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FOREWORD

A SHORT HISTORY OF THE CLOCKWORK ...

In the year 2006 I worked at a "MIDI-to-soundbox"-steering for a piece of theatre, "history tilt" by Daniel Dorsch, sound-artist and friend of mine, who at that time was using almost analogue equipment, like effect pedals of the "moogerfooger" series, (TM). He came to me with the idea to build a simple analogue Multitrack-clock-generator, which should mutually move the different clock tracks. With this tool, one should be able to start envelopes earlier, to produce shuffels and to play uncommon rythms.

After one year of first drafts we started the development under very helpfull influence and innovative ideas of some musician friends (many thanks especially to Robert Junge as well as to Paul Schultz from Schneider's Büro!). So the original Clockwork-concept enlarged with additional CV-outputs, Sum-outputs, Random functions, LFO's and MIDI-functions (MIDI-to-CV-interface, MIDI-controllers). The result of the Clockwork offers many possibilities with high functionalities.

Much fun!

Per Salzwedel

Berlin, january 2008

FIRST STEPS

SECURITY ADVICES

- Please read carefully all advices before starting the tool.
- Don't use the tool in humid environment.
- Don't install close to heating places (radiators, stoves, open fire).
- Don't put into direct sun-radiation.
- Please pay attention to use the correct power supply adapter.
- Don't let the tool fall down, even if it is quiet robust.
- Don't put external voltage at the output-jacks.
- For cleaning, don't use chemical cleanser or solvent, but only dry cloths.

CONSIGNMENT

We deliver following accessories with the tool:

- Power supply adapter AC/AC (induced 14VAC, 500mA)
- Y-adapter 3,5mm (1/4inch) stereo jack to 2x cinch jacks (to be use for the Clock/Gate-Sum-output)
- 2x adapter cinch to 6,35mm (1/2inch) mono jack
- Quickstart manual, optionally additional informations

SHORT DESCRIPTION

The Flame Clockwork is a versatile clock and tempo generator. In first line it 's designed to generate clock/trigger/gate signals for clocking units with tap and clock inputs, to fire envelopes or to control sequencers and sample&holds. The clock can also be shuffled and shifted before/after the master clock!

Further can be produced flexible Shuffle-Beats by different manners.

Additionally it can send MIDI clock and a fixed MIDI note per channel. Some controls transmit MIDI control data and there 's also a simple MIDI/CV interface.

FIRST STEPS

SHORT OVERVIEW

- Internal tempo generator
(but the Clockwork can also be synchronized to external MIDI-Clock)
- Three independent clock-channels with adjustable divisor factor
(BEAT-switch including triplets and punctuated notes)
- GATE sets the gate length and allows a continuous gate signal (HOLD) or to turn off the channel.

SHIFT/CV control has two functions:

- SHIFT can shift the clock BEFORE or AFTER the master clock, maximum shift is half of the chosen divisor!
- CV affects the signal at CV output and controls clock level between zero and MAX (0...2V). In maximum position the CV out turns into a LFO. A MIDI-synchronized LFO in a triplet or punctuated notes?
No problem for the Clockwork!!

Complex RANDOM functions SHUFFLE (8th or 16th grid) and TEMPO affect all three channels simultaneously.

- RECORD:
Recording and looping the movements of each track's controls (besides BEAT) possible over the length of two bars.

- CLOCK:
ca. 0/5V (on/off-logic)
CV adjustable between 0-2V
SUM outputs mix the CV- and Clock-signals (two different logic functions!). A set of LEDs visualises the different clocks.

The simple yet fully independent MIDI/CV-interface follows 1V/oct characteristic. It is limited to MIDI channel 1 and five octaves range.

Each channel sends a MIDI note on channel 10 in the rhythm of the chosen divisor factor.

The least timing unit of all internal timing activities is one MIDI-clock. Please look below for the exactly MIDI-data (appendix).

FIRST STEPS FRONT PANEL / CONNECTIONS / EXAMPLES

FRONT PANEL

TRACK 1 TRACK 2 TRACK 3

- 1 OUTPUT CV 1-3 (0..2V) (3,5mm mono jack*)
- 2 OUTPUT sum clock/gate (3,5mm stereo jack*)
Tip: Sum clock 1 tick lenght (0/5V)
Ring: Sum gate lenght (0/5V)
- 3 OUTPUT sum CV 1-3 (0..2V) (3,5mm mono jack*)
- 4 MIDI-to-CV interface (2x 3,5mm mono jack*)
- 5 Power On LED orange
- 6 LED extern receive MIDI note
- 7 LED red: Start/Stop, LED yellow: Beat
- 8 Switch extern/intern MIDI clock
- 9 Switch start/stop
- 10 Ruler intern tempo
- 11 Switch CV/Shift track 3
- 12 Switch random on/off track 3
or switch LFO wave (if ruler Shift/CV = LFO)
- 13 Ruler shift / CV / select LFO track 3
- 14 Ruler gate: off=track off, point: gate=1 tick
- 15 Select beat track 3
- 16 Ruler random: center position=off
- 17 Ruler shuffle: center position=off
- 18 Switches record track 1-3
- 19 LEDs clock/gate track 1-3
- 20 OUTPUT clock/gate 1-3 (0/5V)
(3x 3,5mm mono jack*)
- 21 LED sum clock/gate

