Solaris System Exclusive

Version 1.4.0

Overview

Device ID

The Solaris system exclusive makes use of the device ID as described in the MIDI specification (rather than MIDI channel as some instruments do). Thus in order for the Solaris to accept an incoming system exclusive message, the device ID in the message must match the device ID set in the Solaris. If the Solaris is set to "All" then it will accept any device ID. The device ID in messages transmitted by the Solaris will be that set in the MIDI parameters. If the device ID is set to "All" then the transmitted ID will be zero.

The Solaris will also always respond to the device ID 0x7F which is sometimes referred to as the 'all call' device ID. If you need to remotely discover the device ID of the Solaris, one way is to use the ID 0x7F in a Universal Identity Request. The ID in the reply message will be the ID the Solaris is currently set to.

Universal Identity Request

Solaris supports the Universal Identity Request as defined in the MIDI specification. This reports the version number of the Solaris operating system which matches the version displayed on the front panel. Since the Solaris is a system that may change over time, software programs should query the version number to confirm the current system exclusive implementation.

Addresses and Values

All parameters can be accessed individually by their three-byte address. All values are *signed* integer values. This means that many values require more space than they otherwise would if some were signed and some unsigned. But it's more consistent to have all values interpreted the same way and it makes development easier.

Preset Blocks

The Solaris preset data is not transferred as a whole but is divided into several blocks. To request a block you send a request with the base address of the block. The base addresses are listed below. The base address always has the low part of the address as zero. When requesting individual blocks the data returned comes from the edit buffer.

Parameters within a preset block may be one, two or three bytes in size. The following is a C/C++ code example of how you might extract a value that is three bytes in size:

```
int value;  // assumed that int is 4 bytes
value = (Data[index++] & 0x7F) << 25;
value |= (Data[index++] & 0x7F) << 18;
value |= (Data[index++] & 0x7F) << 11;
value >>= 11;
```

To request an entire preset, you do not need to request each block individually. You can just request a frame Start base address. See the section below on Frame Base Address.

Checksum

There are two system exclusive messages that include a checksum. These are the bulk dump and the preset name list. In the bulk dump, the checksum is that number which when added to the sum of the three-byte address and the data produces zero in the lowest 7 bits. In the preset name list, the checksum is that number which when added to the bank number, the starting preset number and the 8 presets names produces zero in the lowest 7 bits. In either case, if the checksum is incorrect the message is invalid.

Single Parameters

Individual parameters are sent out over MIDI the when they are changed by the front panel controls. These values are always represented as three-byte signed values regardless of their size as defined in a preset block. So the Single parameter SysEx message is always the same length.

For single parameters to be sent out, both the MIDI parameters TxSysEx and MidiCtrl parameters must be set to "On". Note that parameters RxSysEx and MidiCtrl are intentionally not included in the list of parameters controllable by system exclusive. If you could disable these parameters by MIDI there would be no way to e-enable them by MIDI.

Frame Base Address

In the list of base address you will see Frame Start and Frame End. The purpose of Frame Start and Frame End is to surround a set of Preset Blocks to indicate which preset bank and number the blocks refer to. These are primarily included for future use if all presets on the CF card can be requested. Currently you can only request the data from the edit buffer. To request all blocks in the current preset (edit buffer), send a bulk dump request with base address of Frame Start (high byte 7E) and bank# = 7F and preset# = 7F. The data returned will begin with a Frame Start block followed by all preset blocks and ending with a Frame End block. In the future other banks and presets may be supported.

It's not necessary to *send* Frame Start or Frame End blocks to the Solaris since it's not possible to affect any preset other than the current one, i.e. the edit buffer.

Preset Names and Preset Name List

You can set the preset name and categories of the current preset by sending either the Preset Name block or by sending the individual parameters. This will set the preset name and categories in the current edit buffer only. It does not save the name to the preset on the CF-card because there is no system exclusive command for saving. The modified name and categories are only displayed on the front panel. If you then navigate away from the preset the new name is overwritten and lost. To save a preset with the new name and categories you must save the preset manually immediately after changing it.

You can retrieve the name and categories of any preset on the CF-card. The Preset Name List Request message lets you request eight names at a time from any bank. By requesting only eight names at a time the response time is kept short. So you'll need to send up to 16 requests to get the names and categories for an entire bank. The Preset Name List is transmit only. It is not a recognized received message.

Key Tables

The key table values are different than other parameter values. A key table value is either *fixed* or *interpolated*. Whether it is fixed or interpolated is determined by bit 13 of the value. The actual level is a signed value that occupies bits 0 to 9.

When a fixed key table entry on the Solaris is changed, that value is sent out over MIDI as a system exclusive single parameter. Although that may result in the level of one or more interpolated key table entries to change, the interpolated changes are not sent out. Only changes in fixed values are sent.

If you want set a key table entry to be fixed or modify a fixed entry via SysEx, you must set bit 13 to 0. If you want to change a key table entry from fixed to interpolated, you must set bit 13 to 1. In this case the level value is

ignored because you cannot set the interpolated value. This value is calculated by the Solaris and is a straight line interpolation between two fixed values. To discover the actual interpolated value, you can request either single parameters or the entire block. Or a software editor may choose to estimate the interpolated values itself though there may be slight differences due to round off error.

Summary

Function (Hex)	SysEx Message	Description
	Identity Request	Universal request for device identity.
	Identity Response	Response to Identity Request.
10	Bulk Dump Request	Request for current Preset data. Specify using Base Address.
11	Bulk Dump	Current Preset data.
12	Parameter Request	Request a single parameter from the edit buffer.
13	Parameter Change	A single parameter value sent as a result of a Parameter Request or received by the Solaris without a request.
22	Load Sample Pool	A request to load a sample pool file from the CF card.
30	Preset State Request	Requests the current state of Compare or FxBypass
31	Preset State Change	A message sent as a result of RequestPresetState or as a result of Compare or FxBypass state changing.
32	Preset Name List Request	Requests the names and categories of 8 presets in a given bank.
33	Preset Name List	A list of the names and categories of 8 presets in a given bank.

Detail

Identity Request (Universal SysEx)	
F0	Start of SysEx (SOX)
7E	Non real time
0n	Device ID (n = 0x00 – 0x0F or 0x7F)
06	General Information
01	Identity Request
F7	End of SysEx (EOX)

Identity Request Response	
F0	SOX
7E	Non real time
0n	Device ID (n = 0x00 – 0x0F or 0x7F)
06	General Information
02	Identity Reply
00 12 34	Manufacturer ID
00 01	Device family code (1 = Solaris)
00 01	Device family member code (1 = Keyboard)
xx xx xx xx	Software revision level
F7	EOX

Bulk Dump Request	
F0	SOX
00 12 34	Manufacturer ID
0n	Device ID
10	Solaris ID
10	Function: Bulk Dump Request
aa	Base Address High
bb	Base Address Mid
cc	Base Address Low
F7	EOX

Bulk Dump	
F0	SOX
00 12 34	Manufacturer ID
0n	Device ID
10	Solaris ID
11	Function: Bulk Dump
aa	Base Address High
bb	Base Address Mid
cc	Base Address Low
dd	data
:	:
ee	checksum
F7	EOX

Parameter Request	
F0	SOX
00 12 34	Manufacturer ID
0n	Device ID
10	Solaris ID
12	Function: Parameter Request
aa	Address High
bb	Address Mid
cc	Address Low
F7	EOX

Parameter Changed	
F0	SOX
00 12 34	Manufacturer ID
0n	Device ID
10	Solaris ID
13	Function: Parameter Changed
aa	Address High
bb	Address Mid
cc	Address Low
dd	Parameter value bits 14 - 20
ee	Parameter value bits 7 - 13
ff	Parameter value bits 0 - 6
F7	EOX

Preset State Request	
F0	SOX
00 12 34	Manufacturer ID
0n	Device ID
10	Solaris ID
30	request preset state
ss	state to get (1 = Compare, 2 = FX Bypass)
F7	EOX

Preset State Change	
F0	SOX
00 12 34	Manufacturer ID
0n	Device ID
10	Solaris ID
31	preset state change
ss	state (1 = Compare, 2 = FX Bypass)
vv	value (0 = disabled, 1 = enabled)
F7	EOX

Preset Name List Request		
F0	SOX	
00 12 34	Manufacturer ID	
0n	Device ID	
10	Solaris ID	
32	request preset name list	
bb	bank number	bb = 0 to 7F (hex)
pp	starting preset number	must be a multiple of 8 between 0 and 120. (i.e. 0, 8, 16, 24, etc.)
F7	EOX	

Preset Name List (transmit only)		
F0	SOX	
00 12 34	Manufacturer ID	
0n	Device ID	
10	Solaris ID	
33	function: preset name list	
bb	bank number	
pp	starting preset number	will be a multiple of 8 between 0 and 120. (i.e. 0, 8, 16, 24, etc.)
aa (x 40)	Preset Name (pp + 0)	
cc	Category 1 for preset (pp + 0)	
dd	Category 2 for preset (pp + 0)	
:	:	
aa (x 40)	Preset Name (pp + 7)	
cc	Category 1 for preset (pp + 7)	
dd	Category 2 for preset (pp + 7)	
ee	checksum	includes bank number, starting preset number, and 8 names and categories.
F7	EOX	

