HYDRA

User Manual

Contents

The **Oscillator Devices HYDRA** is a series of MIDI controlled, true bypass loop switchers. They all feature relay based, true bypass loops with clickless switching and muting function. The **Hydra E**-devices also feature expression outs, to control expression inputs of effects via MIDI and control switches to control things like amp channel switches or tap tempo.

HYDRA4 Features

- 4 low impedance, true bypass loops
- Clickless switching with individually selectable muting times for each loop
- Muting after every second loop for retaining trails on later loops
- 14 user presets
- Master switch to set MIDI channel, save presets and manually select loops
- White indication LED for each loop

Connect up to four effects devices to the **HYDRA4** and bring them in and out of the signal path via MIDI commands.
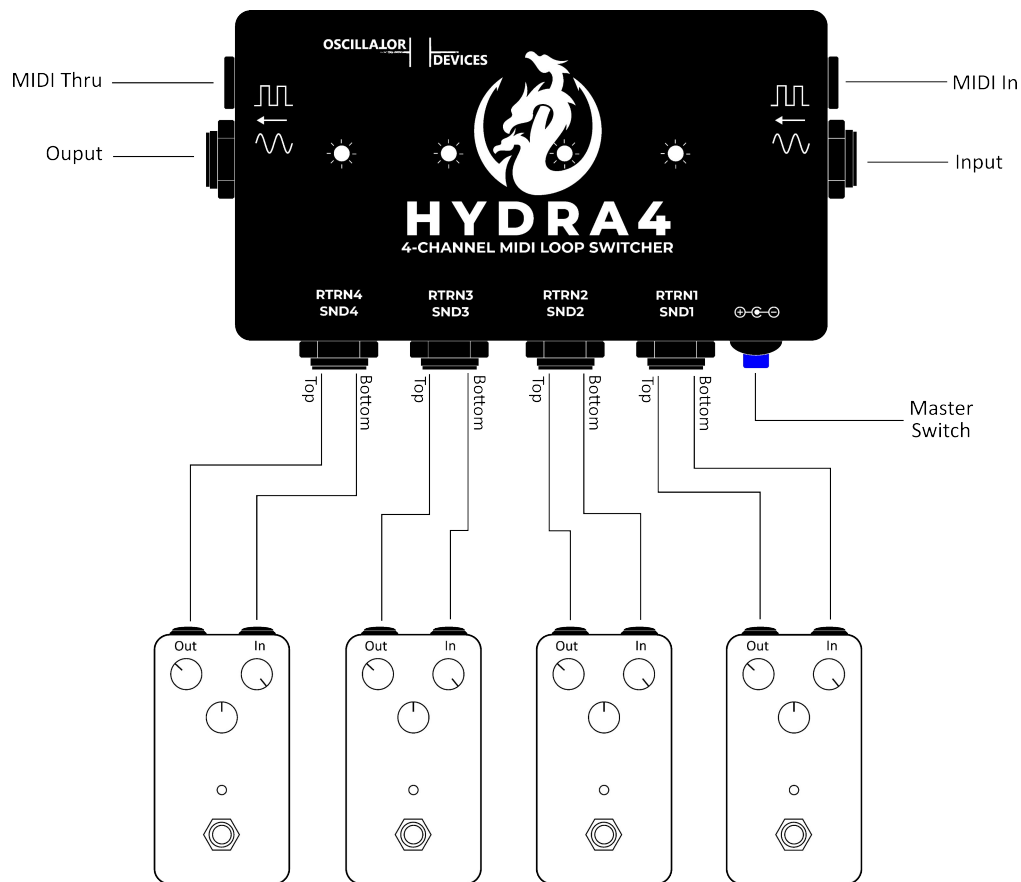
HYDRA2E Features

- 2 low impedance, true bypass loops
- 2 MIDI controllable expression outs
- 4 isolated control switches on 2 TRS plugs
- Clickless switching with individually selectable muting times for each loop
- Mute function
- 14 user presets
- MIDI clock synchronous functions for EXP and EXT
- Master switch to set MIDI channel, save presets and manually select loops
- White indication LED for each loop, red and green LEDs for EXT/EXP