* 3,5mm=1/8th inch

- 1 MIDI-IN connector
- 2 MIDI-OUT connector
- 3 AC-IN jack max.12..14VAC / min.500mA
- 4 Power switch (off-site=on)

Example Filter-Control 1

Example simple Filter-Control 2

Example Trigger Analog - Stepsequencer

Y-adaptor (split stereo to mono left/right)
ring = Sum Gate-Trigger out
tip = Sum Clock-Trigger out

MIDI-Keyboard

Example MIDI to CV Interface

BEAT

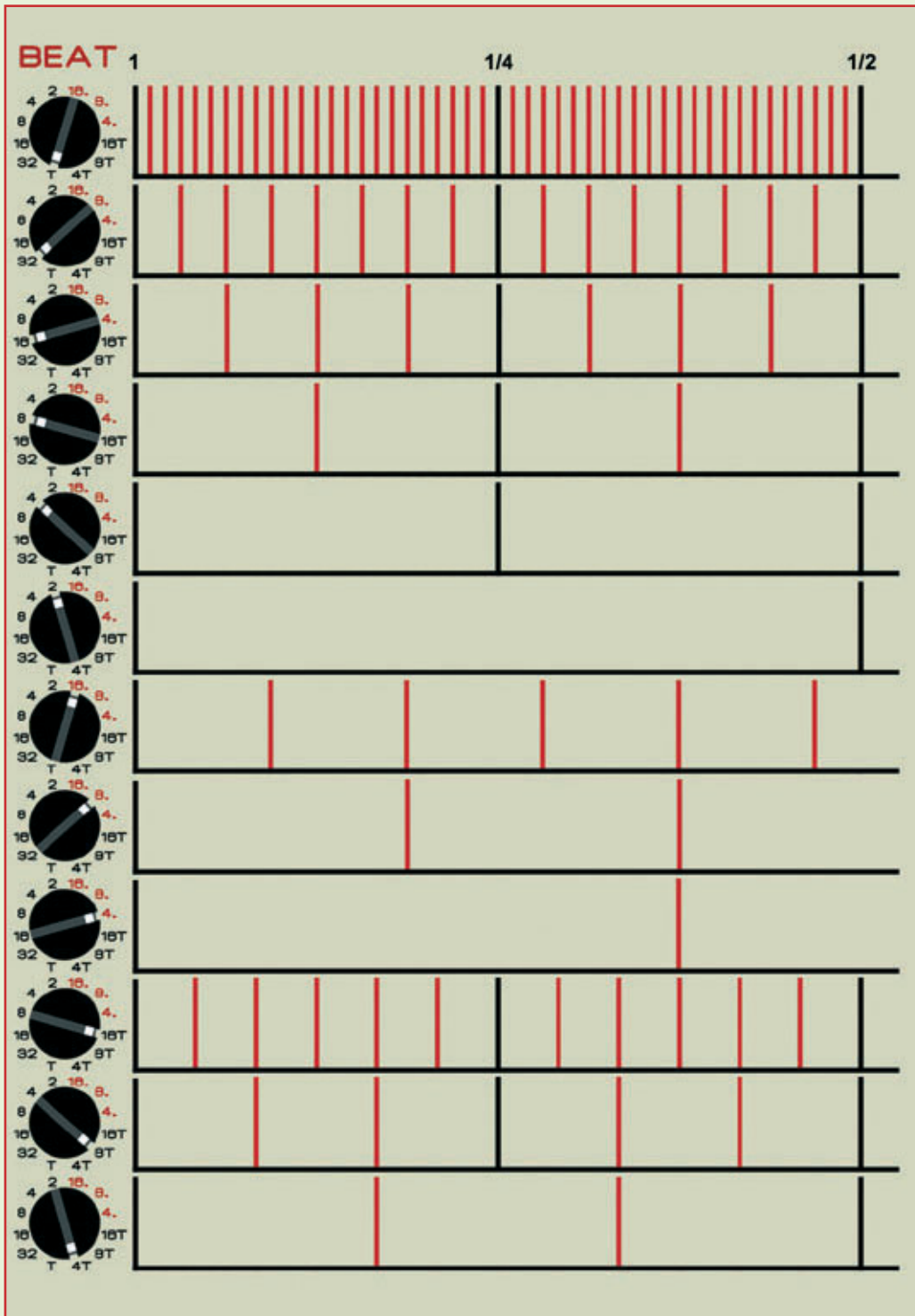
The BEAT-switch determines the division-factor of the internal or external MIDI-CLOCK in musical units.

