K770-KBD

MIDI Interface for
Korg 770 / 700S / 900PS Keyboard

Model 8-430
Version 1.0
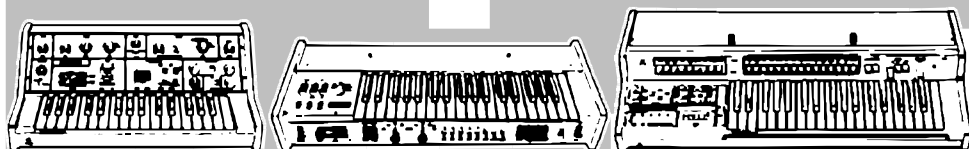
MIDI SysEx Communication

## Contents:

1   SYSTEM EXCLUSIVE COMMUNICATION

K770-KBD interface uses System Exclusive communication to receive and to transmit a SysEx Messages for the control of all parameters in memory banks of the interface. It is also possible to list an actual memory banks content. These data can be backed up in the PC. Certain system and testing functions can be launched by SysEx commands as well.
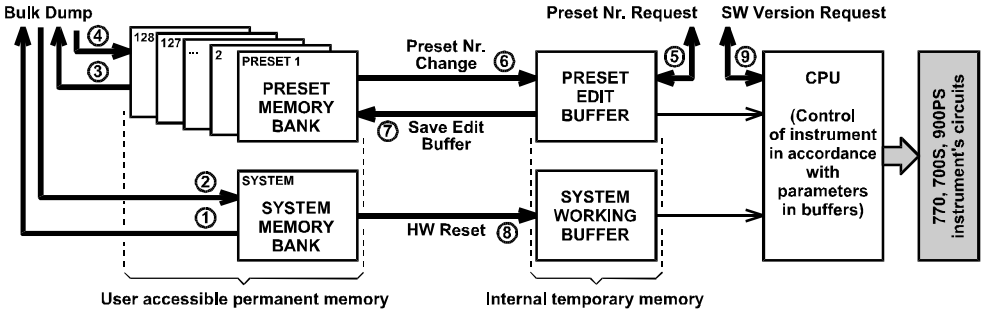
① **Bulk Dump System Data Request** (chapter 3.1)
② **Bulk Dump System Data Save / Load** (chapter 3.2)
③ **Bulk Dump Preset Data Request** (chapter 3.3)
④ **Bulk Dump Preset Data Save / Load** (chapter 3.4)
⑤ **System Functions - Preset Nr. Request** (chapter 3.5.1)

⑥ **System Functions - Preset Nr. Change** (chapter 3.5.2)
⑦ **System Functions - Save Edit Buffer** (chapter 3.5.3)
⑧ **System Functions - Interface Reset** (chapter 3.5.4)
⑨ **System Functions - SW Version Request** (chapter 3.5.5)

2   SYSEX MESSAGES STRUCTURE

K770-KBD receives / transmits own specific messages with the following structure:

[hex]	[bin]	byte
F0	11110000	Start SysEx
00	00000000	Manufacturer ID (always 3 byte)
20	00100000	
21	00100001	
ii	0iiiiiii	Device ID (00h ~ 0Fh or "Universal ID" 7Fh)
54	01010100	Model ID
cc	0ccc0000	Command (10h / 20h / 30h / 40h / 50h / 60h / 70h)
aa	0aaaaaaa	Address
dd	0ddddddd	Datablock (0 ~ 64 byte in dependence on message type)
. .	. . . .	
dd	0ddddddd	
xx	0xxxxxxx	Checksum
F7	11110111	End SysEx

2.1   "DEVICE ID" BYTE

The device ID byte identifies the MIDI device exactly. It is equal to a number of an active MIDI channel (00h for channel Nr. 1, 01h for channel Nr. 2 etc. up to 0Fh for channel Nr. 16). The next possible value of the Device ID is 7Fh – universal Device ID always accepted by the interface regardless on an active MIDI channel number.

