Machinedrum System Exclusive description version 0.8

This is a document describing the MIDI system exclusive messages of the Elektron Machinedrum SPS-1/UW v 1.53

Conventions in this document

Bits are labeled from 0 and upwards.

7 bit data are referred to as data.

8 bit data are referred to as bytes.

How the checksums are calculated

The checksum is generated from the data marked in blue in the tables.

It is the lower 14 bits of the sum of all the indicated data.

How the message length is calculated

The length at the end of the message is the number of bytes starting from version and ending with the checksum.

How the 7 bit encoding is generated

As a SysEx message only allows 7 bit data, 8 bit data blocks are converted as follows:

The first data contains the MSB of the following, up to, 7 data, data[0..6]. Bit 6 is the MSB bit of data[0] and bit 0 is the MSB of data[6]. 7 bytes encodes to 8 data. 8 bytes encodes to 10 data.

7 bit encoding example encoding bytes a, b, c:

```
   Bit:    7  6  5  4  3  2  1  0
Data[0] [0 |a7|b7|c7|..|..|..|..]
Data[1] [0 |a6|a5|a4|a3|a2|a1|a0]
Data[2] [0 |b6|b5|b4|b3|b2|b1|b0]
Data[3] [0 |c6|c5|c4|c3|c2|c1|c0]
Data[4] ...
```

Global Message

Pos	Data	Description
0x00	0xF0 0x00 0x20 0x3C 0x02 0x00	Machinedrum header
0x06	0x50	Global message
0x07	0x06	Version
0x08	0x01	Revision
0x09	[0x00 ... 0x07]	Original position
0x0A	16 x [0..5,6=STEREO]	Drum routing table
0x1A	147 data (7 bit encoding)	Keymap structure
0xAD	[0 ... 15,127=NONE]	Midi base channel
0xAE	[0=24ppr, 1=32ppr, 2 & 3 reserved]	Mechanical settings
0xAF	[0 ... 127]	24 * Tempo (bit 7...13)
0xB0	[0 ... 127]	24 * Tempo (bit 0...6)
0xB1	[0,1]	Extended mode
0xB2	Bit 0 Clock In Bit 4 Transport In Bit 5 Clock Out Bit 6 Transport Out	External sync
0xB3	[0,1]	Local On
	External Trig	
0xB4	[0 ... 15, 16=OFF]	Drum Left
0xB5	[0 ... 15, 16=OFF]	Drum Right
0xB6	[0 ... 127]	Gate Left
0xB7	[0 ... 127]	Gate Right
0xB8	[0 ... 127]	Sense Left
0xB9	[0 ... 127]	Sense Right
0xBA	[0 ... 127]	Minimum Level Left
0xBB	[0 ... 127]	Minimum Level Right
0xBC	[0 ... 127]	Maximum Level Left
0xBD	[0 ... 127]	Maximum Level Right
0xBE	[0 = OFF,1 = IN, 2 = OUT, 3 = IN+OUT]	Program change
0xBF	[0 = GATE, 1 = START, 2 = QUE]	Trig mode for keymap
0xC0	[0 ... 127]	Checksum (bit 7...13)
0xC1	[0 ... 127]	Checksum (bit 0...6)

Pos	Data	Description
0xC2	[0 ... 127]	Message length (bit 7...13)
0xC3	[0 ... 127]	Message length (bit 0...6)
0xC4	0xF7	End of SysEx

Format of the keymap structure

The unpacked keymap structure is 128 bytes in size and is defined as follows.

Byte[0]=mapping of midi note 0

...