Following 12 pulse grids can be adjust:

- T** = Tick = MIDI-pulse (24x per quarter note = least MIDI-clock unit)
- 32** = 1/32 pulse
- 16** = 1/16 pulse
- 8** = 1/8 pulse
- 4** = quarter note pulse
- 2** = half note pulse
- 16.** = punctuated semiquaver
- 8.** = punctuated eighth
- 4.** = punctuated quarter
- 16T** = 16th triplet
- 8T** = 8th triplet
- 4T** = quarter triplet

The length of the impulse is determined by GATE (see below).

After switching, the change always becomes effective with the beginning of the next complete measure (on ONE of the next BAR). The change will not be recorded by RECORD; so it can be used further by looping the track. A looped sequence can be switched to Double or Halftime e.g., so by the way other apparent velocities or variations of the track can be produced live.



BEAT: BASIC PULSE GRIDS

GATE

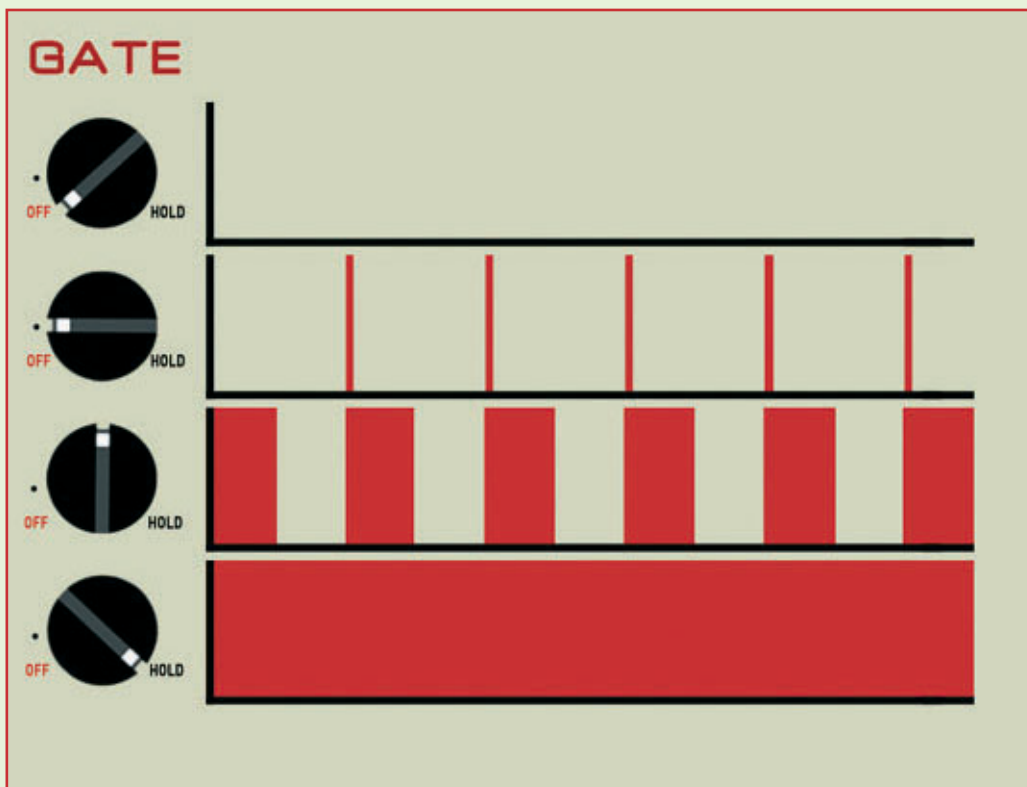
With the switch GATE you can change the length of the Clock/CV-signal (length of the positive impulse = GATE), as well as the duration of the Midi-note (Note On/ Note Off) sented by the according chanel.

In position OFF the track remains switched off and no data will be produced or sended.

In position POINT the GATE has the exact length of one tick.

In position HOLD the note will be bound (endless GATE). The Clock/Gate-output remains on maximal level. An exception is the Midi-note, which can be switched off by Note Off.