Load Sample Pool	
F0	SOX
00 12 34	Manufacturer ID
0n	Device ID
10	Solaris ID
22	Load sample pool
rr	reserved
pp	Pool number bits 7 - 13
pp	Pool number bits 0 - 6
F7	EOX

Base Addresses				
	Address High	Address Mid	Address Low	
System	01	00	00	
Osc	10	n0	00	n = osc index
Rot	10	n0	00	n = rot index + 4
VecAM	10	60	00	
VCA	10	70	00	
Filter	11	n0	00	n = filter index
Mix	11	40	00	
Ins	11	50	00	
LFO	12	n0	00	n = LFO index
Env	13	n0	00	n = Env index
Looping EG	13	70	00	
Seq Params	14	00	00	
Seq Steps	14	10	00	
Effects	15	00	00	
Keytable 1A	16	00	00	
Keytable 1B	16	10	00	
Keytable 2A	16	20	00	
Keytable 2B	16	30	00	
Keytable 3A	16	40	00	
Keytable 3B	16	50	00	
Keytable 4A	16	60	00	
Keytable 4B	16	70	00	
Name	17	00	00	
Common	17	10	00	
Arp Params	18	00	00	
Arp Steps	18	10	00	
Frame Start	7E	bb	pp	bb = bank, pp = program if bb = 7F and pp = 7F, then edit buffer
Frame End	7F	bb	pp	bb = bank, pp = program if bb = 7F and pp = 7F, then edit buffer

System / MIDI

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit	Notes
01	00	00	2	Tune	-100 to 100	1 cent	
		02	1	Load BPM	0 to 1		
		03	1	Load Outputs	0 to 1		
		04	1	Expression Pedal Polarity	Polarity		
		05	1	Sustain Pedal 1 Polarity	Polarity		
		06	1	Sustain Pedal 2 Polarity	Polarity		
		07	1	Expression Pedal Target Override	ExpPedOvr		
		08	1	Sustain Pedal Target Override	SusPedOvr		
		09	2	RndTune	0 to 100	1 cent	
		0B	2	Velocity Table Intensity	0 to 100	1%	
		0D	2	Velocity Table Offset	0 to 100	1%	
		0F	2	Aftertouch Table Intensity	0 to 100	1%	
		11	2	Aftertouch Table Offset	0 to 100	1%	
		13	1	Load Sample Pool	0 to 1		
		14	1	MIDI Channel	0 to 15		
		15	1	Program Change Allowed	0 to 1		
		16	1	Send Arp	0 to 1		
		17	1	Omni	0 to 1		
		18	1	Local	0 to 1		
		19	1	Transmit SysEx	0 to 1		
		1A	1	MIDI Clock Source	ClkSrc		
		1B	1	MIDI Volume	0 to 1		
		1C	1	MIDI RealTime	0 to 1		Enable MIDI Start and Stop messages
		1D	1	Polychain	0 to 1		
		1E	1	Device ID	0 to 16		16 = All
		1F	2	CC1	0 to 127		
		21	2	CC2	0 to 127		
		23	2	CC3	0 to 127		
		25	2	CC4	0 to 127		
		27	2	CC5	0 to 127		

Total Bytes   29   41

Polarity	
+	0
-	1
Off	2

ExpPedOvr	
Off	0
Expr	1
Pan	2
Preset	3

SusPedOvr	
Off	0
Sustenuto	1
Sustain	2
Ribbon Hold	3
Seq On	4
Arp On	5
Arp Hold	6
Arp Transpose	7
Preset	8

ClkSrc	
Internal	0
External	1
Send	2
Auto	3

Oscillator

n = oscillator index 0 - 3

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit
10	n0	00	1	Osc Type	Osc Type	
		01	1	Osc MM1 Wave	MM1 Wave	
		02	1	Osc WT Wave	WT Wave	
		03	1	Osc CEM Wave	CEM Wave	
		04	1	Osc WAV Wave	0 to 63	
		05	1	Osc VS Wave	VS Wave	
		06	1	Osc Mini Wave	Mini Wave	
		07	1	Osc Coarse tune	-60 to +60	
		08	2	Osc Fine tune	-100 to +100	1 cent
		0A	1	Osc Coarse (Clock sync)	ClkDiv	
		0B	3	Osc Coarse tune (No Track)	0 to 200000	0.1 Hz
		0E	2	Osc Shape	0 to 100	
		10	2	Osc Phase	-180 to +180	1 degree
		12	1	Osc Sync	OscSync	
		13	1	Osc Glide Enable	0 to 1	
		14	3	Osc Glide Time	0 to 200000	0.1 ms
		17	1	Osc Clock Sync	0 to 1	
		18	1	Osc No Track	0 to 1	
		19	1	Osc Low	0 to 1	
		1A	3	reserved		
		1D	2	Osc Mod 1 Source	ModSrc	
		1F	1	Osc Mod 1 Control Source	CtrlSrc	
		20	2	Osc Mod 1 Control Strength	-100 to 100	1%
		22	1	Osc Mod 1 Destination	OscModDest	
		23	2	Osc Mod 1 Amount Pitch	-1200 to 1200	
		25	2	Osc Mod 1 Amount LinFM	-1000 to 1000	0.1%
		27	2	Osc Mod 1 Amount Shape	-100 to 100	1%
		29	2	Osc Mod 2 Source	ModSrc	
		2B	1	Osc Mod 2 Control Source	CtrlSrc	
		2C	2	Osc Mod 2 Control Strength	-100 to 100	1%
		2E	1	Osc Mod 2 Destination	OscModDest	
		2F	2	Osc Mod 2 Amount Pitch	-1200 to 1200	
		31	2	Osc Mod 2 Amount LinFM	-1000 to 1000	0.1%
		33	2	Osc Mod 2 Amount Shape	-100 to 100	1%
		35	2	Osc Mod 3 Source	ModSrc	
		37	1	Osc Mod 3 Control Source	CtrlSrc	
		38	2	Osc Mod 3 Control Strength	-100 to 100	1%
		3A	1	Osc Mod 3 Destination	OscModDest	
		3B	2	Osc Mod 3 Amount Pitch	-1200 to 1200	
		3D	2	Osc Mod 3 Amount LinFM	-1000 to 1000	0.1%
		3F	2	Osc Mod 3 Amount Shape	-100 to 100	1%
		41	2	Osc Mod 4 Source	ModSrc	
		43	1	Osc Mod 4 Control Source	CtrlSrc	
		44	2	Osc Mod 4 Control Strength	-100 to 100	1%
		46	1	Osc Mod 4 Destination	OscModDest	
		47	2	Osc Mod 4 Amount Pitch	-1200 to 1200	
		49	2	Osc Mod 4 Amount LinFM	-1000 to 1000	0.1%
		4B	2	Osc Mod 4 Amount Shape	-100 to 100	1%
Total Bytes		4D	77			

Osc Type	
Off	0
MM1	1
WT	2
CEM	3
WAV	4
VS	5
Mini	6

CEM Wave	
Off	0
Saw	1
Tri	2
Pulse	3
Saw+Tri	4
Saw+Pls	5
Tri+Pls	6
S+T+P	7

ClkDiv	
1/128	0
1/64T	1
1/64	2
1/32T	3
1/32	4
1/32D	5
1/16T	6
1/16	7
1/16D	8
1/8T	9
1/8	10
1/8D	11
1/4T	12
1/4	13
1/4D	14
1/2T	15
1/2	16
1/2D	17
1/1	18
2/1	19
3/1	20
4/1	21
5/1	22
6/1	23
7/1	24
8/1	25

MM1 Wave	
Sine	0
Tri	1
Ramp	2
Saw	3
Pulse	4
Noise	5
S/H	6
MorphSw	7
MorphSq	8
Jaws	9

