

MIDI SYSTEM EXCLUSIVE DATA FORMAT FOR S700, X7000 Version : V1.0

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 the AKAI exclusive sample parameters, they send the start and end points as shown on the S700 and X7000 display.

RECOGNISED BY S700, X7000:

AKAI EXCLUSIVE :

Request for overall setting :
Overall settings :
Request for sample parameters :
Sample parameter :
System exclusive common reception enable :
System exclusive common reception disable :

MNEMONIC

ROVS
OVS
RSPRM
SPRM
SECRE
SECRD

SYSTEM EXCLUSIVE COMMON:

Request sample dump :
Abort sample dump :
Not acknowledge sample block (Request retransmission) :
Acknowledge sample block (or sample header) :
Sample dump :

MNEMONIC

RSD
ASD
NAKS
ACKS
SD

TRANSMITTED BY S700, X7000:

AKAI EXCLUSIVE:

Overall Settings :	MNEMONIC
Sample parameters :	DOVS
	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
J	0F0H	B	System exclusive code
1	07EH	B	Common non-realtime identifier.
2	1	B	SD, Sample dump code.
3	N	B	LS, Sample number. The incoming 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 (must 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 WORDS IN 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 length 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 Bytes 1,2.
121	0-127	B	CHECKSUM, being the Exclusive-OR of the previous 120 bytes.

A final byte follows the last block:

??	0F7H	B	EOX
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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. S700, X7000 identifier.
4	65	B	Sample number where applicable. Otherwise 0
5	0-5(15)	B	Reserved (must be 0).
6	0	B	EOX
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, Function code 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, coded 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), e.g. 12 means range of octave down 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 sets 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	7 LSBs are signed key transpose, +/-60. MSB is set for constant pitch.
13,14	0-255	DB	ATPTCH	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=2 Hz, 99=8 Hz.
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	0-255	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

$$\text{Rate} = 26400 \times 2^{((\text{RECBW}-69)/12)}$$

If RECNP=RECBW and SFNTUN=0 and TRNSP=0
then samples made with 60 points per cycle
will come out 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	DB		Undefined.
315,316	X	DB		Undefined.
317	0-127	B	CHECKSUM	Exclusive-OR of bytes 7-316.
318	0F7H	B	EOX	

ENCODING OF B, DB, TB, DW and SW :

B represents a byte transmitted as a single MIDI byte.

DB represents an 8bit parameter in S700's and 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 thus possible 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 40H 0.

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 the previous value will remain.

SIGNED and UNSIGNED

Parameters described as signed are represented in 2's complement form, e.g.
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.