For all other values of the Device ID (from 10h to 7Eh) the message is considered to be invalid and it is ignored by the interface.

2.2 "COMMAND" BYTE

The command "**cc**" specifies the message type i.e. the interface function type.

2.3 "ADDRESS" BYTE

The address "**aa**" specifies the memory area or selects the system function accordingly to a type of the SysEx Msg – see below.

2.4 "DATA" BYTE(S)

The block of databytes "**dd…dd**" contains the values of a parameters or functions defined by the SysEx Msg type. The number of bytes in the datablock "**dd…dd**" is a different accordingly to a type of the SysEx message. It consists none, one or eight databytes.

2.5 "CHECKSUM" BYTE

The checksum byte "**xx**" confirms the validity of System Exclusive message. It must be calculated as 7-bit complement of the sum of bytes from 'Model ID' to 'Data' (by other words, seven-bit sum of bytes from the "Model ID" to "Checksum" must be equal to zero). If the checksum byte is invalid, the whole message is invalid too and it is ignored by the interface.

3 COMMAND TYPES OVERVIEW

The command "**cc**" defines the interface activity after the whole message is received. The valid values of "**cc**" are:

- "**cc**"=10h → **Bulk Dump System Data Request** – request for a content of system memory bank in the internal interface's memory.
- "**cc**"=20h → **Bulk Dump System Data Save / Load** – response to the "Bulk Dump System Data Request" or the change of a content of system memory bank in the internal interface's memory.
- "**cc**"=30h → **Bulk Dump Preset Data Request** – request for a content of a preset from preset memory bank in the internal interface's memory.
- "**cc**"=40h → **Bulk Dump Preset Data Save / Load** – response to the "Bulk Dump Preset Data Request" or the change of content of a preset in preset memory bank in the internal interface's memory.
- "**cc**"=50h → **System Functions** – launches a system function, exact procedure is specified by the values of the "Address" and "Data" bytes (see chapter 3.5).
- "**cc**"=60h → **Service 1** – launches the testing functions for the interface's hardware check.
- "**cc**"=70h → **Service 2** – launches the testing functions for the interface's memory check.

3.1 "BULK DUMP SYSTEM DATA REQUEST" COMMAND

The "Bulk Dump System Data Request" command ("**cc**"=10h) is request for a content of the system memory bank. It launches the listing of the data from the system memory bank stored in user memory.

The address "**aa**" is always 00h. For the address "**aa**" in range from 01h to 7Fh, the message is evaluated as invalid and it is ignored by the interface.

Databytes "**dd**" are not used in this type of the SysEx message.

Immediately after the "Bulk Dump System Data Request" message reception, the interface sends the "Bulk Dump System Data Save / Load" message (see chapter 3.2) as a reply - data of all parameters of system memory bank are included in this message.

Form of the message:

[hex]	[bin]	byte
F0	11110000	Start SysEx
00	00000000	Manufacturer ID (3 byte)
20	00100000	
21	00100001	
ii	0iiiiiii	Device ID (00h ~ 0Fh or "Universal ID" 7Fh)
54	01010100	Model ID
10	00010000	Command (System Data Request)
aa	00000000	Address (always 00h)
xx	0xxxxxxx	Checksum
F7	11110111	End SysEx

3.2 "BULK DUMP SYSTEM DATA SAVE / LOAD" COMMAND

Transmitting the "Bulk Dump System Data Save / Load" message ("**cc**"=20h) to the interface. It changes the content of system memory bank saved in the user interface's memory. This SysEx Msg message is also sent from the interface as a reply to the "Bulk Dump System Data Request" message (see chapter 3.1).

The address "**aa**" is always 00h. For the address "**aa**" in range from 01h to 7Fh, the message is considered to be invalid and it is ignored by the interface.

Length of the "**dd ... dd**" datablock is eight data bytes.