Mini Wave	
Tri	0
Saw+Tri	1
Saw	2
Pulse1	3
Pulse2	4
Pulse3	5

OscModDest	
None	0
Pitch	1
LinFM	2
Shape	3

Rotor

n = 4 : Rotor 1   n = 5 : Rotor 2

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit
10	n0	00	2	Rot 1 Input 1 Source	AudioSrc	
		02	1	Rot 1 Input 1 Level	-63 to 63	
		03	2	Rot 1 Input 2 Source	AudioSrc	
		05	1	Rot 1 Input 2 Level	-63 to 63	
		06	2	Rot 1 Input 3 Source	AudioSrc	
		08	1	Rot 1 Input 3 Level	-63 to 63	
		09	2	Rot 1 Input 4 Source	AudioSrc	
		0B	1	Rot 1 Input 4 Level	-63 to 63	
		0C	1	Rot 1 Coarse tune	-60 to +60	
		0D	2	Rot 1 Fine tune	-100 to +100	1 cent
		0F	1	Rot 1 Coarse (Clock sync)	ClkDiv	
		10	3	Rot 1 Coarse tune (No Track)	0 to 200000	0.1 Hz
		13	2	Rot 1 XFade	0 to 127	
		15	1	Rot 1 Sync	RotSync	
		16	2	Rot 1 Phase	-180 to +180	1 degree
		18	1	Rot 1 Clock Sync	0 to 1	
		19	1	Rot 1 No Track	0 to 1	
		1A	1	Rot 1 Low	0 to 1	
		1B	2	Rot 1 Mod 1 Source	ModSrc	
		1D	1	Rot 1 Mod 1 Control Source	CtrlSrc	
		1E	2	Rot 1 Mod 1 Control Strength	-100 to 100	1%
		20	1	Rot 1 Mod 1 Destination	RotModDest	
		21	2	Rot 1 Mod 1 Amount Pitch	-1200 to 1200	
		23	2	Rot 1 Mod 1 Amount XFade	-100 to 100	1%
		25	2	Rot 1 Mod 2 Source	ModSrc	
		27	1	Rot 1 Mod 2 Control Source	CtrlSrc	
		28	2	Rot 1 Mod 2 Control Strength	-100 to 100	1%
		2A	1	Rot 1 Mod 2 Destination	RotModDest	
		2B	2	Rot 1 Mod 2 Amount Pitch	-1200 to 1200	
		2D	2	Rot 1 Mod 2 Amount XFade	-100 to 100	1%
		2F	2	Rot 1 Mod 3 Source	ModSrc	
		31	1	Rot 1 Mod 3 Control Source	CtrlSrc	
		32	2	Rot 1 Mod 3 Control Strength	-100 to 100	1%
		34	1	Rot 1 Mod 3 Destination	RotModDest	
		35	2	Rot 1 Mod 3 Amount Pitch	-1200 to 1200	
		37	2	Rot 1 Mod 3 Amount XFade	-100 to 100	1%
		39	2	Rot 1 Mod 4 Source	ModSrc	
		3B	1	Rot 1 Mod 4 Control Source	CtrlSrc	
		3C	2	Rot 1 Mod 4 Control Strength	-100 to 100	1%
		3E	1	Rot 1 Mod 4 Destination	RotModDest	
		3F	2	Rot 1 Mod 4 Amount Pitch	-1200 to 1200	
		41	2	Rot 1 Mod 4 Amount XFade	-100 to 100	1%

Total Bytes   43   67

RotSync	
Off	0
Gate	1

RotModDest	
None	0
Pitch	1
XFade	2

Vector/AM

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Address (Hex)
10	60	00	2	Vector 1 Input 1	AudioSrc	
		02	2	Vector 1 Level 1	-100 to 100	1%
		04	2	Vector 1 Input 2	AudioSrc	
		06	2	Vector 1 Level 2	-100 to 100	1%
		08	2	Vector 1 Input 3	AudioSrc	
		0A	2	Vector 1 Level 3	-100 to 100	1%
		0C	2	Vector 1 Input 4	AudioSrc	
		0E	2	Vector 1 Level 4	-100 to 100	1%
		10	2	Vector 1 Mod Source X	ModSrc	
		12	2	Vector 1 Mod Amount X	-100 to 100	1%
		14	1	Vector 1 Offset X	-63 to 63	
		15	2	Vector 1 Mod Source Y	ModSrc	
		17	2	Vector 1 Mod Amount Y	-100 to 100	1%
		19	1	Vector 1 Offset Y	-63 to 63	
		1A	2	Vector 2 Input 1	AudioSrc	
		1C	2	Vector 2 Level 1	-100 to 100	1%
		1E	2	Vector 2 Input 2	AudioSrc	
		20	2	Vector 2 Level 2	-100 to 100	1%
		22	2	Vector 2 Input 3	AudioSrc	
		24	2	Vector 2 Level 3	-100 to 100	1%
		26	2	Vector 2 Input 4	AudioSrc	
		28	2	Vector 2 Level 4	-100 to 100	1%
		2A	2	Vector 2 Mod Source X	ModSrc	
		2C	2	Vector 2 Mod Amount X	-100 to 100	1%
		2E	1	Vector 2 Offset X	-63 to 63	
		2F	2	Vector 2 Mod Source Y	ModSrc	
		31	2	Vector 2 Mod Amount Y	-100 to 100	1%
		33	1	Vector 2 Offset Y	-63 to 63	
		34	1	AM 1 Algorithm	AMAlg	
		35	2	AM 1 Carrier	AudioSrc	
		37	2	AM 1 Mod	ModSrc	
		39	2	AM 1 Mod Amount	-100 to 100	1%
		3B	1	AM 1 Offset	-63 to 63	
		3C	1	AM 1 Mod Control Source	CtrlSrc	
		3D	2	AM 1 Mod Control Strength	-100 to 100	1%
		3F	1	AM 2 Algorithm	AMAlg	
		40	2	AM 2 Carrier	AudioSrc	
		42	2	AM 2 Mod	ModSrc	
		44	2	AM 2 Mod Amount	-100 to 100	1%
		46	1	AM 2 Offset	-63 to 63	
		47	1	AM 2 Mod Control Source	CtrlSrc	
		48	2	AM 2 Mod Control Strength	-100 to 100	1%

Total Bytes 4A 74

AMAlg	
Shift	0
Clip	1
Abs	2
Ring	3

VCA/Lag/Envelope Follower

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit
10	70	00	2	VCA 1 Input	VCASrc	
		02	1	VCA 1 Type	VCAType	
		03	2	VCA 1 Boost	0 to 127	
		05	2	VCA 1 Level	0 to 100	1%
		07	1	VCA 1 InitPan	-63 to 63	
		08	2	VCA 1 Mod 1 Source	ModSrc	
		0A	2	VCA 1 Mod 1 Amount	-100 to 100	1%
		0C	2	VCA 1 Mod 2 Source	ModSrc	
		0E	2	VCA 1 Mod 2 Amount	-100 to 100	1%
		10	2	VCA 2 Input	VCASrc	
		12	1	VCA 2 Type	VCAType	
		13	2	VCA 2 Boost	0 to 127	
		15	2	VCA 2 Level	0 to 100	1%
		17	1	VCA 2 InitPan	-63 to 63	
		18	2	VCA 2 Mod 1 Source	ModSrc	
		1A	2	VCA 2 Mod 1 Amount	-100 to 100	1%
		1C	2	VCA 2 Mod 2 Source	ModSrc	
		1E	2	VCA 2 Mod 2 Amount	-100 to 100	1%
		20	2	VCA 3 Input	VCASrc	
		22	1	VCA 3 Type	VCAType	
		23	2	VCA 3 Boost	0 to 127	
		25	2	VCA 3 Level	0 to 100	1%
		27	1	VCA 3 InitPan	-63 to 63	
		28	2	VCA 3 Mod 1 Source	ModSrc	
		2A	2	VCA 3 Mod 1 Amount	-100 to 100	1%
		2C	2	VCA 3 Mod 2 Source	ModSrc	
		2E	2	VCA 3 Mod 2 Amount	-100 to 100	1%
		30	2	VCA 4 Input	VCASrc	
		32	1	VCA 4 Type	VCAType	
		33	2	VCA 4 Boost	0 to 127	
		35	2	VCA 4 Level	0 to 100	1%
		37	1	VCA 4 InitPan	-63 to 63	
		38	2	VCA 4 Mod 1 Source	ModSrc	
		3A	2	VCA 4 Mod 1 Amount	-100 to 100	1%
		3C	2	VCA 4 Mod 2 Source	ModSrc	
		3E	2	VCA 4 Mod 2 Amount	-100 to 100	1%
		40	1	Enable Part 1	0 to 1	
		41	1	Enable Part 2	0 to 1	
		42	1	Enable Part 3	0 to 1	
		43	1	Enable Part 4	0 to 1	
		44	2	Lag 1 Input	ModSrc	
		46	3	Lag 1 Time	0 to 100000	0.1 ms
		49	2	Lag 2 Input	ModSrc	
		4B	3	Lag 2 Time	0 to 100000	0.1 ms
		4E	2	Lag 3 Input	ModSrc	
		50	3	Lag 3 Time	0 to 100000	0.1 ms
		53	2	Lag 4 Input	ModSrc	
		55	3	Lag 4 Time	0 to 100000	0.1 ms
		58	2	EnvFol Input	AudioSrc	
		5A	2	EnvFol Input Level	0 to 100	1%
		5C	2	EnvFol Output Level	0 to 100	1%
		5E	3	EnvFol Attack	0 to 200000	0.1 ms
		61	3	EnvFol Release	0 to 200000	0.1 ms