Connect up to two effects devices to the *HYDRA2E* and bring them in and out of the signal path via MIDI commands. Control expression, tap tempo, channel or reverb switches on amps. The control switches of the *HYDRA2E* are completely isolated from the circuit and can switch up to +-60V.
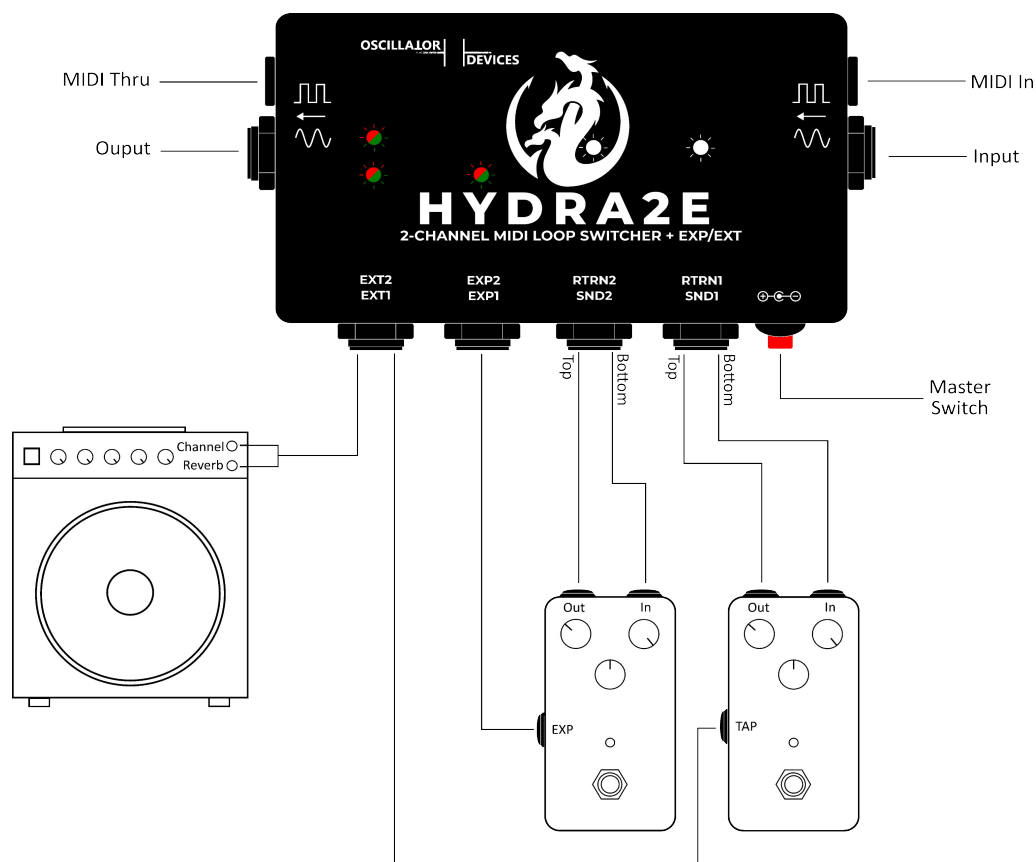
Technical Data

Dimensions (HYDRA2E and HYDRA4): 115 x 64 x 57 mm (129 x 71 x 61 mm incl. Sockets)

Power Supply (HYDRA2E and HYDRA4): 9-18V center negative. 150mA.

Connections

Please disconnect the HYDRA from the power supply before making any connections.

Input: 1/4" mono jack (TS) input. Connect your guitar, bass, synth or any other effects outputs here.

Output: 1/4" mono jack (TS) output. Connect your amp or any other effects input here.

SNDx/RTRNx: 1/4" mono jacks (TS). These are the loops where your effects pedals are connected. The bottom row are the *Sends*, the top rows are the *Returns*. Connect the effects pedals input to the *Send* and the effects pedals output to the *Return*. You can also use the **HYDRA** as output selector for the use of different amps. Connect to the *Returns* for that. To use the **HYDRA** as input selector, e.g. to use different guitars, connect to the *Sends*.

