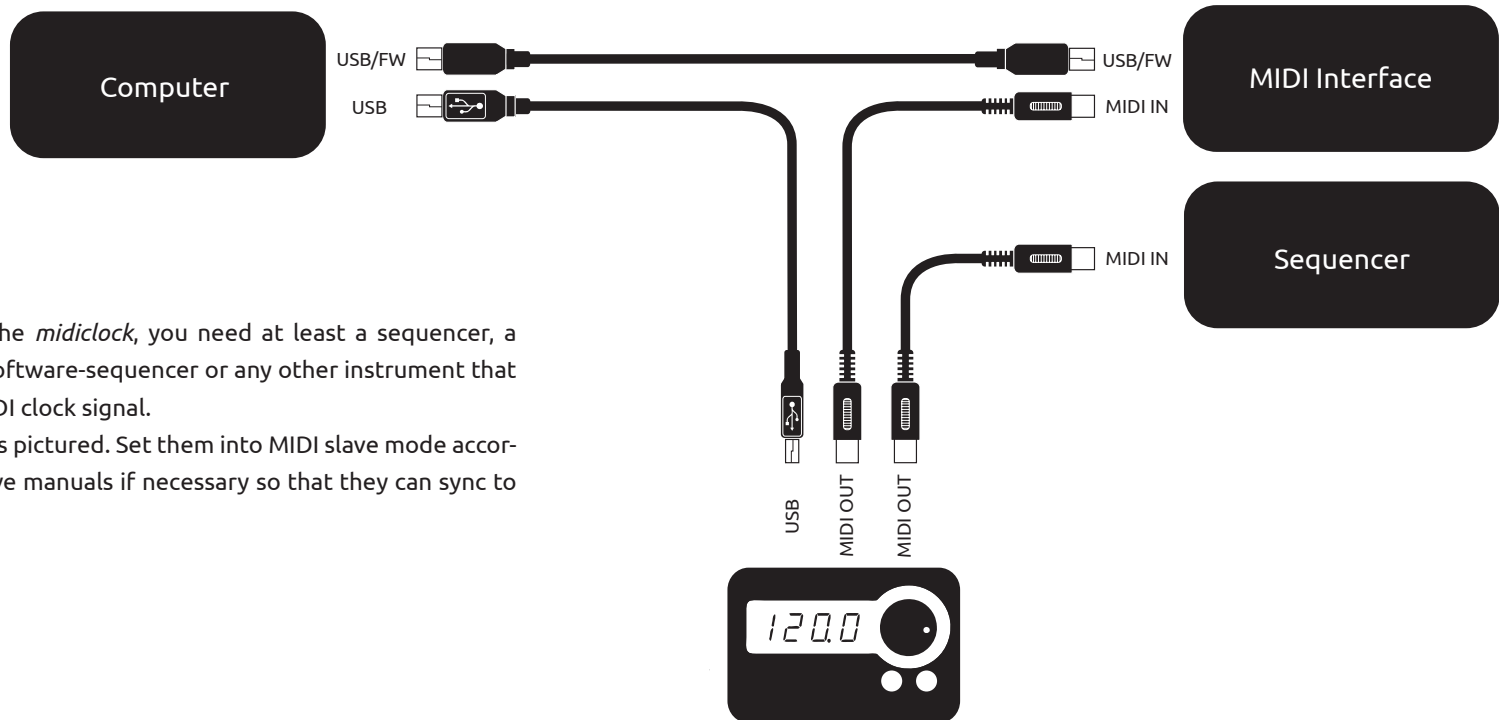
User Interface

Display & LEDs

The display shows the current tempo in beats per minute.
The upper LED Ⓜ shows the operating mode.
When lit, the 'Live' mode is active, otherwise the *midiclock* is in its
'Normal' mode. During playback the lower LED ⏵/⏸ flashes with
the beat. It is constantly lit when paused and turns off if all devices are
reset at the next beginning of a playback.

Rotary encoder

The rotary encoder is used to set the tempo. The respective function
depends on the current operating mode: In the 'Live' mode, tempo
changes are applied immediately. In the 'Normal' mode, the tempo is
only changed if you press down the encoder after your setting. You can
switch between both operating modes by double-clicking the encoder.