Total Bytes 64 100

VCASrc	
Filter	0
InsFx	1

VCAType	
Linear	0
Log	1
Sigma	2

Filter

n = filter index 0 - 3

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit
11	n0	00	1	Filter Type	FilterType	
		01	1	Filter MM1 Mode	MM1Mode	
		02	1	Filter Obie Mode	ObieMode	
		03	1	Filter Comb Mode	CombMode	
		04	1	Filter Vowel1	Vowel	
		05	1	Filter Vowel2	Vowel	
		06	1	Filter Vowel3	Vowel	
		07	1	Filter Vowel4	Vowel	
		08	1	Filter Vowel5	Vowel	
		09	2	Filter Cutoff	0 to 1260	0.1
		0B	2	Filter Resonance	0 to 100	1%
		0D	2	Filter Damping	0 to 100	1%
		0F	2	Filter XFade	0 to 100	1%
		11	2	Filter Input	AudioSrc	
		13	2	Filter Key Tracking	-200 to 200	1%
		15	1	Filter Key Center	-63 to 63	
		16	2	Filter Mod 1 Source	ModSrc	
		18	1	Filter Mod 1 Control Source	CtrlSrc	
		19	2	Filter Mod 1 Control Strength	-100 to 100	1%
		1B	1	Filter Mod 1 Dest	FltModDest	
		1C	2	Filter Mod 1 Amount Pitch	-1200 to 1200	
		1E	2	Filter Mod 1 Amount	-100 to 100	1%
		20	2	Filter Mod 2 Source	ModSrc	
		22	1	Filter Mod 2 Control Source	CtrlSrc	
		23	2	Filter Mod 2 Control Strength	-100 to 100	1%
		25	1	Filter Mod 2 Dest	FltModDest	
		26	2	Filter Mod 2 Amount Pitch	-1200 to 1200	
		28	2	Filter Mod 2 Amount	-100 to 100	1%
		2A	2	Filter Mod 3 Source	ModSrc	
		2C	1	Filter Mod 3 Control Source	CtrlSrc	
		2D	2	Filter Mod 3 Control Strength	-100 to 100	1%
		2F	1	Filter Mod 3 Dest	FltModDest	
		30	2	Filter Mod 3 Amount Pitch	-1200 to 1200	
		32	2	Filter Mod 3 Amount	-100 to 100	1%
		34	2	Filter Mod 4 Source	ModSrc	
		36	1	Filter Mod 4 Control Source	CtrlSrc	
		37	2	Filter Mod 4 Control Strength	-100 to 100	1%
		39	1	Filter Mod 4 Dest	FltModDest	
		3A	2	Filter Mod 4 Amount Pitch	-1200 to 1200	
		3C	2	Filter Mod 4 Amount	-100 to 100	1%

Total Bytes 3E 62

FilterType	
BYPASS	0
MM1	1
SSM	2
Mini	3
Obie	4
Comb	5
Vocal	6

ObieMode	
LP	0
HP	1
BP	2
BR	3

CombMode	
Tube	0
Comb	1

Vowel	
A	0
E	1
I	2
O	3
U	4
Y	5
AA	6
AE	7
OE	8
UE	9

FltModDest	
None	0
Cutoff	1
Resonance	2
Damping/XFade*	3

MM1Mode	
LP4	0
LP3	1
LP2	2
LP1	3
HP4	4
HP3	5
HP2	6
HP1	7
BP4	8
BP2	9
BP2+LP1	10
BP2+LP2	11
BP2+HP1	12
BP2+HP2	13
BR4	14
BR2	15
BR2+LP1	16
BR2+LP2	17
BR2+HP1	18
BR2+BP2	19
AP3	20
AP3+LP1	21
AP3+HP1	22

* Existence of Damping or XFade depends on filter type.

Mixers

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)
11	40	00	2	Mixer 1 Input 1 Source	AudioSrc
		02	1	Mixer 1 Input 1 Level	-63 to 63
		03	2	Mixer 1 Input 1 Mod Source	ModSrc
		05	1	Mixer 1 Input 1 Mod Amount	-63 to 63
		06	2	Mixer 1 Input 2 Source	AudioSrc
		08	1	Mixer 1 Input 2 Level	-63 to 63
		09	2	Mixer 1 Input 2 Mod Source	ModSrc
		0B	1	Mixer 1 Input 2 Mod Amount	-63 to 63
		0C	2	Mixer 1 Input 3 Source	AudioSrc
		0E	1	Mixer 1 Input 3 Level	-63 to 63
		0F	2	Mixer 1 Input 3 Mod Source	ModSrc
		11	1	Mixer 1 Input 3 Mod Amount	-63 to 63
		12	2	Mixer 1 Input 4 Source	AudioSrc
		14	1	Mixer 1 Input 4 Level	-63 to 63
		15	2	Mixer 1 Input 4 Mod Source	ModSrc
		17	1	Mixer 1 Input 4 Mod Amount	-63 to 63
		18	2	Mixer 1 Output Amount	0 to 127
		1A	2	Mixer 1 Output Mod Source	ModSrc
		1C	1	Mixer 1 Output Mod Amount	-63 to 63
		1D	2	Mixer 2 Input 1 Source	AudioSrc
		1F	1	Mixer 2 Input 1 Level	-63 to 63
		20	2	Mixer 2 Input 1 Mod Source	ModSrc
		22	1	Mixer 2 Input 1 Mod Amount	-63 to 63
		23	2	Mixer 2 Input 2 Source	AudioSrc
		25	1	Mixer 2 Input 2 Level	-63 to 63
		26	2	Mixer 2 Input 2 Mod Source	ModSrc
		28	1	Mixer 2 Input 2 Mod Amount	-63 to 63
		29	2	Mixer 2 Input 3 Source	AudioSrc
		2B	1	Mixer 2 Input 3 Level	-63 to 63
		2C	2	Mixer 2 Input 3 Mod Source	ModSrc
		2E	1	Mixer 2 Input 3 Mod Amount	-63 to 63
		2F	2	Mixer 2 Input 4 Source	AudioSrc
		31	1	Mixer 2 Input 4 Level	-63 to 63
		32	2	Mixer 2 Input 4 Mod Source	ModSrc
		34	1	Mixer 2 Input 4 Mod Amount	-63 to 63
		35	2	Mixer 2 Output Amount	0 to 127
		37	2	Mixer 2 Output Mod Source	ModSrc
		39	1	Mixer 2 Output Mod Amount	-63 to 63
		3A	2	Mixer 3 Input 1 Source	AudioSrc
		3C	1	Mixer 3 Input 1 Level	-63 to 63
		3D	2	Mixer 3 Input 1 Mod Source	ModSrc
		3F	1	Mixer 3 Input 1 Mod Amount	-63 to 63
		40	2	Mixer 3 Input 2 Source	AudioSrc
		42	1	Mixer 3 Input 2 Level	-63 to 63
		43	2	Mixer 3 Input 2 Mod Source	ModSrc

11	40	45	1	Mixer 3 Input 2 Mod Amount	-63 to 63
		46	2	Mixer 3 Input 3 Source	AudioSrc
		48	1	Mixer 3 Input 3 Level	-63 to 63
		49	2	Mixer 3 Input 3 Mod Source	ModSrc
		4B	1	Mixer 3 Input 3 Mod Amount	-63 to 63
		4C	2	Mixer 3 Input 4 Source	AudioSrc
		4E	1	Mixer 3 Input 4 Level	-63 to 63
		4F	2	Mixer 3 Input 4 Mod Source	ModSrc
		51	1	Mixer 3 Input 4 Mod Amount	-63 to 63
		52	2	Mixer 3 Output Amount	0 to 127
		54	2	Mixer 3 Output Mod Source	ModSrc
		56	1	Mixer 3 Output Mod Amount	-63 to 63
		57	2	Mixer 4 Input 1 Source	AudioSrc
		59	1	Mixer 4 Input 1 Level	-63 to 63
		5A	2	Mixer 4 Input 1 Mod Source	ModSrc
		5C	1	Mixer 4 Input 1 Mod Amount	-63 to 63
		5D	2	Mixer 4 Input 2 Source	AudioSrc
		5F	1	Mixer 4 Input 2 Level	-63 to 63
		60	2	Mixer 4 Input 2 Mod Source	ModSrc
		62	1	Mixer 4 Input 2 Mod Amount	-63 to 63
		63	2	Mixer 4 Input 3 Source	AudioSrc
		65	1	Mixer 4 Input 3 Level	-63 to 63
		66	2	Mixer 4 Input 3 Mod Source	ModSrc
		68	1	Mixer 4 Input 3 Mod Amount	-63 to 63
		69	2	Mixer 4 Input 4 Source	AudioSrc
		6B	1	Mixer 4 Input 4 Level	-63 to 63
		6C	2	Mixer 4 Input 4 Mod Source	ModSrc
		6E	1	Mixer 4 Input 4 Mod Amount	-63 to 63
		6F	2	Mixer 4 Output Amount	0 to 127
		71	2	Mixer 4 Output Mod Source	ModSrc
		73	1	Mixer 4 Output Mod Amount	-63 to 63
Total Bytes		74	116		

Insert FX

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit
11	50	00	1	InsFx 1 Mode	InsFxMode	
		01	2	InsFx 1 Input	InsFxSrc	
		03	1	InsFx 1 Value	-63 to 63	
		04	2	InsFx 1 Mod Source	ModSrc	
		06	2	InsFx 1 Mod Amount	-100 to 100	
		08	1	InsFx 1 Control Source	CtrlSrc	
		09	2	InsFx 1 Control Strength	-100 to 100	
		0B	1	InsFx 2 Mode	InsFxMode	
		0C	2	InsFx 2 Input	InsFxSrc	
		0E	1	InsFx 2 Value	-63 to 63	
		0F	2	InsFx 2 Mod Source	ModSrc	
		11	2	InsFx 2 Mod Amount	-100 to 100	
		13	1	InsFx 2 Control Source	CtrlSrc	
		14	2	InsFx 2 Control Strength	-100 to 100	
		16	1	InsFx 3 Mode	InsFxMode	
		17	2	InsFx 3 Input	InsFxSrc	
		19	1	InsFx 3 Value	-63 to 63	
		1A	2	InsFx 3 Mod Source	ModSrc	
		1C	2	InsFx 3 Mod Amount	-100 to 100	
		1E	1	InsFx 3 Control Source	CtrlSrc	
		1F	2	InsFx 3 Control Strength	-100 to 100	
		21	1	InsFx 4 Mode	InsFxMode	
		22	2	InsFx 4 Input	InsFxSrc	
		24	1	InsFx 4 Value	-63 to 63	
		25	2	InsFx 4 Mod Source	ModSrc	
		27	2	InsFx 4 Mod Amount	-100 to 100	
		29	1	InsFx 4 Control Source	CtrlSrc	
		2A	2	InsFx 4 Control Strength	-100 to 100	