EXPx: These are 1/4" stereo TRS connectors that function as MIDI controllable expression pedals. They have independent controllable 50kΩ potentiometers (other values available). They can be connected to expression inputs of pedals. Make sure to use them only for standard 5V (or lower) expression inputs. **Do not exceed 5V and do not apply negative voltages to any of these connectors.**
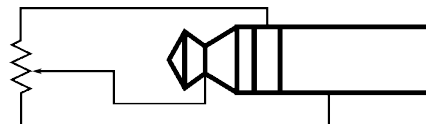
EXTx: These are 1/4" stereo TRS connectors that functions as MIDI controllable switches. Each connector has two switches. One that closes between *tip* and *sleeve* and one that closes between *ring* and *sleeve*. These switches are isolated and can switch external devices such as amplifiers. These are Solid State Relays that can switch up to +-60V. They are also far more durable than mechanical relays and thus can be used for very fast switching applications.
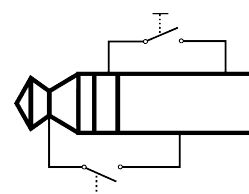
Master Switch: The Master Switch has the following functions:
- When pressed shortly while **HYDRA** is turned on, the loops are turned on and off in any possible combination.
- When held while **HYDRA** is turned on, it enters preset save mode.
- When held while the **HYDRA** turns on, it enters MIDI channel mode

MIDI In/Out: 1/8" Mini TRS Type A MIDI connections. These are according to MIDI TRS standard Type A.
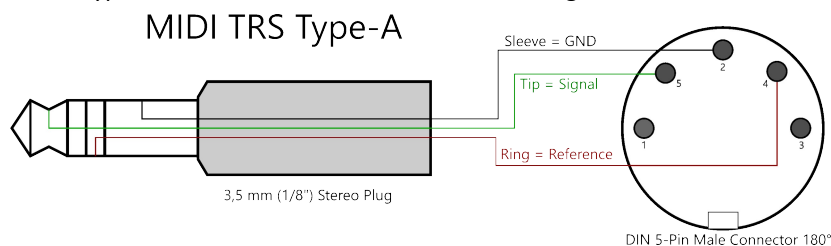
Buffers

HYDRA devices are designed without a buffer. This is not necessary due to the very low impedance signal path. While the use of an input buffer is best practice, it's not always possible because many pedals want to *"see the guitar"*. If you have the need, just place your favorite buffer into one of the loops or before the **HYDRA**. For most cases a buffer is not necessary at all.

Muting and Clickless Switching

HYDRA devices introduce clickless switching. After every two loops follows a passive muting block. It does not interfere with the signal path in normal operation. For clickless switching the output is muted for a few milliseconds before the actual switching. The muting period is so brief, it's barely noticeable. The time the output is muted can be chosen individually for every loop without complex configuration. Since the muting happens after every second loop, later loops are not affected e.g. delay trails of subsequent loops aren't interrupted when switching previous ones.
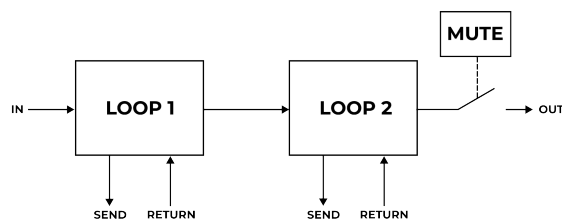
Presets

It is possible to save 14 user presets and call them up with Program Change (PC) or Control Change (CC) commands. When a preset is saved, the current state of the loops is saved along with the last command that was called for EXP and EXT. Presets can be saved either with CC commands, or with the Master Switch.

To save a preset with the Master Switch, proceed as follows:
1. Press and hold the Master Switch while the **HYDRA** is turned on.
2. The LED of the Master Switch starts to flash. Press the Master Switch according to the number of the preset you wish to save the current state to (e.g. twice for preset 2). The **HYDRA** acknowledges this by emitting short flashing pulses corresponding to the number of the preset.
3. Once the desired preset number is set, press the Master Switch and hold it down. The LED will stay lit for approx. 1s, then gives a short flash and stays lit. The preset is now saved.

To cancel the preset saving phase, press the button more than 14 times.