Form of the message:

[hex]	[bin]	byte
F0	11110000	Start SysEx
00	00000000	Manufacturer ID (3 byte)
20	00100000	
21	00100001	
ii	0iiiiiii	Device ID (00h ~ 0Fh or "Universal ID" 7Fh)
54	01010100	Model ID
20	00100000	Command (System Data Save / Load)
00	00000000	Address (always 00h)
d1	0ddddddd	Datablock (8 byte)
..	....	
d8	0ddddddd	
xx	0xxxxxxx	Checksum
F7	11110111	End SysEx

The datablock "**d1…d8**" of the system parameters always contains 8 bytes with the following content:

1st byte: **MIDI CHANNEL**, valid range is from 00h to 0Fh
2nd byte: **AUTO LOCAL**, valid range is from 00h to 01h
3rd byte: **AUTO RESET**, valid range is from 00h to 01h
4th byte: reserve, value is always 00h
5th byte: reserve, value is always 00h
6th byte: reserve, value is always 00h
7th byte: reserve, value is always 00h
8th byte: **GATE INTERRUPT DURATION**, valid range is from 00h to 78h

If received value of any parameter exceeds the valid range listed above, the value is limited to allowed range.

Note that the interface works with changed parameters till after next reset!

For detailed description of the system parameters see the user manual.

3.3 "BULK DUMP PRESET DATA REQUEST" COMMAND

The "Bulk Dump Preset Data Request" command ("**cc**"=30h) is a request for a content of a preset in the preset memory bank. It launches the listing of the data from a preset of preset memory bank stored in user memory.

The address "**aa**" is from 00h to 7Fh. It corresponds to the number from 1 to 128 of a requested preset.

Databytes "**dd**" are not used in this type of the SysEx message.

Immediately after the "Bulk Dump Prest Data Request" message reception, the interface sends the "Bulk Dump Preset Data Save / Load" message (see chapter 3.4) as a reply - data of all parameters of requested preset from preset memory bank are included in this message.

Form of the message:

[hex]	[bin]	byte
F0	11110000	Start SysEx
00	00000000	Manufacturer ID (3 byte)
20	00100000	
21	00100001	
ii	0iiiiiii	Device ID (00h ~ 0Fh or "Universal ID" 7Fh)
54	01010100	Model ID
30	00110000	Command (Preset Data Request)
aa	0aaaaaaa	Address (00h ~ 7Fh : preset number)
xx	0xxxxxxx	Checksum
F7	11110111	End SysEx

3.4 "BULK DUMP PRESET DATA SAVE / LOAD" COMMAND

Transmitting the "Bulk Dump Preset Data Save / Load" message ("**cc**"=40h) to the interface changes the content of a preset in the preset memory bank saved in the user interface's memory. This SysEx Msg message is also sent from the interface as reply to the "Bulk Dump Preset Data Request" message (see chapter 3.3).

The address "**aa**" is from 00h to 7Fh. It corresponds to the number from 1 to 128 of a requested preset.

Length of the "**dd ... dd**" datablock is eight data bytes.

Form of the message:

[hex]	[bin]	byte
F0	11110000	Start SysEx
00	00000000	Manufacturer ID (3 byte)
20	00100000	
21	00100001	
ii	0iiiiiii	Device ID (00h ~ 0Fh or "Universal ID" 7Fh)
54	01010100	Model ID
40	01000000	Command (Preset Data Save / Load)
aa	0aaaaaaa	Address (00h ~ 7Fh : preset number)
d1	0ddddddd	Datablock (8 byte)
..	....	
d8	0ddddddd	
xx	0xxxxxxx	Checksum
F7	11110111	End SysEx

The datablock "**d1…d8**" of the preset parameters always contains 8 bytes with the following content:

1st byte: **KEY SHIFT**, valid range is from 00h to 4Fh
2nd byte: **PITCH BEND RANGE**, valid range is from 00h to 0Ch
3rd byte: **AFTERTOUCH BEND RANGE**, valid range is from 00h to 7Fh
4th byte: **NOTE BUFFER SIZE**, valid range is from 00h to 06h

6

5th byte: **ARPEGGIO MODE**, valid range is from 00h to 04h
6th byte: **ARPEGGIO CLOCK SOURCE**, valid range is from 00h to 02h
7th byte: **ARPEGGIO RATE**, valid range is from 00h to 7Fh
8th byte: **INDICATOR MODE**, valid range is from 00h to 03h

If received value of any parameter exceeds the valid range listed above, the value is limited to allowed range.

