MIDI Controller List

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Some controllers adhere to the normal midi-specified use (eg modwheel, volume) but most are used arbitrarily (and therefore may clash with parameter assignments of other products). We have tried to avoid misuse of some "standard" controllers which could cause problems.

Unless noted, controllers are transmitted and received. Unless noted, parameters have the range 0-127.

*** denotes a signed value where 64 represents zero.
Unless noted, this is -64..0..+63 stored as 0..64..127
another example is -12..0..+12 stored as 52..64..76

--- denotes controller not used

Some controllers use the available 7 data value bits to control more than one parameter.
These are noted as "packed parameters" and details are given.

The term "pulse width" is properly applied when squarewave is selected.
For other waveforms, read "pulse width" as "double waveform phase offset".
Double waveform phase offset is zero when the signed pulse width position parameter is 64 (meaning 0).

Common parameters are transmitted and received on the global midi channel but in performance mode, they can also be received on the midi channel of any active part.

#	MIDI-SPECIFIED USE	X-Station / KS SERIES USE - KS USE ONLY SHOWN IN RED TEXT
0	bank msb	IGNORED/NOT TRANSMITTED
1	modwheel msb	MODWHEEL
2	breath msb	BREATH CONTROL (receive only)
3	undefined msb	ARP PATTERN (0..7 = up, down, ud1, ud2, order, random, chord, drum)
4	foot controller msb	---
5	portamento time msb	PORTAMENTO TIME
6	data entry msb	USED FOR NRPN DATA VALUES
7	volume msb	PART VOLUME
8	balance msb	PREGLIDE SEMITONES *** -12..+12 (0=preglide disabled)
9	undefined msb	ARP/GENERAL SYNC RATE (64..191 bpm) (common)
10	pan msb	PAN POSITION ***
11	expression msb	EXPRESSION PEDAL
12	effect control 1 msb	NON-SYNC PAN RATE
13	effect control 2 msb	SYNC PAN RATE 0..34 (non-sync, 32Triplet..12bars)
14	undefined msb	VOCODER STEREO WIDTH (common)
15	undefined msb	VOCODER SIBILANCE LEVEL (common)
16	gen. controller 1 msb	MODWHEEL DISTORTION ***
17	gen. controller 2 msb	DISTORTION COMPENSATION
18	gen. controller 3 msb	MODWHEEL DELAY SEND
19	gen. controller 4 msb	NON-SYNC DELAY TIME
20	undefined msb	SYNC DELAY TIME 0..19 (non-sync, 32Triplet..2bars)
21	undefined msb	DELAY FEEDBACK
22	undefined msb	DELAY STEREO WIDTH
23	undefined msb	DELAY RATIO
24	undefined msb	MODWHEEL REVERB SEND ***
25	undefined msb	REVERB DECAY
26	undefined msb	MODWHEEL CHORUS SEND ***
27	undefined msb	NON-SYNC CHORUS RATE
28	undefined msb	SYNC CHORUS RATE 0..34 (non-sync, 32Triplet..12bars)
29	undefined msb	CHORUS FEEDBACK ***
30	undefined msb	CHORUS MOD DEPTH
31	undefined msb	CHORUS MOD CENTRE POINT
32	bank lsb	BANK SELECT 1..8 (bit 6 set forces perf mode, bit 5 set forces program mode)
33	modwheel lsb	EQ LEVEL *** (0, 1..63, 64, 65..126, 127 = LP, LPshelf, flat, HPshelf, HP)
34	breath lsb	EQ FREQUENCY
35	undefined lsb	NON-SYNC EQ MOD RATE
36	foot controller lsb	SYNC EQ MOD RATE 0..34 (non-sync, 32Triplet..12bars)
37	portamento time lsb	EQ MOD DEPTH
38	data entry lsb	---
39	volume lsb	---
40	balance lsb	OSC1 SEMITONE *** -12..+12
41	undefined lsb	OSC1 CENT *** -50..+50
42	pan lsb	OSC1 BENDWHEEL PITCH AMOUNT ***
43	expression lsb	OSC1 LFO1 PITCH AMOUNT ***
44	effect control 1 lsb	OSC1 MOD.ENV PITCH AMOUNT ***
45	effect control 2 lsb	OSC1 PULSE WIDTH POSITION *** (0=50% or in-phase double wave)
46	undefined lsb	OSC1 LFO2 PULSE WIDTH MOD ***
47	undefined lsb	OSC1 MOD.ENV PULSE WIDTH MOD ***
48	gen. controller 1 lsb	OSC2 SEMITONE *** -12..+12
49	gen. controller 2 lsb	OSC2 CENT *** -50..+50
50	gen. controller 3 lsb	OSC2 BENDWHEEL PITCH AMOUNT ***
51	gen. controller 4 lsb	OSC2 LFO1 PITCH AMOUNT ***