Total Bytes 2CH 44

InsFxMode	
Off	0
Decimate	1
Bit Chop	2
Distortion	3

InsFxSrc	
Mixer	0
Filter	1

LFO

n = LFO index 0 – 4)

Address (Hex)		Size (Dec)	Parameter Name	Range (Dec)	Unit
12	n0 00	1	LFO Shape	LFOShape	
	01	3	LFO Rate	0 to 50000	0.01 Hz
	04	1	LFO Rate Sync	ClkDiv	
	05	2	LFO Phase	-180 to +180	1 degree
	07	2	LFO Delay Start	0 to 100	0.1 seconds
	09	2	LFO Fade In	0 to 100	0.1 seconds
	0B	2	LFO Fade Out	0 to 100	0.1 seconds
	0D	2	LFO Level	0 to 100	1%
	0F	1	LFO Clock Sync	0 to 1	
	10	1	LFO Offset	0 to 1	
	11	1	LFO Retrigger	0 to 1	
	12	2	LFO Mod 1 Source	ModSrc	
	14	1	LFO Mod 1 Control Source	CtrlSrc	
	15	2	LFO Mod 1 Control Strength	-100 to 100	1%
	17	1	LFO Mod 1 Dest	LFOModDest	
	18	2	LFO Mod 1 Amount Rate	-1200 to 1200	0.1
	1A	2	LFO Mod 1 Amount	-100 to 100	1%
	1C	2	LFO Mod 2 Source	ModSrc	
	1E	1	LFO Mod 2 Control Source	CtrlSrc	
	1F	2	LFO Mod 2 Control Strength	-100 to 100	1%
	21	1	LFO Mod 2 Dest	LFOModDest	
	22	2	LFO Mod 2 Amount Rate	-1200 to 1200	0.1
	24	2	LFO Mod 2 Amount	-100 to 100	1%
	26	2	LFO Mod 3 Source	ModSrc	
	28	1	LFO Mod 3 Control Source	CtrlSrc	
	29	2	LFO Mod 3 Control Strength	-100 to 100	1%
	2B	1	LFO Mod 3 Dest	LFOModDest	
	2C	2	LFO Mod 3 Amount Rate	-1200 to 1200	0.1
	2E	2	LFO Mod 3 Amount	-100 to 100	1%

Total
Bytes   30   48

InsFxMode	
Off	0
Decimate	1
Bit Chop	2
Distortion	3

LFOModDest	
None	0
Rate	1
Level	2

ClkDiv	
1/128	0
1/64T	1
1/64	2
1/32T	3
1/32	4
1/32D	5
1/16T	6
1/16	7
1/16D	8
1/8T	9
1/8	10
1/8D	11
1/4T	12
1/4	13
1/4D	14
1/2T	15
1/2	16
1/2D	17
1/1	18
2/1	19
3/1	20
4/1	21
5/1	22
6/1	23
7/1	24
8/1	25

Envelope Generator

n = EG index (0 - 5)

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit
13	n0	00	3	EG Delay	0 to 200000	0.1 ms
		03	3	EG Attack	0 to 200000	0.1 ms
		06	3	EG Decay	0 to 200000	0.1 ms
		09	2	EG Sustain	0 to 127	
		0B	3	EG Release	0 to 200000	0.1 ms
		0E	2	EG Attack Slope	0 to 127	
		10	2	EG Decay Slope	0 to 127	
		12	3	EG Sustain Slope	-20000 to 20000	1 ms
		15	2	EG Release Slope	0 to 127	
		17	1	EG Attack Mod Source	EGModSrc	
		18	1	EG Decay Mod Source	EGModSrc	
		19	1	EG Sustain Mod Source	EGModSrc	
		1A	1	EG Release Mod Source	EGModSrc	
		1B	1	EG Attack Mod Amount	-63 to 63	
		1C	1	EG Decay Mod Amount	-63 to 63	
		1D	1	EG Sustain Mod Amount	-63 to 63	
		1E	1	EG Release Mod Amount	-63 to 63	
		1F	2	EG Velocity	0 to 127	

Total Bytes   21   33

EGModSrc	
Off	0
Velocity	1
Key tracking	2
Mod Wheel	3
CC 1	4
CC 2	5
CC 3	6
CC 4	7

Looping Envelope Generator

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit
13	70	00	1	Loop EG Start	0 to 7	1 segment
		01	1	Loop EG Key Off	0 to 7	1 segment
		02	2	Loop EG Slope	0 to 127	
		04	1	Loop EG Sync	0 to 1	
		05	2	Loop EG Repeat	0 to 100	
		07	1	Loop EG Loop	0 to 1	
		08	1	Loop EG Mod Level Source	EGModSrc	
		09	2	Loop EG Mod Level Amount	-300 to 300	1%
		0B	1	Loop EG Mod Time Source	EGModSrc	
		0C	2	Loop EG Mod Time Amount	-300 to 300	1%
		0E	3	Loop EG Time 1	0 to 200000	0.1 ms
		11	1	Loop EG Time Sync 1	ClkDiv	
		12	2	Loop EG Level X 1	-127 to 127	
		14	2	Loop EG Level Y 1	-127 to 127	
		16	3	Loop EG Time 2	0 to 200000	0.1 ms
		19	1	Loop EG Time Sync 2	ClkDiv	
		1A	2	Loop EG Level X 2	-127 to 127	
		1C	2	Loop EG Level Y 2	-127 to 127	
		1E	3	Loop EG Time 3	0 to 200000	0.1 ms
		21	1	Loop EG Time Sync 3	ClkDiv	
		22	2	Loop EG Level X 3	-127 to 127	
		24	2	Loop EG Level Y 3	-127 to 127	
		26	3	Loop EG Time 4	0 to 200000	0.1 ms
		29	1	Loop EG Time Sync 4	ClkDiv	
		2A	2	Loop EG Level X 4	-127 to 127	
		2C	2	Loop EG Level Y 4	-127 to 127	
		2E	3	Loop EG Time 5	0 to 200000	0.1 ms
		31	1	Loop EG Time Sync 5	ClkDiv	
		32	2	Loop EG Level X 5	-127 to 127	
		34	2	Loop EG Level Y 5	-127 to 127	
		36	3	Loop EG Time 6	0 to 200000	0.1 ms
		39	1	Loop EG Time Sync 6	ClkDiv	
		3A	2	Loop EG Level X 6	-127 to 127	
		3C	2	Loop EG Level Y 6	-127 to 127	
		3E	3	Loop EG Time 7	0 to 200000	0.1 ms
		41	1	Loop EG Time Sync 7	ClkDiv	
		42	2	Loop EG Level X 7	-127 to 127	
		44	2	Loop EG Level Y 7	-127 to 127	
		46	3	Loop EG Time 8	0 to 200000	0.1 ms
		49	1	Loop EG Time Sync 8	ClkDiv	
		4A	2	Loop EG Level X 8	-127 to 127	
		4C	2	Loop EG Level Y 8	-127 to 127	
Total Bytes		4E	78			

EGModSrc	
Off	0
Velocity	1
Key tracking	2
Mod Wheel	3
CC 1	4
CC 2	5
CC 3	6
CC 4	7

ClkDiv	
1/128	0
1/64T	1
1/64	2
1/32T	3
1/32	4
1/32D	5
1/16T	6
1/16	7
1/16D	8
1/8T	9
1/8	10
1/8D	11
1/4T	12
1/4	13
1/4D	14
1/2T	15
1/2	16
1/2D	17
1/1	18
2/1	19
3/1	20
4/1	21
5/1	22
6/1	23
7/1	24
8/1	25

Sequencer

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit
14	00	00	1	Mode	SeqMode	
		01	1	Pattern	0 to 63	
		02	2	Swing	0 to 375	0.20%
		04	1	Division	SeqArpClkDiv	
		05	1	Pattern Length A	0 to 15	1 step
		06	1	Pattern Length B	0 to 15	1 step
		07	1	Pattern Length C	0 to 15	1 step
		08	1	Pattern Length D	0 to 15	1 step

Total Bytes	09	9

SeqMode	
Normal	0
No Reset	1
No Gate	2
No Gate/No Reset	3
Key Step	4

SeqArpClkDiv	
1/32	0
1/16	1
1/16T	2
1/8	3
1/8T	4
1/4	5
1/4T	6
1/2	7
1/2T	8
1/1	9
2/1	10
3/1	11
4/1	12
6/1	13
8/1	14