RANDOM can affect the GATE-length. The GATE is partially placed on 32th grid at some (bigger) BEAT- adjustments.



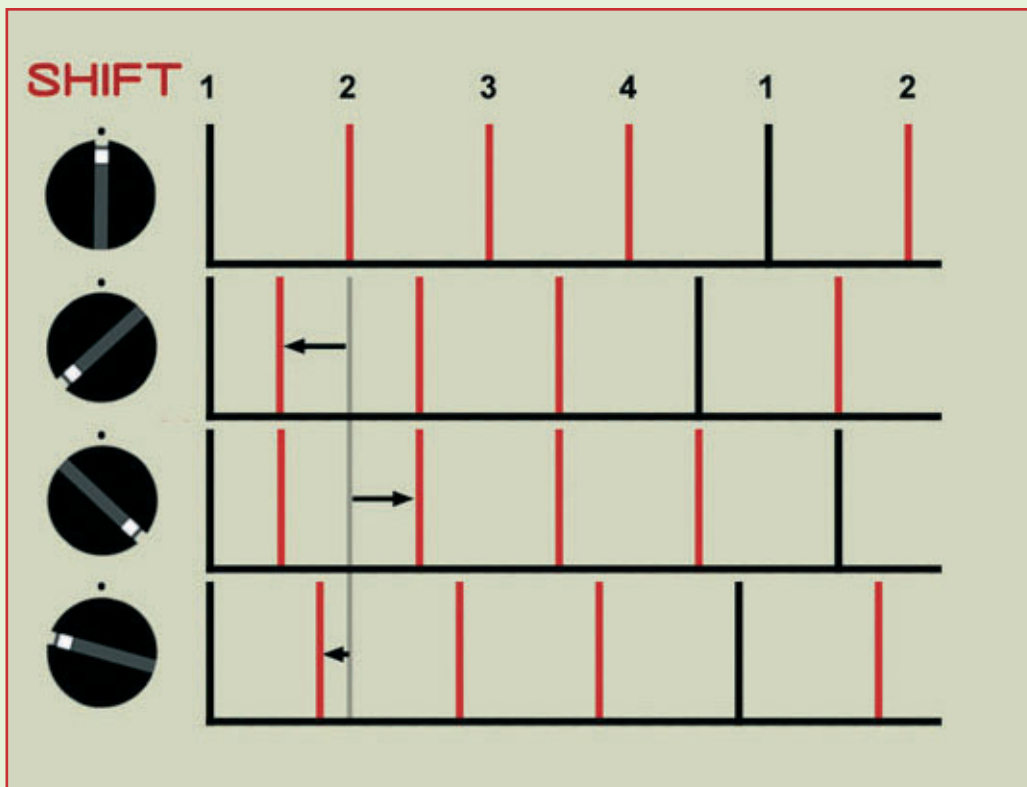
SHIFT

With the SHIFT-function the track in timing can be moved ahead or behind the masterclock.

The left switch beyond the controller must be in lower position SHIFT. Now the control-dial works as SHIFT-controller. In middle-position the track runs synchronously to internal/external masterclock in BEAT-grid. Out of this middle-position the track can be moved chronologically ahead or back and that in Tick-raster. Pay attention to the smaller the BEAT-grid the smaller the dissolution gets, and if BEAT is = tick adjustment is no more possible, because there is no adjustment within two Timing-Clock-orders.

At stop-position left or right of the ruler the track runs exactly displaced by the half. So you can generate easy Offbeats e.g. (e.g. push-pull of Bassdrum and Snare). With help of two tracks can be generated flexible Shuffle-Beats and this yet with triplet or punctated notes.

The Clockwork minimum needs one measure after start to adjust the correct beat with the according adjustment.