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#	MIDI-SPECIFIED USE	KS SERIES USE
52	undefined lsb	OSC2 MOD.ENV PITCH AMOUNT ***
53	undefined lsb	OSC2 PULSE WIDTH POSITION *** (0=50% or in-phase double wave)
54	undefined lsb	OSC2 LFO2 PULSE WIDTH MOD ***
55	undefined lsb	OSC2 MOD.ENV PULSE WIDTH MOD ***
56	undefined lsb	OSC3 SEMITONE *** -12..+12
57	undefined lsb	OSC3 CENT *** -50..+50
58	undefined lsb	OSC3 BENDWHEEL PITCH AMOUNT ***
59	undefined lsb	OSC3 LFO1 PITCH AMOUNT ***
60	undefined lsb	OSC3 MOD.ENV PITCH AMOUNT ***
61	undefined lsb	OSC3 PULSE WIDTH POSITION *** (0=50% or in-phase double wave)
62	undefined lsb	OSC3 LFO2 PULSE WIDTH MOD ***
63	undefined lsb	OSC3 MOD.ENV PULSE WIDTH MOD ***
64	sustain pedal	SUSTAIN / MOMENTARY ARP LATCH ON
65	portamento on/off	ENVELOPE MONO MULTI MODES **(see packed parameter 1)**
66	sostenuto pedal	---
67	soft pedal	UNISON / VOICE TYPE / FILTER TYPE **(see packed parameter 2)**
68	legato footswitch	UNISON DETUNE
69	hold 2	INDIVIDUAL OSCILLATOR RANDOM DETUNE
70	sound controller 1	PORTAMENTO MODE (0=exp, 1=lin)
71	sound controller 2	OSC 1,2,3 OCTAVE / OSC 1>2 SYNC **(see packed parameter 3)**
72	sound controller 3	OSC1 LEVEL (to filter)
73	sound controller 4	OSC2 LEVEL (to filter)
74	sound controller 5	OSC3 LEVEL (to filter)
75	sound controller 6	NOISE LEVEL (to filter)
76	sound controller 7	OSC 1*2 RINGMOD LEVEL (to filter)
77	sound controller 8	EXTERNAL INPUT (to filter)
78	sound controller 9	LFO DELAY MONO MULTI MODE **(see packed parameter 4)**
79	sound controller 10	LFO 1,2 KEYSYNC / LOCK / ONE-SHOT **(see packed parameter 5)**
80	gen. controller 5 lsb	NON-SYNC LFO1 SPEED
81	gen. controller 6 lsb	SYNC LFO1 SPEED 0..34 (non-sync, 32Triplet..12bars)
82	gen. controller 7 lsb	LFO1 DELAY (GRADUAL ONSET TIME/ ONE-SHOT MODE DELAY)
83	gen. controller 8 lsb	NON-SYNC LFO2 SPEED
84	portamento control	SYNC LFO2 SPEED 0..34 (non-sync, 32Triplet..12bars)