Sequencer Steps

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)
14	10	00	2	Pattern A Step 1 Level	-127 to 127
		02	2	Pattern A Step 2 Level	-127 to 127
		04	2	Pattern A Step 3 Level	-127 to 127
		06	2	Pattern A Step 4 Level	-127 to 127
		08	2	Pattern A Step 5 Level	-127 to 127
		0A	2	Pattern A Step 6 Level	-127 to 127
		0C	2	Pattern A Step 7 Level	-127 to 127
		0E	2	Pattern A Step 8 Level	-127 to 127
		10	2	Pattern A Step 9 Level	-127 to 127
		12	2	Pattern A Step 10 Level	-127 to 127
		14	2	Pattern A Step 11 Level	-127 to 127
		16	2	Pattern A Step 12 Level	-127 to 127
		18	2	Pattern A Step 13 Level	-127 to 127
		1A	2	Pattern A Step 14 Level	-127 to 127
		1C	2	Pattern A Step 15 Level	-127 to 127
		1E	2	Pattern A Step 16 Level	-127 to 127
		20	2	Pattern B Step 1 Level	-127 to 127
		22	2	Pattern B Step 2 Level	-127 to 127
		24	2	Pattern B Step 3 Level	-127 to 127
		26	2	Pattern B Step 4 Level	-127 to 127
		28	2	Pattern B Step 5 Level	-127 to 127
		2A	2	Pattern B Step 6 Level	-127 to 127
		2C	2	Pattern B Step 7 Level	-127 to 127
		2E	2	Pattern B Step 8 Level	-127 to 127
		30	2	Pattern B Step 9 Level	-127 to 127
		32	2	Pattern B Step 10 Level	-127 to 127
		34	2	Pattern B Step 11 Level	-127 to 127
		36	2	Pattern B Step 12 Level	-127 to 127
		38	2	Pattern B Step 13 Level	-127 to 127
		3A	2	Pattern B Step 14 Level	-127 to 127
		3C	2	Pattern B Step 15 Level	-127 to 127
		3E	2	Pattern B Step 16 Level	-127 to 127
		40	2	Pattern C Step 1 Level	-127 to 127
		42	2	Pattern C Step 2 Level	-127 to 127
		44	2	Pattern C Step 3 Level	-127 to 127
		46	2	Pattern C Step 4 Level	-127 to 127

14	10	48	2	Pattern C Step 5 Level	-127 to 127
		4A	2	Pattern C Step 6 Level	-127 to 127
		4C	2	Pattern C Step 7 Level	-127 to 127
		4E	2	Pattern C Step 8 Level	-127 to 127
		50	2	Pattern C Step 9 Level	-127 to 127
		52	2	Pattern C Step 10 Level	-127 to 127
		54	2	Pattern C Step 11 Level	-127 to 127
		56	2	Pattern C Step 12 Level	-127 to 127
		58	2	Pattern C Step 13 Level	-127 to 127
		5A	2	Pattern C Step 14 Level	-127 to 127
		5C	2	Pattern C Step 15 Level	-127 to 127
		5E	2	Pattern C Step 16 Level	-127 to 127
		60	2	Pattern D Step 1 Level	-127 to 127
		62	2	Pattern D Step 2 Level	-127 to 127
		64	2	Pattern D Step 3 Level	-127 to 127
		66	2	Pattern D Step 4 Level	-127 to 127
		68	2	Pattern D Step 5 Level	-127 to 127
		6A	2	Pattern D Step 6 Level	-127 to 127
		6C	2	Pattern D Step 7 Level	-127 to 127
		6E	2	Pattern D Step 8 Level	-127 to 127
		70	2	Pattern D Step 9 Level	-127 to 127
		72	2	Pattern D Step 10 Level	-127 to 127
		74	2	Pattern D Step 11 Level	-127 to 127
		76	2	Pattern D Step 12 Level	-127 to 127
		78	2	Pattern D Step 13 Level	-127 to 127
		7A	2	Pattern D Step 14 Level	-127 to 127
		7C	2	Pattern D Step 15 Level	-127 to 127
		7E	2	Pattern D Step 16 Level	-127 to 127

Total
Bytes   80   128

Effects

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit	Notes
15	00	00	1	Channel 1 Input	Input		
		01	1	Channel 1 Slot 1	EffectType		
		02	1	Channel 1 Slot 2	EffectType		
		03	1	Channel 1 Slot 3	EffectType		
		04	1	Channel 1 Slot 4	EffectType		
		05	1	Channel 2 Input	Input		
		06	1	Channel 2 Slot 1	EffectType		
		07	1	Channel 2 Slot 2	EffectType		
		08	1	Channel 2 Slot 3	EffectType		
		09	1	Channel 2 Slot 4	EffectType		
		0A	1	Channel 3 Input	Input		
		0B	1	Channel 3 Slot 1	EffectType		
		0C	1	Channel 3 Slot 2	EffectType		
		0D	1	Channel 3 Slot 3	EffectType		
		0E	1	Channel 3 Slot 4	EffectType		
		0F	1	Channel 4 Input	Input		
		10	1	Channel 4 Slot 1	EffectType		
		11	1	Channel 4 Slot 2	EffectType		
		12	1	Channel 4 Slot 3	EffectType		
		13	1	Channel 4 Slot 4	EffectType		
		14	1	Cho/Fla Mode	0 to 1		
		15	2	Cho/Fla Frequency	0 to 5000	0.01 Hz	
		17	2	Cho/Fla Depth	0 to 100	1%	
		19	2	Cho/Fla Phase	-180 to +180	1 degree	
		1B	2	Cho/Fla Offset	0 to 127		
		1D	2	Cho/Fla Input Level	0 to 100	1%	
		1F	2	Cho/Fla Feedback	-100 to 100	1%	
		21	2	Cho/Fla Dry	0 to 100	1%	
		23	2	Cho/Fla Wet	-100 to 100	1%	
		25	1	Phaser Mode	0 to 1		
		26	2	Phaser Frequency	0 to 5000	0.01 Hz	
		28	2	Phaser Depth	0 to 100	1%	
		2A	2	Phaser Phase	-180 to +180	1 degree	
		2C	3	Phaser Offset	0 to 200000	0.1 Hz	
		2F	2	Phaser Input Level	0 to 100	1%	
		31	2	Phaser Feedback	-100 to 100	1%	
		33	2	Phaser Dry	0 to 100	1%	
		35	2	Phaser Wet	0 to 100	1%	
		37	1	Delay Mode	DelayMode		
		38	3	Delay Time Left	0 to 200000	0.1 ms	
		3B	3	Delay Time Right	0 to 200000	0.1 ms	
		3E	1	Delay Beats Left	ClkDiv		
		3F	1	Delay Beats Right	ClkDiv		
		40	2	Delay Feedback Left	0 to 100	1%	
		42	2	Delay Feedback Right	0 to 100	1%	
		44	2	Delay Damping	0 to 100	1%	
		46	2	Delay Dry	0 to 100	1%	
		48	2	Delay Wet	0 to 100	1%	
		4A	1	Delay MIDI Clk	0 to 1		
		4B	1	EQ Mode	0 to 1		
		4C	3	EQ Frequency 1	0 to 200000	0.1 Hz	
		4F	2	EQ Q 1	47 to 256		Q = max(0.70, (value / 256) * (value / 256) * 20)
		51	2	EQ Gain 1	-120 to 120	0.1	
		53	3	EQ Frequency 2	0 to 200000	0.1 Hz	
		56	2	EQ Q 2	47 to 256		Q = max(0.70, (value / 256) * (value / 256) * 20)

15	00	58	2	EQ Gain 2	-120 to 120	0.1	
		5A	3	EQ Frequency 3	0 to 200000	0.1 Hz	
		5D	2	EQ Q 3	47 to 256		Q = max(0.70, (value / 256) * (value / 256) * 20)
		5F	2	EQ Gain 3	-120 to 120	0.1	

Total
Bytes 61 97

Input	
Off	0
Synth	1
Ext-1/2	2
Ext-3/4	3
S/P-DIF	4
FXChannel 1	5
FXChannel 2	6
FXChannel 2	7
FXChannel 4	8

EffectType	
Off	0
Chorus/Flanger	1
Phaser	2
Delay	3
EQ	4

ClkDiv	
1/128	0
1/64T	1
1/64	2
1/32T	3
1/32	4
1/32D	5
1/16T	6
1/16	7
1/16D	8
1/8T	9
1/8	10
1/8D	11
1/4T	12
1/4	13
1/4D	14
1/2T	15
1/2	16
1/2D	17
1/1	18
2/1	19
3/1	20
4/1	21
5/1	22
6/1	23
7/1	24
8/1	25

DelayMode	
Bypass	0
Delay	1
XDelay	2

Preset Name

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)
17	00	00	2	Preset Name 1	32 – 126
		02	2	Preset Name 2	32 – 126
		04	2	Preset Name 3	32 – 126
		06	2	Preset Name 4	32 – 126
		08	2	Preset Name 5	32 – 126
		0A	2	Preset Name 6	32 - 126
		0C	2	Preset Name 7	32 - 126
		0E	2	Preset Name 8	32 - 126
		10	2	Preset Name 9	32 - 126
		12	2	Preset Name 10	32 - 126
		14	2	Preset Name 11	32 - 126
		16	2	Preset Name 12	32 - 126
		18	2	Preset Name 13	32 - 126
		1A	2	Preset Name 14	32 - 126
		1C	2	Preset Name 15	32 - 126
		1E	2	Preset Name 16	32 - 126
		20	2	Preset Name 17	32 - 126
		22	2	Preset Name 18	32 - 126
		24	2	Preset Name 19	32 - 126
		26	2	Preset Name 20	32 - 126
		28	1	Category 1	Category 1
		29	1	Category 2	Category 2

Category 1	
None	0
Arpeggio	1
Bass	2
Drum	3
Effect	4
Keyboard	5
Lead	6
Pad	7
Sequence	8
Texture	9