For detailed description of the preset parameters see the user manual.

3.5 "SYSTEM FUNCTION" COMMANDS

The "System Function" commands ("**cc**"=50h) are direct commands for the execution of a system function. The type of the function is defined by the address "**aa**".

"**aa**"=00h → **Preset Request** - request for the actual (active) preset number.
"**aa**"=01h → **Preset Change** - change of actual (active) preset number.
"**aa**"=02h → **Save Edit Buffer To Preset Memory** - saving of edit buffer content to a preset in permanent preset memory bank.
"**aa**"=03h → **Interface Reset** – execution of hardware (warm) reset or factory (total) reset of the interface.
"**aa**"=04h → **SW Version Request** – request for the version of installed firmware.

The datablock "**dd**" always contains only one databyte which specifies an activity of a system function.

Form of the message:

[hex]	[bin]	byte
F0	11110000	Start SysEx
00	00000000	Manufacturer ID (3 byte)
20	00100000	
21	00100001	
ii	0iiiiiii	Device ID (00h ~ 0Fh or "Universal ID" 7Fh)
54	01010100	Model ID
50	01010000	Command (System Function)
aa	00000aaa	Address (00h ~ 04h : the function type)
dd	0ddddddd	Databyte
xx	0xxxxxxx	Checksum
F7	11110111	End SysEx

3.5.1 PRESET Nr. REQUEST

If the address "**aa**" is equal to 00h, the SysEx Msg is a request for the number of actual (active) preset number. The value of databyte "**dd**" can be any number from 00h to 7Fh.

Immediately after the message is received, the interface transmits the information about the actual (active) preset number to the MIDI output. The form of transmitted SysEx message is following:

F0 00 20 21 ii 54 50 00 dd xx F7 [hex],

where the databyte "**dd**" is the number from 00h to 7Fh which defines the number of the actual (active) preset number (1 to 128).

3.5.2 PRESET Nr. CHANGE

If the address "**aa**" is equal to 01h, the SysEx Msg is a command for the actual preset change. The value of databyte "**dd**" is from 00h to 7Fh. It specifies the number of newly selected preset (1 to 128).

Immediately after the message is received, the actually selected preset is changed to another specified by the message. This message is an equivalent for the standard channel MIDI command "Program Change".

3.5.3 SAVE EDIT BUFFER TO MEMORY BANK

If the address "**aa**" is equal to 02h, the SysEx Msg is a command for saving of the data from preset edit buffer to a preset memory bank in the user memory. The value of databyte "**dd**" can be from 00h to 7Fh. This value specifies the number of a preset in preset memory bank (1 to 128) to which the data will be stored.

3.5.4 INTERFACE RESET

If the address "**aa**" is equal to 03h, the SysEx Msg is the command for execution of the interface reset. The value of databyte "**dd**" can only be 00h or 7Fh. For all other values the message is considered to be invalid and it is ignored by the interface.

If the value of databyte "**dd**" is 00h, the "Warm Hardware Reset" of the interface is executed. The interface is set to the same status (Stand-by) as when the instrument is switched on.

If the value of databyte "**dd**" is 7Fh, the complete "Factory Reset" is executed. The interface is initialized to the factory status (all parameters in both system and preset memory banks are set to the default values).