01 display
LED
02 rotary encoder
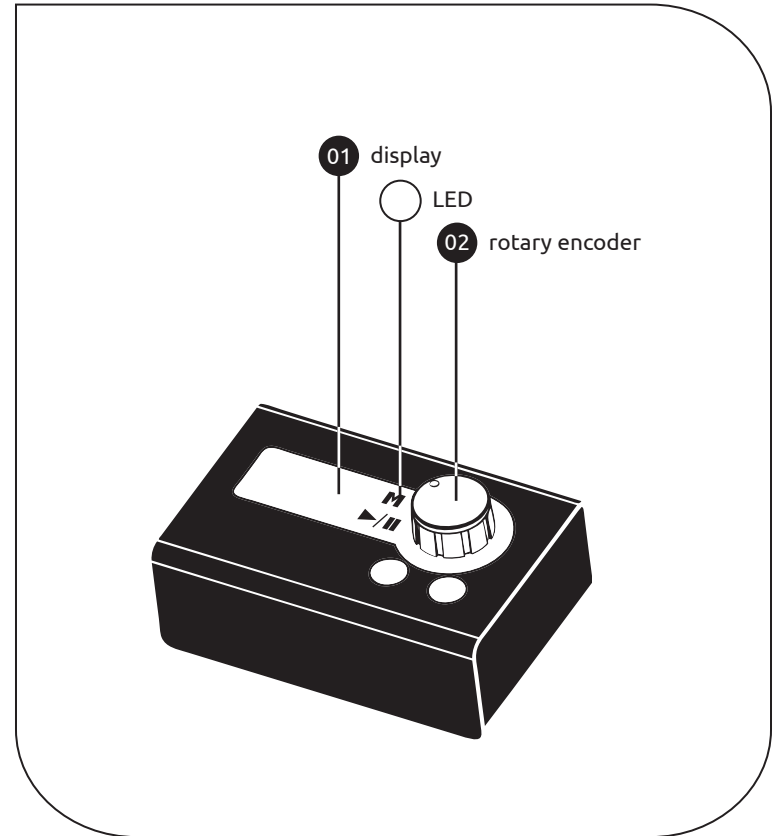
03.1

User Interface

03

Play/Pause - Button

This button starts and stops all connected devices if they support 'MIDI Start', 'MIDI Stop', and 'MIDI Continue' commands. After pressing the button at the beginning of a session the song position of all slaves is reset to the beginning and the clients are started. During playback, 'MIDI Stop' and 'MIDI Continue' are sent alternately.

04

Resync/Reset - Button

If pressed during playback, this button causes a reset of the song position pointer in all connected devices at the beginning of the next bar, followed by 'MIDI Start'. With this feature you are able to re-sync slaves during playback without interruption.
If it is pressed while the playback is paused, it acts like a 'Stop' button.
If you now press 'Play' again, all devices start their playback from the beginning.

03 Play/Pause - button

04 Resync/Reset - button
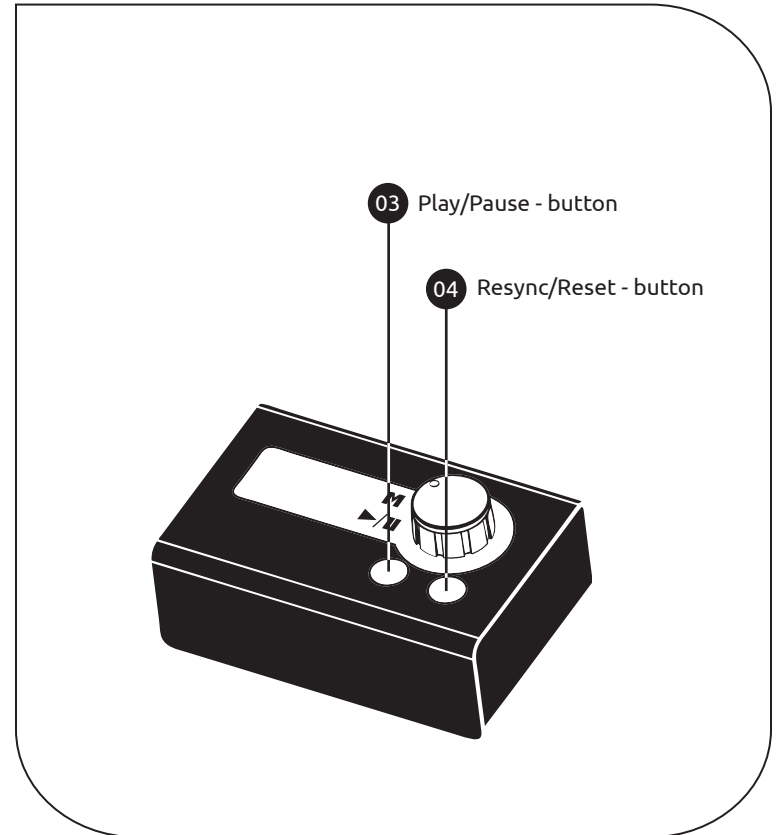
03.2

Modes of Operation

The *midiclock* has two modes of operation that are indicated by the LED Ⓜ and the display brightness.

If the LED is off, the *midiclock* is in the 'Normal' mode. In the 'Normal' mode, it is intended to be used as a stable clock generator that works in the background. If you change the tempo by turning the rotary encoder, the *midiclock* displays the new tempo and you can confirm it within a timeout of two seconds by pressing down the encoder. If you do not confirm it in time, the changes will be discarded and the actual tempo is displayed again. In this mode, accidental adjustments won't affect the tempo of your performance.

You can change the operating mode by double clicking the encoder.

When the LED is lit permanently, the *midiclock* is in 'Live' mode. The 'Live' mode is useful if you want to be able to change the tempo at any time during the playback. In this case the tempo changes are applied immediately and without confirmation. During 'Live' mode, the BPM shown in the display is always the actual tempo.

You can always get back into the 'Normal' mode by double-clicking the encoder again.