Category 2	
None	0
Acoustic	1
Aggressive	2
Big	3
Bright	4
Chord	5
Classic	6
Dark	7
Electric	8
Moody	9
Soft	10
Short	11
Synthetic	12
Upbeat	13

Common

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit	Notes
17	10	00	3	Performance knob 1 param			Three-byte parameter address. MSB first. The address returned is {0,0,0} if not assigned.
		03	3	Performance knob 2 param			
		06	3	Performance knob 3 param			
		09	3	Performance knob 4 param			
		0C	3	Performance knob 5 param			
		0F	2	Performance knob 1	-100 to 100	1%	
		11	2	Performance knob 2	-100 to 100	1%	
		13	2	Performance knob 3	-100 to 100	1%	
		15	2	Performance knob 4	-100 to 100	1%	
		17	2	Performance knob 5	-100 to 100	1%	
		19	1	Transpose	-63 to 63		
		1A	1	PitchWheelUpRange	-63 to 63		
		1B	1	PitchWheelDownRange	-63 to 63		
		1C	1	LFO 5 Mod Wheel	0 to 1		
		1D	2	LFO 5 Mod Wheel Max	-100 to 100	1%	
		1F	2	Ribbon Offset	0 to 100	1%	
		21	2	Ribbon Intensity	0 to 200	1%	
		23	1	Ribbon Hold	0 to 1		
		24	1	Ribbon Touch Offset	0 to 1		
		25	1	Glide Type	GlideType		
		26	1	Glide Mode	GlideMode		
		27	3	Glide Time	0 to 100000		

		2A	2	Glide Rate	0 to 100		
17	10	2C	2	Glide Range	0 to 100		
		2E	1	Play Mode	PlayMode		
		2F	1	Legato	Legato		
		30	1	Note Priority	Priority		
		31	1	EgReset	EgReset		
		32	1	UniVoice	UniVoice		
		33	2	UniTune	-100 to 100		
		35	1	Unison Enable	0 to 1		
		36	2	RndTune	-1 to 100	1 cent	Negative 1 means that the Global RndTune parameter value is used.
		38	1	Arp Enable	0 to 1		
		39	1	Seq Enable	0 to 1		
		3A	1	Expression Pedal Function	ExpPed		
		3B	1	Sustain Pedal 1 Function	SusPed		
		3C	1	Sustain Pedal 2 Function	SusPed		
		3D	1	Assign 1 Function	Assign		
		3E	1	Assign 2 Function	Assign		
		3F	1	Assign Button 1 Mode	AssignMode		
		40	1	Assign Button 2 Mode	AssignMode		
		41	1	Assign 1 State	0 to 1		
		42	1	Assign 2 State	0 to 1		
		43	2	BPM	30 to 300		
		45	1	Output 1/2	OutputSrc		
		46	1	Output 3/4	OutputSrc		
		47	1	Output 5/6	OutputSrc		
		48	1	Output 7/8	OutputSrc		
		49	1	Output S/P-DIF	OutputSrc		
		4A	1	ChordStackNotes	0 to 10		Number of chord stack notes actually used
		4B	2	ChordStackNote 1	0 to 127		
		4D	2	ChordStackNote 2	0 to 127		
		4F	2	ChordStackNote 3	0 to 127		
		51	2	ChordStackNote 4	0 to 127		
		53	2	ChordStackNote 5	0 to 127		
		55	2	ChordStackNote 6	0 to 127		
		57	2	ChordStackNote 7	0 to 127		
		59	2	ChordStackNote 8	0 to 127		
		5B	2	ChordStackNote 9	0 to 127		
		5D	2	ChordStackNote 10	0 to 127		

Total Bytes 5F 95

GlideType	
Porta	0
Gliss	1
FingPort	2
FingGlis	3

GlideMode	
C-Time	0
C-Rate	1
Exp	2

PlayMode	
Poly	0
Mono	1

Legato	
Off	0
Reassign	1
Retrigger	2

Priority	
Last	0
Low	1
High	2

ExpPed	
Off	0
Expr	1
Pan	2

EgReset	
ShutDown	0
Running	1

AssignMode	
Toggle	0
Momentary	1

OutputSrc	
Off	0
Synth	1
Ext-1/2	2
Ext-3/4	3
S/P-DIF	4
FXChannel 1	5
FXChannel 2	6
FXChannel 2	7
FXChannel 4	8

Assign	
Global Glide	0
Glide 01	1
Glide 02	2
Glide 03	3
Glide 04	4
--	5
--	6
Glide All	7
Ribbon Hold	8
Arp Transpose	9

UniVoice	
2	0
3	1
4	2
5	3
6	4
7	5
8	6
All	7
Chord	8

SusPed	
Off	0
Sostenuto	1
Sustain	2
Ribbon Hold	3
Seq On	4
Arp On	5
Arp Hold	6
Arp Transpose	7

Key Tables

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit
16	00	00	2	KeyTable 1, Key 0	0 - 1000	0.1%
		02	2	KeyTable 1, Key 1		
		04	2	KeyTable 1, Key 2		
		:	:			
		7C	2	KeyTable 1, Key 62		
		7E	2	KeyTable 1, Key 63		

Total Bytes   80   128

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit
16	10	00	2	KeyTable 1, Key 64	0 - 1000	0.1%
		02	2	KeyTable 1, Key 65		
		:	:			
		7C	2	KeyTable 1, Key 126		
		7E	2	KeyTable 1, Key 127		

Total Bytes   80   128

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit
16	20	00	2	KeyTable 2, Key 0	0 - 1000	0.1%
		02	2	KeyTable 2, Key 1		
		04	2	KeyTable 2, Key 2		
		:	:			
		7C	2	KeyTable 2, Key 62		
		7E	2	KeyTable 2, Key 63		

Total Bytes   80   128

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit
16	30	00	2	KeyTable 2, Key 64	0 - 1000	0.1%
		02	2	KeyTable 2, Key 65		
		:	:			
		7C	2	KeyTable 2, Key 126		
		7E	2	KeyTable 2, Key 127		

Total Bytes   80   128

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit
16	40	00	2	KeyTable 3, Key 0	0 - 1000	0.1%
		02	2	KeyTable 3, Key 1		
		04	2	KeyTable 3, Key 2		
		:	:			
		7C	2	KeyTable 3, Key 62		
		7E	2	KeyTable 3, Key 63		

Total Bytes   80   128

Notes
bit 13: 0 = fixed, 1 = interpolated
bit 0 - 9: amount
Setting a value with bit 13 as 1 will set that key to be interpolated. In this case, the amount is ignored.
For key tables a SysEx message is only sent out when:
1. A table entry changes from fixed to interpolated
2. A table entry changes from interpolated to fixed
3. A fixed value changes
A SysEx message is not sent out for interpolated value changes.

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit
16	50	00	2	KeyTable 3, Key 64	0 - 1000	0.1%
		02	2	KeyTable 3, Key 65		
		:	:			
		7C	2	KeyTable 3, Key 126		
		7E	2	KeyTable 3, Key 127		

Total
Bytes   80   128

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit
16	60	00	2	KeyTable 4, Key 0	0 - 1000	0.1%
		02	2	KeyTable 4, Key 1		
		04	2	KeyTable 4, Key 2		
		:	:			
		7C	2	KeyTable 4, Key 62		
		7E	2	KeyTable 4, Key 63		

Total
Bytes   80   128

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit
16	70	00	2	KeyTable 4, Key 64	0 - 1000	0.1%
		02	2	KeyTable 4, Key 65		
		:	:			
		7C	2	KeyTable 4, Key 126		
		7E	2	KeyTable 4, Key 127		

Total
Bytes   80   128

Arpeggiator

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)	Unit
18	00	00	1	Mode	ArpMode	
		01	1	Resolution	SeqArpClkDiv	
		02	1	Pattern	0 to 63	
		03	2	Swing	0 to 375	0.20%
		05	1	Octave	0 to 3	
		06	1	Velocity	ArpVel	
		07	1	Note Length	-63 to 63	
		08	1	Pattern Length	0 to 31	
		09	1	Arp Hold	0 to 1	

Total Bytes	0A	10

ArpVel	
Pattern	0
Keyboard	1
Both	2

ArpMode	
Up	0
Down	1
Up/Down	2
AsPlayed	3
Random	4
Chord	5
Down2	6
Up/Down2	7

SeqArpClkDiv	
1/32	0
1/16	1
1/16T	2
1/8	3
1/8T	4
1/4	5
1/4T	6
1/2	7
1/2T	8
1/1	9
2/1	10
3/1	11
4/1	12
6/1	13
8/1	14