CV

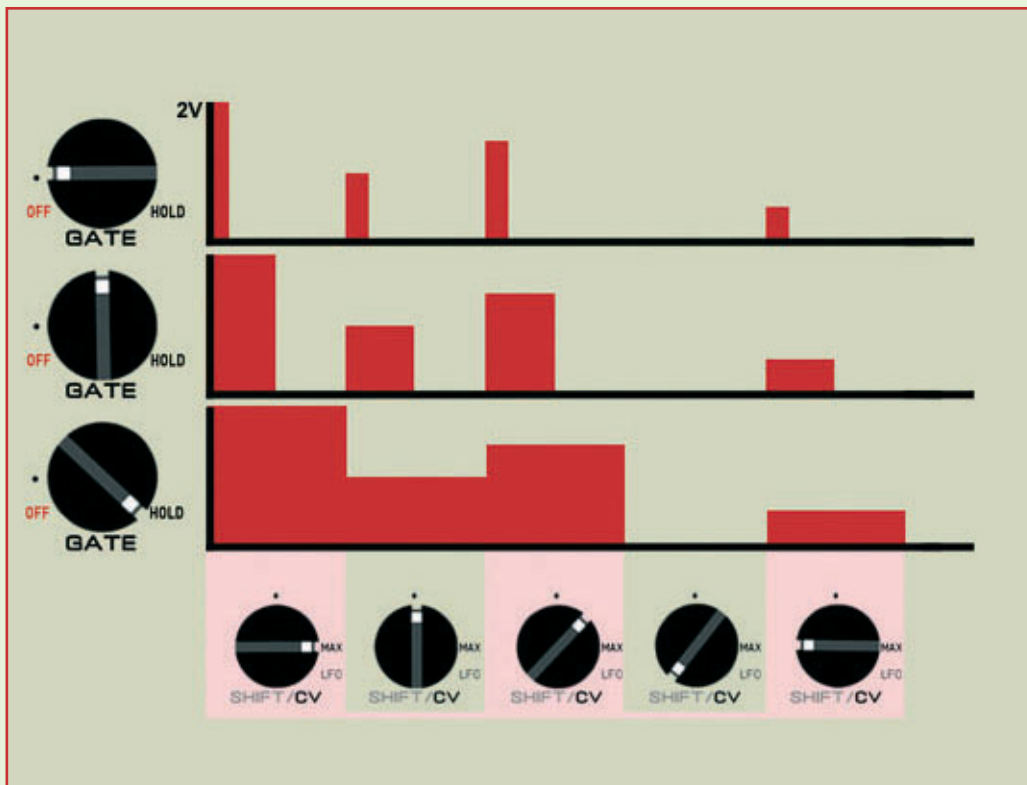
If the left switch above SHIFT/CV-ruler is in upper position CV, the voltage at CV-output can be adjusted between 0 and 2 V (between zero and position MAX) with the control dial.

The modification always happens in the chronologically grid of adjusted BEAT.

RANDOM can affect on control voltages.

Tipp:

If GATE is adjusted on HOLD, on CV-jack permanently fits the voltage which is adjusted on CV-ruler. Changing the factor you'll get rasterized upstairs/downstair voltage (Sample & Hold) in adjusted BEAT. The agitation of the CV-switch can be taped over two measures with RECORD and so generate individual two-bar-CV-loops (hand-played LFO-waves).



LFO

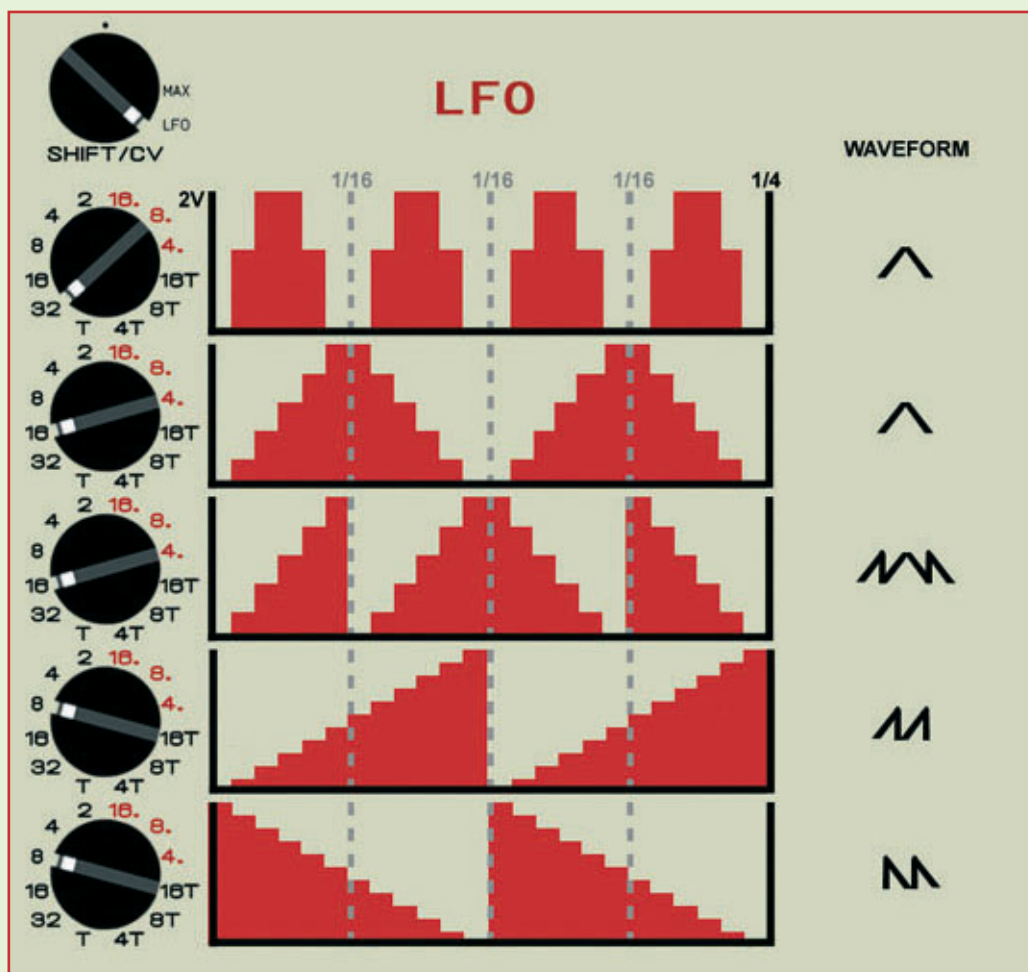
If the left switch above SHIFT/CV-ruler is in upper position CV and the control-dial is in end-position (pot on right stop-position) the CV-output-jack converts into LFO.