85	undefined	LFO2 DELAY (GRADUAL ONSET TIME/ ONE-SHOT MODE DELAY)
86	undefined	--- (may be used in future software releases)
87	undefined	ARPEGGIATOR SYNC SETTING 0..15 (32Triplet..1 bar)
88	undefined	ARPEGGIATOR GATE TIME *** (+64 GIVES TIED NOTE IN MONO MODE)
89	undefined	ARPEGGIATOR CONTROL **(see packed parameter 6)**
90	undefined	DISTORTION LEVEL
91	effects 1 depth	REVERB SEND LEVEL
92	effects 2 depth	DELAY SEND LEVEL
93	effects 3 depth	CHORUS SEND LEVEL
94	effects 4 depth	PAN MOD DEPTH
95	effects 5 depth	VOCODER BALANCE (0=off 64=full vocoder 127=modulator only) (common)
96	data increment	---
97	data decrement	---
98	nrpn lsb	NRPN NUMBER
99	nrpn msb	IGNORED / NOT TRANSMITTED (for future compatibility, assume value is 0)
100	rpn lsb	---
101	rpn msb	---
102	undefined	FILTER FREQUENCY LFO2 MOD DEPTH ***
103	undefined	FILTER Q NORMALISE (127=zero filter drive at max resonance)
104	undefined	FILTER OVERDRIVE
105	undefined	FILTER FREQUENCY
106	undefined	FILTER RESONANCE
107	undefined	FILTER FREQUENCY MOD.ENV DEPTH ***
108	undefined	AMPLITUDE ENVELOPE ATTACK
109	undefined	AMPLITUDE ENVELOPE DECAY
110	undefined	AMPLITUDE ENVELOPE SUSTAIN
111	undefined	AMPLITUDE ENVELOPE RELEASE
112	undefined	AMPLITUDE ENVELOPE VELOCITY DEPTH ***
113	undefined	--- (may be used in future software releases)
114	undefined	MOD. ENVELOPE ATTACK
115	undefined	MOD. ENVELOPE DECAY
116	undefined	MOD. ENVELOPE SUSTAIN
117	undefined	MOD. ENVELOPE RELEASE
118	undefined	MOD. ENVELOPE VELOCITY DEPTH ***
119	undefined	VOICE TO OUTPUT & EFFECTS LEVEL BOOST (0..30dB)
120	all sounds off	ALL NOTES OFF WITH FAST RELEASE (receive only)
121	reset controllers	RESET CONTROLLERS (receive only)
122	local on/off	LOCAL ON/OFF (ALSO VALUE 63 IS USED FOR SEQUENCER MODE)
123	all notes off	ALL NOTES OFF (receive only)
124	omni off	ALL NOTES OFF (receive only)
125	omni on	ALL NOTES OFF (receive only)
126	mono mode setup	ALL NOTES OFF (receive only)
127	poly mode on	ALL NOTES OFF (receive only)