Arpeggiator Steps

Address (Hex)			Size (Dec)	Parameter Name	Range (Dec)
18	10	00	2	Step 1 Volume	0 to 127
		02	2	Step 2 Volume	0 to 127
		04	2	Step 3 Volume	0 to 127
		06	2	Step 4 Volume	0 to 127
		08	2	Step 5 Volume	0 to 127
		0A	2	Step 6 Volume	0 to 127
		0C	2	Step 7 Volume	0 to 127
		0E	2	Step 8 Volume	0 to 127
		10	2	Step 9 Volume	0 to 127
		12	2	Step 10 Volume	0 to 127
		14	2	Step 11 Volume	0 to 127
		16	2	Step 12 Volume	0 to 127
		18	2	Step 13 Volume	0 to 127
		1A	2	Step 14 Volume	0 to 127
		1C	2	Step 15 Volume	0 to 127
		1E	2	Step 16 Volume	0 to 127
		20	2	Step 17 Volume	0 to 127
		22	2	Step 18 Volume	0 to 127
		24	2	Step 19 Volume	0 to 127
		26	2	Step 20 Volume	0 to 127
		28	2	Step 21 Volume	0 to 127
		2A	2	Step 22 Volume	0 to 127
		2C	2	Step 23 Volume	0 to 127
		2E	2	Step 24 Volume	0 to 127
		30	2	Step 25 Volume	0 to 127
		32	2	Step 26 Volume	0 to 127
		34	2	Step 27 Volume	0 to 127
		36	2	Step 28 Volume	0 to 127
		38	2	Step 29 Volume	0 to 127
		3A	2	Step 30 Volume	0 to 127
		3C	2	Step 31 Volume	0 to 127
		3E	2	Step 32 Volume	0 to 127
		40	1	Step 1 Gate Length	1 to 40
		41	1	Step 2 Gate Length	1 to 40
		42	1	Step 3 Gate Length	1 to 40
		43	1	Step 4 Gate Length	1 to 40

		44	1	Step 5 Gate Length	1 to 40
18	10	45	1	Step 6 Gate Length	1 to 40
		46	1	Step 7 Gate Length	1 to 40
		47	1	Step 8 Gate Length	1 to 40
		48	1	Step 9 Gate Length	1 to 40
		49	1	Step 10 Gate Length	1 to 40
		4A	1	Step 11 Gate Length	1 to 40
		4B	1	Step 12 Gate Length	1 to 40
		4C	1	Step 13 Gate Length	1 to 40
		4D	1	Step 14 Gate Length	1 to 40
		4E	1	Step 15 Gate Length	1 to 40
		4F	1	Step 16 Gate Length	1 to 40
		50	1	Step 17 Gate Length	1 to 40
		51	1	Step 18 Gate Length	1 to 40
		52	1	Step 19 Gate Length	1 to 40
		53	1	Step 20 Gate Length	1 to 40
		54	1	Step 21 Gate Length	1 to 40
		55	1	Step 22 Gate Length	1 to 40
		56	1	Step 23 Gate Length	1 to 40
		57	1	Step 24 Gate Length	1 to 40
		58	1	Step 25 Gate Length	1 to 40
		59	1	Step 26 Gate Length	1 to 40
		5A	1	Step 27 Gate Length	1 to 40
		5B	1	Step 28 Gate Length	1 to 40
		5C	1	Step 29 Gate Length	1 to 40
		5D	1	Step 30 Gate Length	1 to 40
		5E	1	Step 31 Gate Length	1 to 40
		5F	1	Step 32 Gate Length	1 to 40
		60	1	Step 1 Gate Enable	0 to 1
		61	1	Step 2 Gate Enable	0 to 1
		62	1	Step 3 Gate Enable	0 to 1
		63	1	Step 4 Gate Enable	0 to 1
		64	1	Step 5 Gate Enable	0 to 1
		65	1	Step 6 Gate Enable	0 to 1
		66	1	Step 7 Gate Enable	0 to 1
		67	1	Step 8 Gate Enable	0 to 1
		68	1	Step 9 Gate Enable	0 to 1
		69	1	Step 10 Gate Enable	0 to 1
		6A	1	Step 11 Gate Enable	0 to 1
		6B	1	Step 12 Gate Enable	0 to 1
		6C	1	Step 13 Gate Enable	0 to 1
		6D	1	Step 14 Gate Enable	0 to 1
		6E	1	Step 15 Gate Enable	0 to 1
		6F	1	Step 16 Gate Enable	0 to 1
		70	1	Step 17 Gate Enable	0 to 1
		71	1	Step 18 Gate Enable	0 to 1
		72	1	Step 19 Gate Enable	0 to 1
		73	1	Step 20 Gate Enable	0 to 1
		74	1	Step 21 Gate Enable	0 to 1
		75	1	Step 22 Gate Enable	0 to 1
		76	1	Step 23 Gate Enable	0 to 1
		77	1	Step 24 Gate Enable	0 to 1
		78	1	Step 25 Gate Enable	0 to 1
		79	1	Step 26 Gate Enable	0 to 1
		7A	1	Step 27 Gate Enable	0 to 1
		7B	1	Step 28 Gate Enable	0 to 1
		7C	1	Step 29 Gate Enable	0 to 1
		7D	1	Step 30 Gate Enable	0 to 1
		7E	1	Step 31 Gate Enable	0 to 1
		7F	1	Step 32 Gate Enable	0 to 1

Total
Bytes 80 128

Source Lists

AudioSrc				ModSrc			
0	Off	42	EG 3	0	Off	42	Polyphonic Aftertouch
1	Osc 1	43	EG 4	1	LFO 1	43	Lag Processor 1
2	Osc 2	44	EG 5	2	LFO 2	44	Lag Processor 2
3	Osc 3	45	EG 6	3	LFO 3	45	Lag Processor 3
4	Osc 4	46	Looping EG -X axis	4	LFO 4	46	Lag Processor 4
5	Rotor 1	47	Looping EG -Y axis	5	Vibrato LFO	47	Breath Control
6	Rotor 2	48	Velocity	6	EG 1	48	Maximum Value
7	AM 1	49	Aftertouch	7	EG 2	49	Osc 1
8	AM 2	50	Note	8	EG 3	50	Osc 2
9	Vector 1	51	Mod Wheel	9	EG 4	51	Osc 3
10	Vector 2	52	Aftertouch + Mod Wheel	10	EG 5	52	Osc 4
11	Mixer 1	53	Ribbon 1	11	EG 6	53	Rotor 1
12	Mixer 2	54	Ribbon 2	12	Looping EG -X axis	54	Rotor 2
13	Mixer 3	55	Joystick X	13	Looping EG -Y axis	55	AM 1
14	Mixer 4	56	Joystick Y	14	Velocity	56	AM 2
15	Filter 1	57	CC 1	15	Aftertouch	57	Vector 1
16	Filter 2	58	CC 2	16	Note	58	Vector 2
17	Filter 3	59	CC 3	17	Mod Wheel	59	Mixer 1
18	Filter 4	60	CC 4	18	Aftertouch + Mod Wheel	60	Mixer 2
19	Insert FX 1	61	CC 5	19	Ribbon 1	61	Mixer 3
20	Insert FX 2	62	Seq A	20	Ribbon 2	62	Mixer 4
21	Insert FX 3	63	Seq B	21	Joystick X	63	Filter 1
22	Insert FX 4	64	Seq C	22	Joystick Y	64	Filter 2
23	VCA 1	65	Seq D	23	CC 1	65	Filter 3
24	VCA 2	66	Pedal 1	24	CC 2	66	Filter 4
25	VCA 3	67	Pedal 2	25	CC 3	67	Insert FX 1
26	VCA 4	68	Assignable Button 1	26	CC 4	68	Insert FX 2
27	White Noise	69	Assignable Button 2	27	CC 5	69	Insert FX 3
28	Pink Noise	70	Envelope Follower	28	Seq A	70	Insert FX 4
29	External Input 1	71	--------	29	Seq B	71	VCA 1
30	External Input 2	72	Key Table 1	30	Seq C	72	VCA 2
31	External Input 3	73	Key Table 2	31	Seq D	73	VCA 3
32	External Input 4	74	Key Table 3	32	Pedal 1	74	VCA 4
33	S/PDIF Input Left	75	Key Table 4	33	Pedal 2	75	White Noise
34	S/PDIF Input Right	76	Polyphonic Aftertouch	34	Assignable Button 1	76	Pink Noise
35	LFO 1	77	Lag Processor 1	35	Assignable Button 2	77	External Input 1
36	LFO 2	78	Lag Processor 2	36	Envelope Follower	78	External Input 2
37	LFO 3	79	Lag Processor 3	37	--------	79	External Input 3
38	LFO 4	80	Lag Processor 4	38	Key Table 1	80	External Input 4
39	Vibrato LFO	81	Breath Control	39	Key Table 2	81	S/PDIF Input Left
40	EG 1	82	Maximum Value	40	Key Table 3	82	S/PDIF Input Right
41	EG 2			41	Key Table 4		

CtrlSrc			
0	Off	30	Seq C
1	LFO 1	31	Seq D
2	LFO 2	32	Pedal 1
3	LFO 3	33	Pedal 2
4	LFO 4	34	Assignable Button 1
5	Vibrato LFO	35	Assignable Button 2
6	EG 1	36	Envelope Follower
7	EG 2	37	--------
8	EG 3	38	Key Table 1
9	EG 4	39	Key Table 2
10	EG 5	40	Key Table 3
11	EG 6	41	Key Table 4
12	Looping EG -X axis	42	Polyphonic Aftertouch
13	Looping EG -Y axis	43	Lag Processor 1
14	Velocity	44	Lag Processor 2
15	Aftertouch	45	Lag Processor 3
16	Note	46	Lag Processor 4
17	Mod Wheel	47	Breath Control
18	Aftertouch + Mod Wheel	48	Maximum Value
19	Ribbon 1		
20	Ribbon 2		
21	Joystick X		
22	Joystick Y		
23	CC 1		
24	CC 2		
25	CC 3		
26	CC 4		
27	CC 5		
28	Seq A		
29	Seq B		