Byte[127]= mapping of midi note 127

Value	Mapping
[0x00 ... 0x0F]	Drum on track [0x00...0x0F]
[0x10 ... 0x1F]	Trigger pattern A1 ... 16
[0x20 ... 0x2F]	Trigger pattern B1 ... 16
[0x30 ... 0x3F]	Trigger pattern C1 ... 16
[0x40 ... 0x4F]	Trigger pattern D1 ... 16
[0x50 ... 0x5F]	Trigger pattern E1 ... 16
[0x60 ... 0x6F]	Trigger pattern F1 ... 16
[0x70 ... 0x7F]	Trigger pattern G1 ... 16
[0x80 ... 0x8F]	Trigger pattern H1 ... 16
0x90	Trigger start
0x91	Trigger stop

Kit Message

Pos	Data	Description
0x00	0xF0 0x00 0x20 0x3C 0x02 0x00	Machinedrum header
0x06	0x52	Kit message
0x07	0x04	Version
0x08	0x01	Revision
0x09	[0x00 ... 0x3F]	Original position
0x0A	16 x ASCII	Kitname
0x1A	24 x [0 ... 127]	Parameters track 1
	...	...
	24 x [0 ... 127]	Parameters track 16
0x19A	16 x [0 ... 127]	Level track [1 ... 16]
0x1AA	74 data (7 bit encoding)	Selected Drum Model
0x1F4	659 data (7 bit encoding)	LFO settings
0x487	8 x [0 ... 127]	Reverb settings
0x48F	8 x [0 ... 127]	Delay settings
0x497	8 x [0 ... 127]	EQ settings
0x49F	8 x [0 ... 127]	Dynamics settings
0x4A7	37 data (7 bit encoding)	Trig groups
0x4CC	[0 ... 127]	Checksum (bit 7...13)
0x4CD	[0 ... 127]	Checksum (bit 0...6)
0x4CE	[0 ... 127]	Message length (bit 7...13)
0x4CF	[0 ... 127]	Message length (bit 0...6)
0x4D0	0xF7	End of SysEx

Selected drum model

Unpacked structure (16 x 4-byte integers, big endian)

Pos	Value	Mapping
0x00 ... 0x03	0=OFF ...	Drum model on track 1
	...	
0x3c ... 0x3F	0=0FF ...	Drum model on track 16

LFO Settings

16 LFO setting structures

Pos	Value	Mapping
0x00	[0 ... 15]	Destination track
0x01	[0 ... 23]	Destination param
0x02	[0 ... 5]	Shape 1
0x03	[0 ... 5]	Shape 2
0x04	0=Free, 1=Trig, 2=Hold	LFO type
0x05	31 bytes, [7..14] must not all be 0!	Internal state

Trig groups

Pos	Value	Mapping
0x00	16 x [0 ... 15, -1 = OFF]	Trig group track 1-16
0x10	16 x [0 ... 15, -1 = OFF]	Mute group track 1-16

Pattern Message

Pos	Data	Description
0x00	0xF0 0x00 0x20 0x3C 0x02 0x00	Machinedrum header
0x06	0x67	Pattern message
0x07	0x03	Version
0x08	0x01	Revision
0x09	[0x00 ... 0x7F]	Original position
0x0A	74 data (7 bit encoding)	Trig pattern
0x54	74 data (7 bit encoding)	Lock pattern
0x9E	19 data (7 bit encoding)	Accent pattern
0xB1	[0 ... 127]	Accent amount
0xB2	[0 ... 64]	Pattern length
0xB3	[0 = 1x, 1=2x, 2=3/4x, 3=3/2x]	Tempo multiplier
0xB4	[0 = 16, 1=32, 2=48, 3=64]	Scale
0xB5	[0 ... 63]	Kit
0xB6	[0 ... 64]	Number of locked rows (unused)
0xB7	2341 data (7 bit encoding)	Locks
0x9DC	234 data (7 bit encoding)	Extra Pattern
0xAC6	2647 data (7 bit encoding)	Extra Pattern 64 (optional)
0xAC6 / 0x151D	[0 ... 127]	Checksum (bit 7...13)
0xAC7 / 0x151E	[0 ... 127]	Checksum (bit 0...6)
0xAC8 / 0x151F	[0 ... 127]	Message length (bit 7...13)
0xAC9 / 0x1520	[0 ... 127]	Message length (bit 0...6)
0xACA / 0x1521	0xF7	End of SysEx

Trig Pattern

Unpacked structure (16 x 4-byte integers, big endian)

Pos	Value	Description
0x00 ... 0x03	Bit 0 is pos 0	Trig Pattern track 1
	...	