The right switch determines now the curves-form. In upper position the triangle-form is available to all three tracks. Differences are in lower position:

- Track 1 = saw up
- Track 2 = saw down
- Track 3 = alternated saw up and down.

Keep in mind that LFO`s are rasterized per smallest chronologically unit. Because of this, the LFO is Midi-synchronous and could be moved by SHIFT.

RANDOM has no influence on LFO. (But this can be achieved easily via CV-sum-output combining two tracks).



RANDOM

Some parameters of the tracks can be diversified by accident (RANDOM). The right switch of the track must be placed on RND (the LFO may not be activated at the same time). With the global RANDOM-switch can be adjusted various influences by accident, out of middle-position. The further the switch is moved from middle-position, the bigger is the effect.

Per track RANDOM effects on following values:

- CLOCK On/Off
- GATE duration
- CV
- Velocity of the transmitted MIDI-note

Play with the different ruler-positions to test the various effects!

You can graduate very animated variations.

- See too: GLOBAL FUNCTIONS, RANDOM-POT

RECORD

When RECORD-switch(-es) of the track are in upper position, the ruler-switch-modification of the according track will be recorded continuously over two measures (in tick-raster). All ruler/switches of the track belong to this (except the BEAT- switch and RECORD-switches).

To activate the recording, turn the RECORD-switch down. The last two measures will be played automatically (LOOP). Now a changing of the rulers/switches is not possible (except BEAT) while the recorded data are running.

Tip:

When the LOOP is activated (and RECORD-switch down):

a short RECORD-switch up, adjusting the ruler/switch a little and then switching RECORD back, the loop is now diversified.

ANALOG - OUTPUTS









































Per track CLOCK/GATE (0/5V) and CV/LFO (0...approx.2V) come out of separate jacks. Similar is the case with CLOCK and CV. They differ only in the expensed voltage. That means on the CLOCK-jack is while the duration of GATE a voltage of approx. 5V and during the breaks zero Volt. At the CV-jack while the duration of GATE there is a voltage between 0 and 2V (determined by CV-switch and possibly RANDOM) and during the breaks zero Volt.

When CV-output is switched to LFO the according LFO-voltage between 0 and approx.2V continuously comes out, not influenced by GATE or RANDOM.

All three Clock-outputs flow into a Clock-sum-output and a Gate-sum-output (arranged as a stereo-plug). The signals of the three tracks are connected by different ways. The according generation of both sum-outputs you can see in the schedule below.

The three CV-output of the tracks are also put on an extra CV-sum-output. Thereby one-third of the voltage of the according track is mixed on the output. The sum-voltage ranges as well between 0 and 2 V. By means of this output different LFO - actions are mixable or Random can be influenced.

SUM LOGIC SHEMATICS

1	2	3	CLOCK GATE
			 
			 
			 
			 
			 
			 
			 
			 

TEMPO / SYNC

For internal Clock put the SYNC-switch down on INT (internal Clock). The position of the TEMPO-ruler now determines the tempo between approx. 20 and 220 Bpm (Beats per minute). You start or stop the sequencer with switch START/STOP. By synchronisation of an external sequencer via MIDI-CLOCK put the SYNC-switch on EXT (external Clock) and the other switch aside on STOP. Now the sequencer can only get started from external connected master.

RANDOM-POT

The RANDOM-Pot always works globally on all three tracks. In middle-position the function is deactivated.

If you want to leave the analogue-outputs (Clock/CV) on chance, put the right switch of the track down to RND (and SHIFT/CV between 0 and MAX, not! on LFO).