To save a preset via MIDI CC, send MIDI CC message 14 with the preset number you wish to save, followed by CC 14 127 without sending another message in between. For example, to save to preset 1, send CC 14 01 and CC 14 127. To delete a preset, do the same with CC 18.

To recall a preset use either PC commands, or CC 15 (recall everything), CC 16 (recall only for loops), or CC 17 (recall only for EXP/EXT).

CC		Function
14	0-13 + 127	Save the current state to preset 0-13
15	0-13	Recall preset 0-13 (Alternative to PC)
16	0-13	Recall preset 0-13 only for the loops
17	0-13	Recall preset 0-13 only for EXP/EXT
18	0-13 + 127	Delete preset 0-13

ATTENTION: Preset 0 is the startup state that is called when the device is switched on.

MIDI Channel

The **HYDRA** ships in omni mode (i.e. it responds to every channel). The **HYDRA**'s MIDI channel can be set with the Master-Switch, or with MIDI commands.

To change the MIDI channel using the Master-Switch, follow the steps below
1. Disconnect the **HYDRA** from the power supply
2. Press and hold the Master Switch while connect the **HYDRA** to the power supply.
3. The LED of the Master Switch starts to flash. Press the Master Switch according to the number of the MIDI channel you wish to set (e.g. twice for MIDI channel 2). The **HYDRA** acknowledges this by emitting short flashing pulses corresponding to the number of the desired MIDI channel.
4. Once the desired MIDI channel is set, press the Master Switch and hold it down. The LED lights up for approx. 1s, then gives a short flash. The **HYDRA** automatically restarts and reacts to the new MIDI channel.

To set the **HYDRA** to omni mode skip step 3.

To change the MIDI channel via MIDI, CC command 119 with the desired MIDI channel is used followed by CC 119 127 without sending another message in between. For example, to set MIDI channel 1, send CC 119 01 and CC 119 127.

CC		Function
119	0-16 + 127	Set MIDI channel to 1-16, 0 for omni mode.

Operating the Loops

Loop muting and clickless switching

The *HYDRA* is is equipped with a muting function. That means that no output signal comes from muted loops and the loops before. The muting function is grouped in pairs. When loop 1 is muted, loop 2 is also muted and vice versa. Same for loops 3 and 4. It's possible to mute the first two loops and still have delay or reverb trails from loop 3 and 4.

Muted loops are shown by a fast blinking LED. Unmuting is done by either sending the unmute command, or setting the loop to activated or deactivated.

The muting function is used to implement clickless switching by muting the output for a brief moment when the actual switching happens. How long the loop is muted during switching can be chosen individually for every loop (see MIDI commands) or no muting can happen at all. Since the muting is grouped in pairs, you won't hear the muting of loop 1 and 2 in the output of loop 3 and 4.

MIDI commands (Loops)

The time the loop is muted for switching can be chosen by adding 10 to the command for every step. The commands 0 – 2 are without clickless swichting, 20-22 is most recommend and will be short enough to be hardly noticeable. For effects with very strong clicks, higher commands like 50-52 are recommended.

CC					Function					
Loop 1	Loop 2	Loop 3	Loop 4	#	No clickless switching	#	Clickless switching (short)	#	Clickless switching (long)
20	**21**	**22**	**23**	00	**Loop deactivated**	20	**Loop deactivated (clickless)**	50	**Loop deactivated (clickless long)**
				01	**Loop activated**	21	**Loop activated (clickless)**	51	**Loop activated (clickless long)**
				02	Toggle Loop (On → Off, Off → On)	22	Toggle loop (clickless)	52	Toggle loop (clickless long)
				03	Mute Loop				
				04	Unmute Loop				

Operating the Expression Outs

The LED associated with the expression out lights green, when EXP1 goes toward the heel position, for EXP2 it lights red.

MIDI commands (EXP)

The expression outs have 256 steps. Command 22/23 and 28/29 distributes the entire range over 128 steps with only one command. The high-resolution commands 24/25 and 30/31 can be used to set precise values.