MIDI NRPN List

MIDI NRPN List

The KS series uses NRPNs as detailed below. Since less than 128 of them are used, only one NRPN msb (bank) is needed. Therefore only the NRPN lsb is transmitted/received and the NRPN msb is ignored and is not transmitted.
For future compatibility, assume that the NRPN msb is 0.

NRPN lsb	KS SERIES USE
0	FM FIXED LEVEL
1	FM ENVELOPE DEPTH ***
2	FM ENVELOPE VELOCITY DEPTH ***
3	FM ENVELOPE ATTACK
4	FM ENVELOPE DECAY
5	OSCs 1,2,3 MODWHEEL DIRECT PITCH DEPTH ***
6	OSCs 1,2,3 AFTERTOUCH DIRECT PITCH DEPTH ***
7	OSCs 1,2,3 BREATH DIRECT PITCH DEPTH ***
8	OSCs 1,2,3 MODWHEEL LFO1 PITCH DEPTH ***
9	OSCs 1,2,3 AFTERTOUCH LFO1 PITCH DEPTH ***
10	OSCs 1,2,3 BREATH LFO1 PITCH DEPTH ***
11	FILTER KEYBOARD TRACKING (0=NONE, 127=PRECISE PITCH TRACK)
12	FILTER MODWHEEL DIRECT FREQUENCY DEPTH ***
13	FILTER AFTERTOUCH DIRECT FREQUENCY DEPTH ***
14	FILTER BREATH DIRECT FREQUENCY DEPTH ***
15	FILTER MODWHEEL LFO2 FREQUENCY DEPTH ***
16	FILTER AFTERTOUCH LFO2 FREQUENCY DEPTH ***
17	FILTER BREATH LFO2 FREQUENCY DEPTH ***
18	AMPLITUDE MODWHEEL DIRECT DEPTH ***
19	AMPLITUDE AFTERTOUCH DIRECT DEPTH ***
20	AMPLITUDE BREATH DIRECT DEPTH ***
21	EFFECTS TYPE CONTROL **(see packed parameter 7)**
22	EFFECTS GLOBAL SYNC CONTROL **(see packed parameter 8)**
23	AUDIO INPUT CONTROL **(see packed parameter 9)**
24	VOCODER SIBILANCE TYPE (0=hp, 1=noise) (common)
25	EFFECT TYPE SELECTOR/KEYBOARD OCTAVE **(see packed parameter 10)**
26	OSC, SOURCE, PW, LFO SELECTORS **(see packed parameter 11)**
	(end of A/K-station similarity)
27-49	--- (may be used in future software releases)
50	OSC1 WAVEFORM (0..31)
51	OSC2 WAVEFORM (0..31)
52	OSC3 WAVEFORM (0..31)
53	LFO1 WAVEFORM (0..31)
54	LFO2 WAVEFORM (0..31)
55	LFO1 UNIPOLAR (0= centre-zero, 1=all positive)
56	LFO2 UNIPOLAR (0= centre-zero, 1=all positive)
57	LFO1 KEYSYNC START PHASE (0..357 degrees)
58	LFO2 KEYSYNC START PHASE (0..357 degrees)
59	LFO1 SYNC DELAY TIME 0..34 (non-sync, 32Triplet..12bars)
60	LFO2 SYNC DELAY TIME 0..34 (non-sync, 32Triplet..12bars)
61	MIX MODULATION SELECTOR (0=normal, 1=pots control mod levels)
62	FILTER TYPE (0..2 = LP, BP, HP)
63	OSC1 LFO1 LEVEL MOD ***
64	OSC2 LFO2 LEVEL MOD ***
65	OSC3 A/D ENV LEVEL MOD ***
66	NOISE LFO1 LEVEL MOD ***
67	RING1*2 LFO1 LEVEL MOD ***
68	AUDIO INPUT LFO1 LEVEL MOD ***
69	OSC123 WAVEFORM KEYSYNC PHASE (0..357 degrees)
70	NOISE TYPE (0..3 = white, hp, bp, hp*bp)
71	ARPEGGIATOR PATTERN (0..32 0=off, 32 patterns. In DRUM MODE, 33 patterns)
72	FILTER FREQUENCY VELOCITY CONTROL ***
73	ARPEGGIATOR PATTERN VELOCITY MODE (0=use note-on velocity, 1= use velocity in pattern)
74	FIXED NOTE CONTROL (0=off, 1-127 fix the note to midi 1..127 ie C#-2..G8)
75	LFO1 OUTPUT LEVEL VELOCITY CONTROL ***
76	LFO2 OUTPUT LEVEL VELOCITY CONTROL ***
77	OSC1 LFO2 LEVEL MOD ***
78	OSC 2>3 FM LFO1 DEPTH MOD ***
79	DRUM NOTE ON-TIME (0=turn off by note-off, 1-127=1msec..10sec auto-turn-off, ignoring note-off)
80-81	--- (may be used in future software releases)
82	CATEGORY (0..23) (currently not transmitted)
83	EXPRESSION PEDAL CONTROLLER NUMBER
84	FOOTSWITCH FUNCTION (0=sustain, 1=arp latch on override)
85	PART OUTPUT (0..5 = 1+2, 3+4, 1, 2, 3, 4)
86	PART MIDI CHANNEL (0..15 Note that in program mode, the global channel is used)
87	PART LOW NOTE LIMIT
88	PART HIGH NOTE LIMIT
89	PART SEMITONE OFFSET ***
90	PART CENT OFFSET ***
91	PART VELOCITY FUNCTION (0..15 0=normal, 1=inverse, 2=xfade hi, 3=xfade lo, 12 limit settings)
92-99	--- (may be used in future software releases)
100	PERFORMANCE VOCODER PART SELECTION (0..3 for parts 1..4) (common)
101-111	--- (may be used in future software releases)