Pos	Value	Description
0x3c ... 0x3F	Bit 0 is pos 0	Trig Pattern track 16

Lock Pattern

Unpacked structure (16 x 4-byte integers, big endian)

Pos	Value	Description
0x00 ... 0x03	Bit 0 is param 1 Bit 23 is param 23 ...	Locked params track 1
0x3c ... 0x3F	Bit 0 is param 1 Bit 23 is param 24	Locked params track 16

Accent Pattern

Unpacked structure (4 x 4-byte integers, big endian)

Pos	Value	Description
0x00 ... 0x03	Bit 0 is pos 0	Accent pattern
0x04 ... 0x07	Bit 0 is pos 0	Slide pattern
0x08 ... 0x0B	Bit 0 is pos 0	Swing pattern
0x0C ... 0x0F	...	Swing amount << 14

Locks

64 locked rows, 32 bytes each

Pos	Value	Description
0x00 ... 0x20	32 x [0 ... 127, -1 = OFF] ...	Values of locks of 1st parameter lock
0x7E0 ... 0x7FF	32 x [0 ... 127, -1 = OFF]	Values of locks of 64th parameter lock

Extra Pattern

Unpacked structure (51 x 4-byte integers, big endian)

Pos	Value	Mapping
0x00 ... 0x03	[0 ... 1]	Accent edit all
0x04 ... 0x07	[0 ... 1]	Slide edit all
0x08 ... 0x0B	[0 ... 1]	Swing edit all
0x0C ... 0x1B	16 x (32 bit pattern)	Accent
0x1C ... 0x2B	16 x (32 bit pattern)	Slide
0x2C ... 0x3B	16 x (32 bit pattern)	Swing

Extra Pattern 64

Unpacked structure (2316 bytes). Contains data for pattern steps 33-64.

Pos	Value	Mapping
0x000 ... 0x03F	16 x (32 bit pattern)	Trig pattern
0x040 ... 0x043	32 bit pattern	Accent pattern
0x044 ... 0x047	32 bit pattern	Slide pattern
0x048 ... 0x04B	32 bit pattern	Swing pattern
0x04C ... 0x84B	64 x 32 bytes	Locks
0x84C ... 0x88B	16 x (32 bit pattern)	Accent
0x88C ... 0x8CB	16 x (32 bit pattern)	Slide
0x8CC ... 0x90B	16 x (32 bit pattern)	Swing

Song Message

Pos	Data	Description
0x00	0xF0 0x00 0x20 0x3C 0x02 0x00	Machinedrum header
0x06	0x69	Song message
0x07	0x02	Version
0x08	0x02	Revision
0x09	[0x00 ... 0x07]	Original position
0x0A	16 x ASCII	Song name
0x1A	12 data (7 bit encoding)	Song row 1
...	...	...
0x1A + 12(N-1)	12 data (7 bit encoding)	Song row N, N≤256
0x1A + 12N	[0 ... 127]	Checksum (bit 7...13)
0x1B + 12N	[0 ... 127]	Checksum (bit 0...6)
0x1C + 12N	[0 ... 127]	Message length (bit 7...13)
0x1D + 12N	[0 ... 127]	Message length (bit 0...6)
0x1E + 12N	0xF7	End of SysEx

Song Row

Up to 256 rows, last row must be Pattern END, 10 bytes each.

Pos	Value	Description
0x00	[0 ... 127] -1= END -2 = JUMP/HALT/ STOP -3 = REMARK	Pattern
0x01	[0 ... 63]	Kit
0x02	[0=INF, 1 ... 63]	Loop (times)
0x03	[0 ... 255] = current row is halt < current row is loop > current row is a jump	Jump to row
0x04	2 bytes	Channel mutes
0x06	[0 ... 30*300]	30 * Tempo
0x08	[0 ... 31]	Pattern start position
0x09	[0 ... 31]	Pattern end position

Document revision history

Version 0.1 First one.

Version 0.2 Fixed: Song hex code. Kit structure.

Version 0.3 Message length clarification.

Version 0.4 7 bit encoding example.

Version 0.5 Song Message updated.

Version 0.6 Pattern structure updated for 64 step patterns and OS 1.50.

Version 0.7 Pattern double tempo becomes tempo multiplier.

Version 0.8 Global mechanical settings added and version number changed.