CC			Function
EXP1	EXP2	#	
22	**28**	0-127	Expression out from heel (0) to toe (127)
23	**29**	0-127	Expression out from toe (0) to heel (127)
24	**30**	0-127	Expression out from heel (0) to middle position (127)
25	**31**	0-127	Expression out from middle position (0) to toe (127)

LFO Waveforms (EXP)

The *HYDRA* has an internal, MIDI clock synchronous, LFO engine with 3 waveforms to drive the Expression.

CC			Function		#	Function
EXP1	**EXP2**	**#**				
		0	Stop LFO		50	LFO square wave with starting point A
		1	Restart LFO		60	LFO square wave with starting point B
26	**32**	10	LFO sine wave with starting point A		90	LFO sawtooth forward with starting point A
		20	LFO sine wave with starting point B		100	LFO sawtooth forward with starting point B
		30	LFO sine wave with starting point C		110	LFO sawtooth backward with starting point C
		40	LFO sine wave with starting point D		120	LFO sawtooth backward with starting point D

LFO sine wave

LFO square wave

LFO sawtooth forward

LFO sawtooth backward
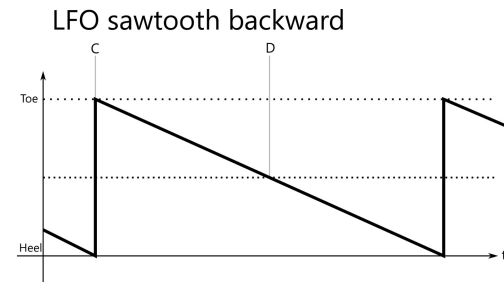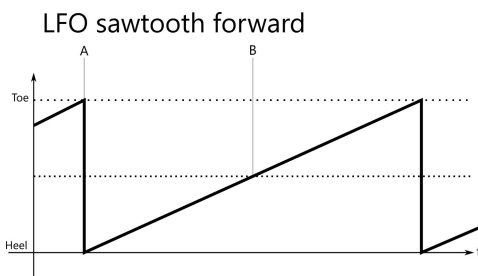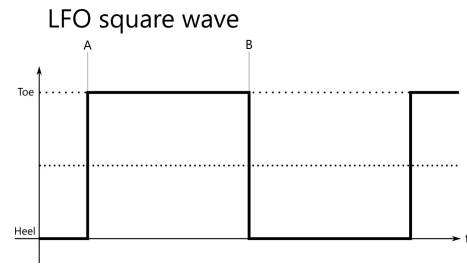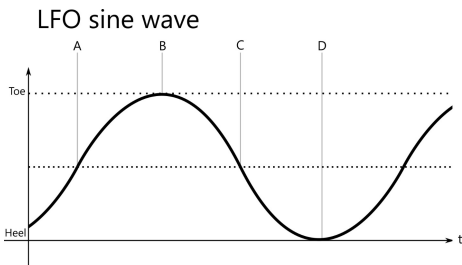
The LFO starts immediately at the specified starting point. Resending the commands will reset the engine to start over from the starting point.

LFO Speed (EXP)

The speed of the LFO relative to MIDI clock can be increased or decreased. The commands above perform one pass of the waveform per 1/4 note. The commands to change the speed are determined by adding to the basic command (CC 26 10, CC 26 20 etc.).

- Basic Command: Normal speed
- Basic Command+1: Half speed
- Basic Command+2: Double speed
- Basic Command+3: Quarter speed
- Basic Command+4: Quadruple speed

For example:

| CC			Function
EXP1	**EXP2**	**#**	
		10	LFO sine wave with starting point A, speed normal (1/4 Note)
		11	LFO sine wave with starting point A, half speed (1/2 Note)
26	**32**	12	LFO sine wave with starting point A, double speed (1/8 Note)
		13	LFO sine wave with starting point A, quarter speed (Whole Note)
		14	LFO sine wave with starting point A, quadruple speed (1/16 Note)

This procedure can be applied to all waveforms and starting points. E.g. rectangle with starting point B in 1/8 notes EXP1: CC 26 62

LFO Parameter (EXP)

The waveforms set this way always run through the entire range, from heel to toe. The range can be reduced and the center point shifted. The waveforms are shifted in 13 steps, with step 6 being the waveform in the middle. This corresponds to the *Offset* in the graphic below.