MIDI NRPN List - Packed Controller / NRPN Details

NRPNs FOR GLOBAL DATA (not part of programs or performances)

NRPN lsb	KS SERIES USE
113	GLOBAL MIDI CHANNEL (0..15)
114	MIDI CLOCK SOURCE (0=internal 1=external)
115	MASTER TUNE CENTS ***
116	VELOCITY CURVE (0=soft 1=hard)
117	EXTERNAL INPUT RANGE (0=line 1=mic)
118	EXTERNAL INPUT TRIM (-10..+20 dB)
119	EXTERNAL INPUT TRIGGER SENSITIVITY (0 is most sensitive)
120	GLOBAL SYNC TYPE (0,1,2 = note when all notes off, first note after prog change, midi song start)
121	PARAMETER MOMENTARY DISPLAY TIME (off.200..1200mS)
122	MENU INITIAL PAGE MODE (0=first 1=last used)
123	PROGRAM MODE PARAMETER DISPLAY MODE (0=timed 1=permanent)
124-127	--- (may be used in future software releases)

PACKED PARAMETER HANDLING FOR X-STATION, KS4/5/RACK, A/K/V-STATION

KS4/5/RACK	introduced in O/S version 2.1	alternatives are received, originals transmitted and received
A/K-STATION	introduced in O/S version 2.1	alternatives are received, originals transmitted and received
V-STATION	introduced in version 1.4	alternatives are received, originals transmitted and received
X-STATION	included in first release	alternatives are received and transmitted, originals received

These alternative messages give individual packed parameters their own unique midi message.
This allows a controller to change a parameter which is stored in the same data byte as other parameters without needing to know the value of the other parameters in the byte. Prior to this, the Astation, Kstation, Vstation and KS series only transmitted and received the original messages detailed below in the far right-hand column. All NRPNs shown are NRPN lsb. NRPN msb is ignored and is not required.
If a controller wishes to transmit an NRPN msb, the value 0 should be used for future compatibility.

The X-station and KS series details are identical. There are a few differences in the A / K and V stations as shown.

ALTERNATIVE NRPN	VALUES	ORIGINAL PACKED PARAMETER BYTE
		CONTROLLER 65 ENVELOPES MONO SINGLE-MULTI
104	0..1	bit 0 amp env trigger 0=single 1=multi
104	2..3	bit 1 mod env trigger 0=single 1=multi
104	4..5	bit 2 fm env trigger 0=single 1=multi
107	0..15 A/K only	bits 3-6 4-bit wave keysync phase 0=free-run 1..15 = 0..336 degrees in 24 degree steps
		CONTROLLER 67 UNISON / POLY MODE / FILTER TYPE
106	0..7	bits 0-2 3-bit unison count 0=off 1..7=2..8 voices
105	0..3	bits 3-4 2-bit voice polyphony mode 0=mono 1=mono autoglide 2=poly1 3=poly2
104	6..7	bit 5 filter slope 0=12dB 1=24dB per octave
		CONTROLLER 70 OSC 1/2/3 WAVEFORM / PORTAMENTO MODE (A/K only)
105	4..7	bits 0-1 2-bit osc1 waveform sine, tri, saw, square (pulse)
105	8..11	bits 2-3 2-bit osc2 waveform sine, tri, saw, square (pulse)
105	12..15	bits 4-5 2-bit osc3 waveform sine, tri, saw, square (pulse)
104	8..9	bit 6 portamento mode 0=exponential 1=linear
		CONTROLLER 71 OSC 1,2,3 OCTAVE / OSC 1>2 SYNC
105	16..19	bits 0-1 2-bit osc1 octave -1,0,1,2
105	20..23	bits 2-3 2-bit osc2 octave -1,0,1,2
105	24..27	bits 4-5 2-bit osc3 octave -1,0,1,2
104	10..11	bit 6 osc1>2 sync 1=on
		CONTROLLER 78 LFO 1,2 DELAY MONO MULTI MODE
104	12..13	bit 0 lfo1 delay multi 1=on
104	14..15	bit 1 lfo2 delay multi 1=on
105	28..31 A/K only	bits 2-3 2-bit lfo1 waveform tri, saw, square, s/h
105	32..35 A/K only	bits 4-5 2-bit lfo2 waveform tri, saw, square, s/h

