MIDI SYSTEM EXCLUSIVE DATA FORMAT FOR S700, X7000

GENERAL NOTES

The purpose of the interface is to allow a computer to control all S700 and X7000 functions, to process and synthesize samples, and to allow the S700 and X7000 to replay samples developed for other machines, e.g. Prophet 2000.

S700 and X7000 are always slaves. They will never send unless they are told to. This means all data transfers out of S700 and X7000 must use two way communication. S700 and X7000 can however receive with an incoming connection only. Reception of sample dump is speeded up with a two way connection.

Samples are requested by NUMBER. This number is 0 to 5 (0 to 15 with ASK70) and corresponds to the displayed sample number N-1.

Sample transfer is according to the standard described in the Prophet 2000 manual. This uses "System exclusive common" which does not include a manufacturers prefix code. As it does not include a MIDI channel code, any samples sent, or requests for samples would be responded to by all samplers on the same MIDI line. The "System exclusive common reception enable" and "disable" messages, which do include a MIDI channel number, can be used to select one of several S700s and X7000s on the same line.

A further enhancement of the standard sample dump protocol is that when closed loop transmission is used, gaps between blocks may be as long as 10 seconds rather than the 20 mS specified. This allows the computer to use its disk in the middle of a long file. This variation maintains full compatibility with the standard.

There are several parameters associated with a S700 and X7000 sample that are not included in the Prophet 2000 sample dump. These may be sent with the AKAI exclusive "Sample parameters" messages.

The use of the above enhancements will not prevent the S700 and X7000 from being completely compatible with the Prophet 2000 sample dump format.

START POINT

When S700 and X7000 sends a sample, they send only that part of the waveform between the start and end points. When they send AKAI exclusive sample parameters, they sends the start and the end points as shown on the S700 and X7000 display.

RECOGNISED BY S700, X7000 :

AKAI EXCLUSIVE :

	MNEMONIC
Request for overall setting :	ROVS
Overall settings :	OVS
Request for sampl parameters :	RSPRM
Sample parameter :	SPRM
System exclusive common reception enable :	SECRE
System exclusive common reception disable :	SECRD

SYSTEM EXCLUSIVE COMMON :

	MNEMONIC
Request sample dump :	RSD
Abort Sample Dumd :	ASD
Not Acknoledge sample block (Request retransmission) :	NAKS
Acknoledge sample block (or sample header) :	ACKS
Sample dump :	SD

TRANSMITTED BY S700, X7000 :

AKAI EXCLUSIVES :

	MNEMONIC
Overall settings :	DOVS
Sample parameters :	DSP

SYSTEM EXCLUSIVE COMMON :

System :	MNEMONIC
Sample dump :	SD
Abort sample dump :	ASD
Not acknowledge sample block :	NAKS
Acknowledge sample block :	ACKS

DETAILED SPECIFICATION OF MESSAGES :

SAMPLE DUMP FORMAT (as recognised and transmitted by S700 and X7000)

BYTE	RANGE	TYPE*	DESCRIPTION
0	0F0H	B	System exclusiv code
1	07EH	B	Common non-realtime identifier
2	1	B	SD, Sample dump code
3	N	B	LS, Sample number The incomming sample will replace the S700's and X7000's sample numbered N+1 where N is 0 to 5 (or 15). If N is greater than 5 (or 15) , then the sample being edited will be replaced.
4	0	B	Reserved (mus be 0).
5	8-16	B	Bits per WORD. S700 and X7000 transmit 12, but can accept 8 to 14.
6-8	0-127	TB	SAMPLING PERIOD IN ns. S700 and X7000 accept 15259 to 500000. S700 and X7000 assume that the nominal pitch of samples is C3 (MIDI 60) unless a subsequent set of AKAI exclusive parameters specifies it otherwise.
9-11	0-127	TB	TOTAL WORDSIN SAMPLE. S700 and X7000 accept 200 to 32752. If more than 32752 points are sent only the first 32752 will be stored.
12-14	0-127	TB	LOOP START POINT. If it is equal or larger than TOTAL WORD-5, assume non looping.
15-17	0-127	TB	LOOP END. S700 and X7000 take this as end point. They take the start point as 0 unless AKAI exclusive sample parameters subsequently raise it.
18	0-1	B	MODE, 0=looping, 1=alternating (One shot if loop lenght is smaller than 5).

Next follows a variable number of sample blocks. Each has the same format :

0	0-127	B	BLOCK NUMBER Lsbyte (Block number Msbyte is not sent.)
1, 2	0-4095	SW	SAMPLE DATA
3-120	0-4095	SW	59 more SAMPLE DATA as byte 1, 2.
121	0-127	B	CHECKSUM, being the Exclusive-OR of previous 120 bytes.