WARNING - All data stored by user in the internal memory are fully erased after the execution of the "Factory Reset" command. It is recommended to make a back up of all user data by the "Bulk Dump Data Request" and "Bulk Dump Data Save / Load" messages before the "Factory Reset" execution.

3.5.5 SW VERSION REQUEST

If the address "**aa**" is equal to 04h, the SysEx Msg is a request for the version number of the installed operation system. The value of databyte "**dd**" can only be 00h. For all other values the message is considered to be invalid and it is ignored by the interface.

Immediately after the request is received, the interface transmits the SysEx message:

F0 00 20 21 ii 54 50 04 dd xx F7 [hex],

where nibbles of the databyte "**dd**" are identifying installed firmware version. For example - byte 10h (nibbles 01h, 00h) means the version 1.0.

3.6   "SERVICE 1" AND "SERVICE 2" COMMANDS

The "Service" commands ("**cc**"=60h, 70h) are used only for the debugging of the firmware and for the service and test procedures of the interface hardware. They are not expected to be used during regular operation so they are ignored in normal working modes of the interface.

See service manual for description of the "Service" commands.

4   EXAMPLES OF SYSEX MESSAGES

4.1   EXAMPLE 1

Task:

Set the system parameters of the interface to the following values:
- MIDI CHANNEL: 0Fh (i.e. channel Nr. 16)
- AUTO LOCAL: 01h (i.e. ON)
- AUTO RESET: 01h (i.e. ON)
- BREAK PULSE DURATION: 2Dh (i.e. 10 ms)

Solution:

• I don't know what number of the MIDI channel is actually active so the universal Device ID (**7Fh**) will be used.
• The command to be used is the "**Bulk Dump System Data Save / Load**", the command byte will be **20h**.
• The address byte is always **00h** for this message type.

Start of SysEx Msg will be:

Start SysEx :	**F0h**
Mfr ID :	**00h 20h 21h**
Device ID :	**7Fh**
Model ID :	**54h**
Command :	**20h**
Address :	**00h**

• All four parameter bytes of the datablock are given by the task. Whole datablock inc. reserve bytes will be:
0Fh 01h 01h 00h 00h 00h 00h 2Dh (4th, 5th, 6th and 7th bytes are reserve – value is always 00h)

• Now, the checksum must be calculated as 7-bit complement of the sum of bytes from 'Model ID' to 'Data', i.e.:
00h – (54h + 20h + 00h + 0Fh + 01h + 01h + 00h + 00h + 00h + 00h + 2Dh) = 4Eh

• The form of the whole required System Exclusive message is after the checksum and End SysEx byte refilling:
F0h 00h 20h 21h 7Fh 54h 20h 00h 0Fh 01h 01h 00h 00h 00h 00h 2Dh 4Eh F7h

When the message is received, the values of all system parameters in a system memory bank will be set accordingly to the SysEx message data. Note that to use the newly stored data the interface needs to be reset.

4.2   EXAMPLE 2

Task:

Set the preset parameters of preset memory Nr. 1 to the following values:
- KEY SHIFT: 24h (i.e. from MIDI Note Nr. 36)
- PITCH BEND RANGE: 02h (i.e. ± 2 semitones)
- AFTERTOUCH BEND RANGE: 40h (i.e. no bending)
- NOTE BUFFER SIZE: 02h (i.e. four notes)
- ARPEGGIO MODE: 01h (i.e. Up mode)
- ARPEGGIO CLOCK SOURCE: 01h (i.e. MIDI Clock)
- ARPEGGIO RATE: 7Ah (i.e. 16th note)
- INDICATOR MODE: 03h (i.e. Arpg Clock indication)

Solution:

• I don't know what number of the MIDI channel is actually active so the universal Device ID (**7Fh**) will be used.
• The command to be used is the "**Bulk Dump Preset Data Save / Load**", the command byte will be **40h**.
• Data will be stored to preset memory Nr. 1, the address byte will be **00h**.