PACKED PARAMETER HANDLING FOR X-STATION, KS4/5/RACK, A/K/V-STATION

ALTERNATIVE NRPN	VALUES		ORIGINAL PACKED PARAMETER BYTE
			CONTROLLER 79 LFO 1,2 KEYSYNC / LOCK / ONE-SHOT
104	16..17		bit 0 lfo1 keysync phase shift (A/K) lfo1 one-shot mode 1=on (KS)
104	18..19		bit 1 lfo1 keysync 1=on
104	20..21		bit 2 lfo1 lock 0=independent per voice 1=all voices same phase
104	22..23		bit 3 lfo2 keysync phase shift (A/K) lfo2 one-shot mode 1=on (KS)
104	24..25		bit 4 lfo2 keysync 1=on
104	26..27		bit 5 lfo2 lock 0=independent per voice 1=all voices same phase
			note that when lock is on, keysync becomes global sync
			(ie note when all notes off, first note after prog change, song start message)
			CONTROLLER 89 ARPEGGIATOR CONTROL
105	36..39		bits 0-1 2-bit number of octaves 1,2,3,4
104	28..29		bit 2 arpeggiator off/on 1=on
104	30..31		bit 3 arpeggiator keysync control 1=on
104	32..33		bit 4 arpeggiator latch control 1=on
105	40..43		bits 5-6 2-bit arpeggiator output control int, ext, int+ext, ext+normplay
			NRPN 21 EFFECTS TYPE CONTROL
106	8..13		bits 0-2 3-bit reverb type (values 6,7 not used-reserved)
104	34..35		bit 3 chorus/phaser control 0=chorus 1=phaser
			NRPN 22 EFFECTS GLOBAL SYNC CONTROL
105	44..47		bits 0-1 2-bit chorus global sync off,left,centre,right
105	48..51		bits 2-3 2-bit pan global sync off,left,centre,right
105	52..55		bits 4-5 2-bit eq frequency global sync off,low,mid,high
			NRPN 23 AUDIO INPUT CONTROL
104	36..37	A/K only	bit 3 vocoder sibilance type 0=hi-pass 1=noise
104	38..39		bit 5 audio input trigger control 1=enabled
104	40..41		bit 6 audio input to fx control 1=enabled
			NRPN 25 EFFECT TYPE SELECTOR / KEYBOARD OCTAVE
106	16..22	K/KS only	bits 0-2 3-bit effect type del, rev, chor, dist, EQ, pan, vocoder (value 7 not used-reserved)
107	16..31	signed	bits 3-6 4-bit signed keyboard octave shift A/K -4..+5 KS4 -3..+4 KS5 -3+3
			NRPN26 OSC / NOISE-RING-EXT / PW / LFO SELECTORS
105	56..58		bits 0-1 2-bit osc select. 0,1,2 for osc 1,2,3. (value 3 reserved)
105	60..62		bits 2-3 2-bit source select. 0,1,2 for noise, ring, ext. (value 3 reserved)
105	64..66		bits 4-5 2-bit PW select. 0,1,2 for position, lfo2, mod env. (value 3 reserved)
104	42..43		bit 6 0=lfo1, 1=lfo2