A final byte follows the last block :

??	0F7H	B	EOX

SYSTEM COMMON HANDSHAKES (recognised and transmitted by S700 and X7000)

BYTE	RANGE	TYPE*	DESCRIPTION
0	0F0H	B	System exclusive code
1	7EH	B	Common non-realtime code
2	ff	B	Function code : ACKS = 7FH, Acknowledge sample block or header, ASD = 7DH, Abort sample dump, NAKS = 7EH, Not acknowledge (request retransmission of block)
3	0F7H	B	EOX

SYSTEM COMMON REQUEST SAMPLE DUMP (recognised by S700 and X7000)

BYTE	RANGE	TYPE*	DESCRIPTION
0	0F0H	B	System exclusive code
1	7EH	B	Common non-realtime code
2	0	B	RSD, Request sample dump code.
3	0-5(15)	B	Sample No. : displayed sample No N-1,
4	0	B	Reserved (must be 0)
5	0F7H	B	EOX

AKAI EXCLUSIVE MESSAGES (recognised by S700 and X7000)

BYTE	RANGE	TYPE*	DESCRIPTION
0	0F0H	B	System exclusive code
1	47H	B	AKAI identifier
2	0-15	B	MIDI channel No.
3	1,4,5,6	B	Function code : ROVS = 1 Request for overall settings, RSPRM = 4 Request for sample parameters, SECRE = 5 System exclusive common reception enable, SECRD = 6 System exclusive common reception disable.
4	65	B	S700, X7000 identifier
5	0-5(15)	B	Sampler number where applicable. Otherwise 0
6	0	B	Reserved (must be 0)
7	0F7H	B	EOX

AKAI EXCLUSIVE OVERALL SETTINGS (recognised and transmitted by S700 and X7000)

BYTE	RANGE	TYPE*	DESCRIPTION
0	0F0H	B	System exclusive code
1	47H	B	AKAI identifier
2	0-15	B	MIDI channel No.
3	8	B	OVS, Functioncode for overall settings
4	65	B	S700, X7000 identifier
5	0	B	Reserved (must be 0)
6	0	B	Reserved (must be 0)
			Overall settings data :
7, 8	0-15	DB	MDCH, S700 and X7000 basic MIDI reception channel. Code 0-15.
9, 10	3,8,16	DB	MDMPM, S700 and X7000 MIDI mode. 3=POLY,, 8=MONO, 16=Special mono.
11, 12	0-15	DB	MDXTCH, MIDI transmitting channel to send AKAI exclusive messages from S700 and X7000.
13, 14	0,64,128	DB	OMNION, S700 and X7000 MIDI mode. 128=OMNI ON, 0=OMNI OFF, 64=Multi-program.
15, 16	0-12	DB	PWRNGE, Pitch wheel range (+/- semitones).eg.12 means range of octavedown to octave up.
17, 18	0,255	DB	PRCHOF, MIDI program change reception. 0 to allow 255 to inhibit.
19-22	0	DW	Reserved
23-26	0	DW	Reserved
27-30	0	DW	Reserved
31	0-127	B	CHECKSUM, Exclusive-OR of bytes 7-30.
32	0F7H	B	EOX

AKAI EXCLUSIVE SAMPLE PARAMETERS (recognised and transmitted by S700 and X7000)

BYTE	RANGE	TYPE*	DESCRIPTION
0	0F0H	B	System exclusive code
1	47H	B	AKAI identifier
2	0-15	B	MIDI channel No.
3	10	B	SPRM, Function code for sample parameters
4	65	B	S700, X7000 identifier
5	0-5 (15)	B	Sample Number
6	0	B	Reserved (must be 0)

First are 32 ets of sample parameters, one for each program. Each consists of 4 data elements.

7, 8	0-99	DB	KEYL	Lowest key in keyrange for this sample in first program
9, 10	0-99	DB	KEYH	Highest key in keyrange.
11, 12	0-255	DB	TRNSP	Signed key transpose, +/-60. MSB is set for constant pitch.
13, 14	0-255	DB	ATPICH	Audio trigger. MSB set to disable, 7 LSBs give MIDI note.