04

Hints for Synchronisation with MIDI clock

Synchronising multiple MIDI devices is a known topic for almost any electronic musician. The *midiclock* is an essential tool for a low-jitter sound setup, but please keep in mind, that also the *midiclock* cannot compensate all the malfunctions of other devices. There are numerous manufacturers that make MIDI capable devices, but not all of these instruments are able to react immediately and precisely to MIDI clock. There are two main problems that a MIDI slave has to solve, especially a DAW:

• First, it needs to take care of the synchronisation of the tracks to the master clock.

• Second, it should implement functions like 'start', 'pause' and 'stop'. These actions should be applied immediately and without any delay or run-out time.

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It is technically possible to synchronise a system to a jittering external clock source. To be prepared for jitter, some products make use of complex signal processing.

With a PLL for example, it is possible to manage difficult clock signals. That implies that the slave calculates an average value for the tempo to compensate the jitter. This calculated moving average is then used for the playback. This average tempo is continuously refreshed by the incoming clock ticks but the playback is freewheeling on the calculated BPM. Sometimes you can observe that the song position is not based on the counted beats, but on the calculated tempo and the elapsed time.

Moreover, most devices for electronic music production are equipped with a buffer for the sound output.
These buffers cause constant latencies that have to be merged with the playback time. It depends on the implementation what happens when a 'stop' command is received. Sometimes you can recognize some sort of a run-out time. In this run-out time the data in the audio buffer is played till the end and the playback does not stop immediately. This causes that some sequencers do not stop instantly with the arrival of the 'stop' command, but with delay of the buffer. If now the master does not define a new song position, the slaves are shifted to each other on a 'continue' command. In this case all slaves run with the same tempo, but not in sync with the beat.

Please consider the following hints to prevent those problems:

- First, use a sound card with a small buffer size if you use DAWs and software-sequencers.

- Furthermore, a professional MIDI interface is essential for good results.

- Avoid merging *midiclock* signals with MIDI commands from other sources, since you cannot ensure beat accuracy in this case..

It is possible that you still notice shifted tracks after pausing. In this case you can get around this by sending a 'MIDI song position pointer'. The *midiclock* sends this pointer at the beginning of playback and re-sync, but not on 'MIDI continue'.

That's the only way to ensure that all slaves are situated at the same song position and start in sync.

05.1

Technical details

Electrical Properties

• MIDI OUT

The *midiclock* has two MIDI ports (DIN, 5-pole). They provide a current loop and are designed for opto-coupler driven slaves, like documented in the MIDI specs. The no-load voltage is 3.3V, the short-circuit current is 20mA.

• Power

The USB port (Type B) acts only as a power supply. You can use either a computer or an external power adaptor. The power consumption is max. 75mA at 5V when used properly.

Please note that the input voltage must not exceed 7V under any circumstances.

Dimensions and Weight

The dimensions with knob and rubber feet are 48mm high, 95mm long and 62mm wide. The weight is 235g without cable.

05.2

Table of MIDI commands

The *midiclock* uses the following MIDI commands to synchronise and control all connected slaves:

Function	MIDI command	
Synchronisation	MIDI clock:	0xF8
Start	Song Position Pointer:	0xF2, 0x00, 0x00
	MIDI start:	0xFA
Pause	MIDI stop:	0xFC
Continue	MIDI continue:	0xFB
Reset	like 'Start'	
Resync	like 'Start', but on the next downbeat	

The MIDI clock command (0xF8) is always being sent when a power supply is connected. The jitter is 0.1μs on average, the maximum deviation is 0.46μs.

Operating Notes

! Please note the following advice to help you enjoy your *midiclock*. Failure to observe may void your warranty.

- Use a soft and clean cloth to wipe your *midiclock*. Do not use any detergents on the surface.

- Do not expose your *midiclock* to temperatures below -10 °C (14 °F) or above 60 °C (140 °F) and avoid direct sunlight.
  If you face a high difference in temperature during transport, wait a sufficient time before you use your *midiclock*. Otherwise there may be condensation which can destroy the electronics inside.

- The *midiclock* must not be used in wet environments and the ingress of any fluids must be avoided.

- Usually, the power is supplied by a computer USB port. If you want to use a wall plug, be sure to meet the electrical specifications!

- Damages, which are caused by third party wall plugs are not included in any warranty. You also void your warranty with rough handling, excessive strain, manipulation, mechanical or chemical influences, as well as damage due to other reasons that we are not responsible for.

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Declaration of Conformity & Disposal Note

C€   It is hereby confirmed, that the *midiclock* meets all rules and regulations regarding EU-directive 2004/108/EG for electromagnetic compliance to protect humans and the environment.

√RoHS   The *midiclock* is compliant with the RoHS directive.

If you wish to dispose your *midiclock*, please contact your local dealer for recycling. Do not put it in your household waste.

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Contact

We, that is Erfindungsbüro Rest & Maier, made the *midiclock* meet our own high expectations on value and functionality of a product. If you have any questions or suggestions, do not hesitate to contact us. A small production batch for professional users makes it possible to adapt to your personal requirements.

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