CC			Function
EXP1	EXP2	#	
27	**33**	00	Offset 0. The middle of the waveform is at Heel
		60	Offset middle: The middle of the waveform is right between the heel and toe (default)
		120	Offset Max: The middle of the waveform is at Toe

All values in increments of 10 are valid.
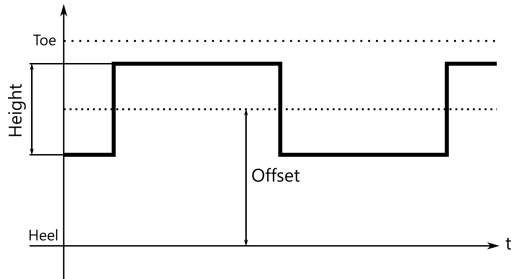
In addition to the shift, the height of the waveforms can also be restricted. This corresponds to *Height* in the graphic. As with command CC 26/33, this parameter is calculated by addition to the basic command.

- Basic Command: Normal Height
- Base Command+1: Half Height
- Base Command+2: Quarter Height
- Base Command+7: Height 1/128

For example:

CC			Function
EXP1	EXP2	#	
27	**33**	60	No constraint on height, waveform sweeps full range (default)
		61	Waveform height halved
		62	Waveform height 1/4
		63	Waveform height 1/8
		...	
		67	Waveform height 1/128

The *Offset* and *Height* settings are global, so they persist across a new waveform. Reset with CC 27 60 or CC 33 60.

Operating the Switches

Switch Behaviour

Most effects expect a switch that is open when idle and activated by a connection to the *sleeve*. But there are also manufacturers who expect a closed switch for the idle state (e.g. Boss). In the case of commands that generate pulses, each command is therefore laid out twice: **NO** (Normally Open) and **NC** (Normally Closed).

- **NO**: The impulse always ends openly. If the switch is closed at the beginning, it is only opened

- **NC**: The impulse always ends closed. If the switch is open at the beginning, it only closes.
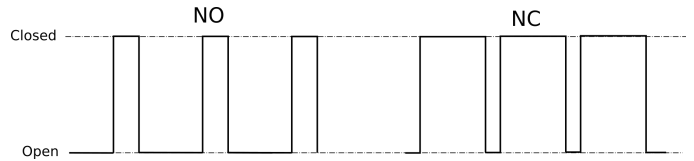
LEDs

The associated LEDs light up whenever the contact of the switch is closed. If the LED lights up green, the tip is connected to the sleeve, if it lights up red, the ring is connected to the sleeve.

MIDI Commands (EXT)

CC 34 (EXT1-Tip), CC 39 (EXT1-Ring), CC44 (EXT2-Tip), CC 49 (EXT2-Ring) only act on one switch at a time.

CC					Function					
EXT1		EXT2		#	Basic functions and NO	#	NC	#	Toggle	
Tip	Ring	Tip	Ring							
34	40	46	52	00	Set „Open"					
				01	Set „Closed"					
				02	Single Pulse NO					
				03	Single Pulse NC					
				04	Toggle (Open → Close/Close -> Open)					
				10	Pulse NO MIDI clock 1/4 notes	30	Pulse NC MIDI clock 1/4 notes	50	Toggle MIDI clock 1/4 notes	
				11	Pulse NO MIDI clock 1/8 notes	31	Pulse NC MIDI clock 1/8 notes	51	Toggle MIDI clock 1/8 notes	
				12	Pulse NO MIDI clock triplets	32	Pulse NC MIDI clock triplets	52	Toggle MIDI clock triplets	
				13	Pulse NO MIDI clock 1/16 notes	33	Pulse NC MIDI clock 1/16 notes	53	Toggle MIDI clock 1/16 notes	
				14	Pulse NO MIDI clock dotted 1/8 notes	34	Pulse NC MIDI clock dotted 1/8 notes	54	Toggle MIDI clock dotted 1/8 notes	
				15	Pulse NO MIDI clock 1/32 notes	35	Pulse NC MIDI clock 1/32 notes	55	Toggle MIDI clock 1/32 notes	
				16	Pulse NO MIDI clock 1/2 notes	36	Pulse NC MIDI clock 1/2 notes	56	Toggle MIDI clock 1/2 notes	
				17	Pulse NO MIDI clk every whole note	37	Pulse NC MIDI clk every whole note	57	Toggle MIDI clock every whole note	
				18	Pulse NO MIDI clk every 2nd whole note	38	Pulse NC MIDI clk every 2nd whole note	58	Toggle MIDI clock every 2nd note	
				19	Pulse NO MIDI clk every 3rd whole note	39	Pulse NC MIDI clk every 3rd whole note	59	Toggle MIDI clock every 3rd note	
				20	Pulse NO MIDI clk every 4th whole note	40	Pulse NC MIDI clk every 4th whole note	60	Toggle MIDI clock every 4th note	
				21	Pulse NO MIDI clk every 5th whole note	41	Pulse NC MIDI clk every 5th whole note	61	Toggle MIDI clock every 5th note	
				22	Pulse NO MIDI clk every 6th whole note	42	Pulse NC MIDI clk every 6th whole note	62	Toggle MIDI clock every 6th note	
				23	Pulse NO MIDI clk every 7th whole note	43	Pulse NC MIDI clk every 7th whole note	63	Toggle MIDI clock every 7th note	
				24	Pulse NO MIDI clk every 8th whole note	44	Pulse NC MIDI clk every 8th whole note	64	Toggle MIDI clock every 8th note	