15-262	31 further blocks of four elements for 2nd to 32nd programs. Each block is coded as bytes 7-14 above.		
263, 264	X	DB	undefined
265- 266	1,2,4,9	DB	RPMODE : 1 = One shot, 2 = Looping, 4 = Alternating, 9 = Drum triggered one shot
267-270	0-32552	DW	SSTRT Start Point
271-274	X	DW	undefined
275-278	200-32752	DW	SEND End point+1, must be equal or larger than SSTRT+200.
279-282	0-32752	DW	SLOOP Loop point, must be smaller than SEND
283-286	X	DW	undefined
287, 288	0-99	DB	LFSP, LFO speed, 0=2Hz, 99=8Hz.
289, 290	0-99	DB	LFDP = LFO depth, 99=+/- semitone
291, 292	0-99	DB	LFDL, LFO delay, 99 means slow build-up.
293, 294	0-99	DB	FLTFRQ, Filter frequency, 99 means maximum
295, 296	0-99	DB	RLEASE, Release time, 99 means slowest.
297, 298	0-99	DB	LDNSS, Loudness, 99=max. LSB is 0.375 dB
299, 300	0-99	DB	SFNTUN, Fine tuning, signed. LSB is 1/16 semitone.
301, 302	24-96	DB	RECNP Nominal recording pitch, coding as for MIDI KEY in semitones (69=A3 440Hz).
303, 304	36-77	DB	RECBW Recording bandwidth, defines original sample rate. 69 means, bandwidth of 10.56 kHz which corresponds to sample rate of 26400 Hz. Other rates are computed according to $\text{Rate} = 26400 \times 2^{((\text{RECBW69})/12)}$ If RECNP=RECBW and SFNTUN=0 and TRNSP=0then samples made at concert pitch (A3 440Hz).
305, 306	0,255	DB	RVRSE, 0=Forward, 255=Reversed. Used only for display
307, 308	0-99	DB	VELFIL, Velocity/filter interaction.
309, 310	0-99	DB	VELLDN Velocity/loudness interaction
311, 312	0-99	DB	VELRLS Velocity/release interaction. 99 gives slowest release for low velocity
313, 314	X	DW	undefined
315, 316	X	DW	undefined
317	0-127	B	CHECKSUM, Exclusive-OR of bytes 7-316.
318	0F7H	B	EOX

*CODING OF B, DB, TB, DW and SW :

B represents a byte transmitted as single MIDI byte.

DB represents an 8 bit parameter in S700's ans X7000's memory. It is sent as two MIDI bytes :

first byte :	0	d6	d5	d4	d3	d2	d1	d0
second byte :	0	0	0	0	0	0	0	d7

Where d0 is the parameter's least significant bit.

If the second byte is 2 or higher the value will not be copied into S700's and X7000's memory and the previous value will remain. It is thuspossible to change only selected parameter.

TB represents a 21 bit value transmitted as three MIDI bytes :

first byte :	0	d6	d5	d4	d3	d2	d1	d0
second byte :	0	d13	d12	d11	d10	d9	d8	d7
third byte :	0	d20	d19	d18	d17	d16	d15	d14

SW represents a 12 bit value transmitted as two MIDI bytes :

first byte :	0	d11	d10	d9	d8	d7	d6	d5
second byte :	0	d4	d3	d2	d1	d0	0	0

Coding is offset binary, zero is sent as 40H0

DW represents a 16 bit quantity. It is sent as four MIDI bytes :

first byte :	0	d6	d5	d4	d3	d2	d1	d0
second byte :	0	0	0	0	0	0	0	d7
third byte :	0	d14	d13	d12	d11	d10	d9	d8
fourth byte :	0	0	0	0	0	0	0	d15

If both the second and fourth bytes are 2 or more, the value will not be copied into S700's and X7000's memory and previous value will remain.

SIGNED and UNSIGNED

Parameters described as signed are represented in 2's complement form, e.q. DB value of -1=0FFH.

UNDEFINED and RESERVED

Reserved values are for possible future enhancements and must be transmitted as shown. Undefined values have no operational effect and might as well be filled with 0s.

TIMEOUT

When receiving AKAI exclusive data after the first six bytes have been received, the remaining bytes must be separated by no more than 2 seconds. This provision protects the S700 and X7000 from hanging in the event of incomplete messages.

Example of dialog where computer receives sample from S700

COMPUTER : RSD
(0F0H, 7EH, 0, 0, 0, 0F7H)
Computer request S700 to send its first sample.

S700 : SD
(0F0H, 7EH, 1, 0, 0, 0CH)
77H, 27H, 2 Sample period = 10^9 / 26400

70H, 7FH, 1 Words in sample = 32752
34H, 7FH, 1 Loop start point = 32692
70H, 7FH, 1 Loop end point = 32752
last sample point +1.
0) Mode = Looping

COMPUTER : ACKS
(0F0H, 7EH, 7FH, 0F7H) Computer acknowledges sample header.

S700 : (0, 40H, 0, 40H, 0, 40H, 0, 40H, 0, …….0)
This is a block of 60 sample points.

COMPUTER : ACKS
(0F0H, 7EH, 7FH, 0F7H) Computer acknowledges sample block.
The above two lines are repeated while S700 sends a total of 546 blocks.
:
:
:
S700 : (21H, 40H, 0, 40H, 0, 40H, 0, 40H, 0, …….0, 0 0, 0 0)
This is the 546th block. Note that the last bytes are padded with 0s to keep the block the same length as the others.

COMPUTER : ACKS
(0F0H, 7EH, 7FH, 0F7H) Computer acknowledges last block.

S700 : EOX
(0F7H) Marks end of message.