Starting from middle-position, going to both sides the by-accident-function amplifies. The two directions differ in effect, you should try. The by-accident effects work on velocity of the transmitted note of the track too, and that independent from position of RND-Pot.

The changing of the values per RANDOM will be recorded and played using RECORD.

Follwing parameters get influenced:

Pot positions left:

- Step (Clock) of track on/off
- Level of control voltage (CV-out)
- Velocity

Pot positions right:

- Step (Clock) of track on/off
- Level of control voltage (CV-out)
- Velocity
- Gate-duration

SHUFFLE

By means of the SHUFFLE-ruler on all tracks running on 16th or 8th can be generated a shuffle. In middle-position the function is deactivated. Turning left on track(s) with 8th BEAT you can generate three Shuffle-steps, turning right only one step on track(s) with 16th BEAT. The SHUFFLE-function has no influence on the sended Midi-Clock.

To improve Your Shuffles, don` t use global SHUFFLE-ruler but two tracks.

Here a short discription:

MORE FLEXIBLE SHUFFLE (without Shuffle-ruler)

1. Analogue Shuffle (on output Clock-sum= tip)

At first:

The Shuffle-ruler should last now in middle-position. For a 16th-shuffel put the Beat from track 1 and 2 on 8th and move track 1 with the SHIFT-ruler on the half (ruler SHIFT on 0 or max). Now both tracks are running on 8th push-pull and generate on the Clock-sum-output a 16th pulse-sequence.

Now move track 2 with the SHIFT-ruler of this track out of middle-position and you` ll have on every second 16th on the sum-output the according Shuffle. So the SHIFT-ruler from track 2 becomes a SHUFFLE- ruler, and that with a much higher dissolution.

At 8th-shuffle put the tracks accordingly on fourth. Further on, now you have the possibility of shuffles with triplets or punctuated notes! Only choose the according beat on both tracks. There is one restriction with this procedure: the third track should stay switched off, because it affects the sum-output too. But for interesting experiments you can dare some tests. Off course you can choose the tracks as you want (changing the order and shuffeling with Shift 1).

2. Midi Shuffle (on Midi-out via note-numbers)

The procedure stays the same as with analogue shuffle (see above). But to both sended note-numbers on the sampler (or sound-expander) should be assigned the same samples or sounds, to be sure that both tracks appear as ONE SOUND. Additionally you could use the third track without any constricttion. Here is much place for experiments, because of more parameters could take infuence on the shuffle.

MIDI

The CLOCKWORK basically is intended to generate analogue Gate/Trigger/CV-voltages, so it offers only limited MIDI-functionality. E.g. it is not possible to edit MIDI-channels. All MIDI-parameter according to the switches and rulers are defined and not changeable.

The triggering of MIDI-data can be different and is not always according to the analogue function of the Clockwork.

For example you could send controller-data via turning the potentiometer, although the track is switched off (GATE= OFF)

MIDI - SENDING

The CLOCKWORK only can send MIDI-data, when the internal sequencer is started, or has been started via external MIDI-clock. If a track is switched off per GATE = OFF, no note-number of the track can be sendet, but the ruler/switches of the track can send nevertheless controller-data.

All MIDI-data of the track are sendet always with the adjusted BEAT-raster of the track.

Tip: If you want a quasi-continuous controller, put the track on T (Tick).

CONTROLLER (Control-Change)

All potentiometers and switches (except RECORD, SYNC, START, BEAT) can send controller-data. The determined data please see schedule of MIDI-data in the appendix. A controller-value is always sendet in BEAT-determined time-grid. The control-dial offer data continuous between 0 and 127. The switches send according to the switch-position only two determined values (0 and 127, see schedule in appendix).

The MIDI-controller of RANDOM-potentiometer, SHUFFLE-potentiometer and TEMPO-potentiometer are always recorded by the according track, where they belong to. So at external sync the TEMPO-potentiometer can be used as an independent controller-potentiometer. The tempo will not be recorded and can be transformed furtheron from track 3 with RECORD.

NOTE ON /VELOCITY

Per track at a time can be send one fixed note on fixed MIDI-channel 10 with velocity varying or by accident. If a track is activated (GATE-switch from POINT to HOLD), this track sends a note whereas the velocity can be switched with GATE-ruler from starting-magnitude decimal 79 to 127. Despite of inactivated RANDOM-switch on the track you can arouse effects by accident with RANDOM-ruler on velocity. That means, if you don't want any or very small velocity-variations, RANDOM-ruler always have to be in middle-position. This is made, that you can put RANDOM on velocity, even if the track is inactivated by RANDOM.