Pulses (EXT)

It is also possible to send a certain number of pulses. This is also possible as *NO* and *NC*.

CC					Function
EXT1-Tip	EXT1-Ring	EXT2-Tip	EXT2-Ring	#	
35	41	47	53	0	1 pulse NO
				1	2 pulses NO
				2	3 pulses NO
				n	n+1 pulses NO
				126	127 pulses NO
				127	128 pulses NO

CC					Function
EXT1-Tip	EXT1-Ring	EXT2-Tip	EXT2-Ring	#	
36	42	48	54	0	1 pulse NC
				1	2 pulses NC
				2	3 pulses NC
				n	n+1 pulses NC
				126	127 pulses NC
				127	128 pulses NC

MIDI clock pulse (EXT)

Some effects with Tap Tempo are sensitive to the Tap Tempo Pulse being sent continuously. Therefore there is the possibility to send the clock only for a limited number of pulses until the effect has recognized the clock. This is also possible as *NO* and *NC*. With these commands, an automatic MIDI clock detection is carried out. If the MIDI clock changes by more than approx. 1%, the pulses are sent again.

CC					Function
EXT1-Tip	EXT1-Ring	EXT2-Tip	EXT2-Ring	#	
37	43	49	55	0-19	1-20 pulses NO MIDI clock 1/4
				20-39	1-20 pulses NO MIDI clock 1/8
				40-59	1-20 pulse NO MIDI clock triplets
				60-79	1-20 pulses NO MIDI clock 1/16
				80-99	1-20 pulses NO MIDI clock dot. 1/8
				100-119	1-20 pulses NO MIDI clock 1/32

CC					Function
EXT1-Tip	EXT1-Ring	EXT2-Tip	EXT2-Ring	#	
38	44	50	56	0-19	1-20 pulses NC MIDI clock 1/4
				20-39	1-20 pulses NC MIDI clock 1/8
				40-59	1-20 pulses NC MIDI clock triplets
				60-79	1-20 pulses NC MIDI clock 1/16
				80-99	1-20 pulses NC MIDI clock dot. 1/8
				100-119	1-20 pulses NC MIDI clock 1/32

For systems with high MIDI clock jitter, the detection sensitivity can be set in 16 steps, or the function can be deactivated completely. The following two commands must be sent immediately one after the other.

CC		Function
19	0-16	Sensitivity (default = 12) 0 = Deactivated 1 = Very low sensitivity 16 = Very High sensitivity
19	127	Save sensitivity

Pulse length (EXT)

The standard length of a pulse is approx. 80 ms. This can be too short for some devices, or too long for fast switching applications. Therefore the pulse length can be set in 10ms steps.

CC					Function
EXT1-Tip	EXT1-Ring	EXT2-Tip	EXT2-Ring	#	
39	45	51	57	n	Pulse length in 10ms steps