9

Start of SysEx Msg will be then:

Start SysEx :   **F0h**
Mfr ID :   **00h 20h 21h**
Device ID :   **7Fh**
Model ID :   **54h**
Command :   **40h**
Address :   **00h**

- All eight parameter bytes of the datablock are given by the task. Whole datablock will be:
24h 02h 40h 02h 01h 01h 7Ah 03h

- Now, the checksum must be calculated as 7-bit complement of the sum of bytes from 'Model ID' to 'Data', i.e.:
00h – (54h + 40h + 00h + 24h + 02h + 40h + 02h + 01h + 01h + 7Ah + 03h) = 05h

- The form of the whole required System Exclusive message is after the checksum and End SysEx byte refilling:
F0h 00h 20h 21h 7Fh 54h 40h 00h 24h 02h 40h 02h 01h 01h 7Ah 03h 05h F7h

When the message is received, the values of all preset parameters in permanent preset memory Nr. 1 will be set accordingly to the SysEx message data. If the preset Nr. 1 is just set as active, the interface will start to work with the newly stored data immediately (they are stored to the edit buffer simultaneously in that case).

4.3 EXAMPLE 3

Task:

Save the data from edit buffer (e.g. set by CCs previously) to preset memory Nr. 128

Solution:

- I don't know what number of the MIDI channel is active so the universal Device ID (**7Fh**) will be used.
- The command to be used is the "**System Functions**", the command byte will be **50h**
- The function is **"Save Edit Buffer To Memory Bank"**, the address byte will be **02h**

Start of SysEx Msg will be then:

Start SysEx :   **F0h**
Mfr ID :   **00h 20h 21h**
Device ID :   **7Fh**
Model ID :   **54h**
Command :   **50h**
Address :   **02h**

- Databyte depends on number of required preset memory; for preset Nr. 128 it is 7Fh. Since datablock has only one byte, whole datablock will be then:
7Fh

- Now, the checksum must be calculated as 7-bit complement of the sum of bytes from 'Model ID' to 'Data', i.e.:
00h – (54h + 50h + 02h + 7Fh) = 5Bh

- The form of the whole required System Exclusive message is after the checksum and End SysEx byte refilling:
**F0h 00h 20h 21h 7Fh 54h 50h 02h 7Fh 5Bh F7h**

When the message is received, the actual values of all parameters in the preset edit buffer will be copied to permanent preset memory Nr. 128.

5   SUPPORT SOFTWARE

Special software generator for an easy creation of any necessary SysEx messages for control and programming of the interface can be used (see Owner's Manual of the interface):
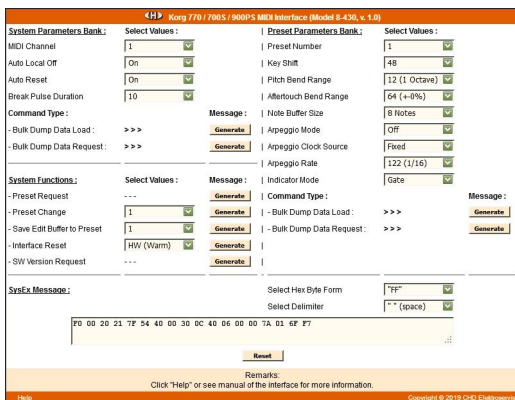
For easy calculation of the "checksum" byte, a special software calculator can be used:
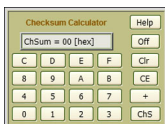
Both these software tools are based on Java script so they can be launched under any operation system (PC, MAC, ...) which includes a web browser (Opera, Firefox, Chrome, ...). The Generator and the Calculator are available at manufacturer's web pages.

This manual in PDF form is available at manufacturer's web pages.

KORG 770 / 700S / 900PS MIDI Interface
Model K770-KBD, Nr. 8-430, ver. 1.00
Document: 843010_syxcom

Manufacturer: CHD Elektroservis, Czech Republic

www.chd-el.cz   info@chd-el.cz

11