Please note, also with activated HOLD the note will be send again in the raster of BEAT (in opposite to clock-output, which is than continuously on maximum pegel). The velocity-by-accident-algorithm bases on emperical value and simulates nearly the differently strong percussive clapping by hand. That will sound different at external sound-modules, because velocity works differently on sounds.

MIDI-to-CV-INTERFACE

On fixed midi-channel 1 the CLOCKWORK understands note-numbers from 24 to 83 (notes outside this area are ignored).

In integrated MIDI-to-CV-INTERFACE these notes are graduated into analogue voltages, namely into CV-voltage from 0 to 5V (5 octaves, at 1V/octave, MOOG-compatible) and a GATE of 0/5V per duration of the note. The velocity will not be evaluated. This interface works autonomous of the sequencer and can be used by running or stopped sequencer. All other received data (except midi-clock) will be ignored. Arriving data are signalised by yellow Led over the SYNC-switch.

Advice: You should avoid sending bigger gratuitous data-amounts (like e.g. SysEx) to the CLOCKWORK, because the timing-behaviour could become insecure. With every arriving midi-message the processor is occupied with the analysis of data and from a certain amount it doesn't have the time to administrate its programm correctly.

MIDI-CLOCK

Via midi-clock the CLOCKWORK can be synchronized with other sequencers and act as a master or slave. The running CLOCKWORK always sends MIDI-clock-data (internal clock the same as external clock). In STOP-mode no clock-instructions are generated. It sends or receive the START/STOP-command. It cannot send or receive CONTINUE.

APPENDIX

APPLICATIONS

The Flame Clockwork is a versatile device for example:

- Rythmical filter-modulations
- Creating of rythmical CV/gate-patterns
- Trigger + shift of envelopes
- Sample & hold
- Loops (changing in realtime)
- Complex shuffle-beats
- Controlled random patterns

Furthermore you can use the Clockwork like a:

- Midi-controller
- MIDI-to-CV-interface
- Drum - sequencer
- Universal Clock/pulse-generator
- Tap-synchronizer

LIST OF MIDI-DATA

MIDI-CV-INTERFACE

Receive: MIDI-Channel 1 Note numbers: 24..83

DRUM NOTEN

Sending: MIDI-Channel 10	Track1	Track2	Track3
Note numbers:	36	37	42

CONTROLLER - Ruler (Value = 0..127)

Sending: MIDI-Channel 2	Track1	Track2	Track3
	Gate: 73	Gate: 81	Gate: 84
	Shift/CV: 70	Shift/CV: 80	Shift/CV: 83
	Random: 74	Shuffle: 82	Tempo: 85

CONTROLLER - Switches (Value = 0 oder 127)

Sending: MIDI-Channel 2	Track1	Track2	Track3
Shift/CV:	64	66	68
Random:	65	67	69

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APPENDIX ADDITIONAL INFORMATIONS

TECHNICAL DETAILS

Ruler	9 Potentiometer
Switches	11 toggle switches, 3 rotary switchr
Connections	4 Analogue CV ouputs 0..2V 3,5mm mono jack 1 Analogue CV outputs 0..5V 3,5mm mono jack 4 Analogue Gate/Clock outputs 3,5mm mono jack 2 Analogue Gate/Clock outputs 1x 3,5mm stereo jack
MIDI	1x MIDI-Out, 1x MIDI-IN
Display	10x 3mm LEDs
Power supply	1x external AC/AC-adapter 12..14VAC/500mA
Case	ALU, size: 165x100x42mm

WARRANTY

Beginning from the date of purchase a 1-year warranty is guaranteed for this device in case of any manufacturing errors or other functional deficiencies during runtime. The warranty does not apply in case of:

- damage caused by misuse
- mechanical damage arising from careless treatment (dropping, vigorous shaking, mishandling, etc)
- damage caused by liquids penetrating the device
- heat damage caused by overexposure to sunlight or heating
- electric damage caused by improper connecting (wrong power supply/ jacks/ MIDI connections/ voltage problems)

If you have any complaints please contact your dealer or send an e-mail to:
service@flame.fortschritt-musik.de

TERMS OF PRODUCTION

conformity: CE, RoHS, UL

DISPOSAL

The device is produced with RoHS-conformity (subject to the regulations of the European Union) and is free of hazardous substances (like mercury, plumb, cadmium and hexavalent chrome). But electronical scrap is hazardous waste. Please don't add this to consumer waste. For a environment-friendly disposal of waste please contact your distributor or specialist dealer.

SUPPORT

More informations, news, updates, downloads, tips, videos and links:
<http://flame.fortschritt-musik.de>