# SH 2/9-M

# MIDI Interface for Roland SH-2 / SH-09

**Model 8-437**
**ver. 1.0 and 2.0**



# SYSTEM EXCLUSIVE COMMUNICATION

## Content

---

Manufacturer :

**CHD Elektroservis**
Nad kundratkou 27, 19000 Praha 9
Czech Republic

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

---

## 1. SYSTEM EXCLUSIVE COMMUNICATION

SH2/9-M interface disposes of a system of System Exclusive communication which enables to receive and to transmit a SysEx Messages for the changes of all parameters in memory banks of the interface. Also, it is possible to list an actual memory banks content. These data can be archived in PC for example.

Some system and testing functions can be launched via SysEx commands too.

Software generator for the simple creation of the SysEx messages necessary for SH2/9-M control is available on the supplemental CD-ROM. The generator is based on Java scripts. Any message for the interface setting described below can be created with a help of this generator.

## 2. SYSEX MESSAGES STRUCTURE

SH2/9-M receives own specific messages for the changes of parameters setting etc. with this structure:

| | |
|---|---|
| **F0h** | Start SysEx |
| **00h 20h 21h** | Manufacturer ID |
| **ii** | Device ID |
| **5Bh** | Model ID |
| **cc** | Command |
| **aa** | Address |
| **dd…dd** | Datablock |
| **xx** | Checksum |
| **F7h** | End SysEx |

### 2.1. "DEVICE ID" BYTE

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

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

### 2.2. "COMMAND" BYTE

The command "**cc**" specifies the interface function type after the whole SysEx Msg is received.

### 2.3. "ADDRESS" BYTE

The address "**aa**" specifies the memory area or selects the system function in dependence on 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 given by the SysEx Msg. The number of bytes in datablock "**dd…dd**" is a different in dependence on a type of the SysEx message. There can be from 1 to 20 databytes. Some SysEx messages don't use the databytes at all.

## 2.5. "CHECKSUM" BYTE

The checksum byte "**xx**" confirms the validity of System Exclusive message. It must be calculated so that seven-bit sum of bytes from the "Model ID" to "Checksum" is 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**" gives the interface activity after the whole message is received. The valid values of "**cc**" are :

"**cc**"=10h - **Bulk Dump Data Request** - inquiry for a content of user memory bank in the internal interface's memory.

"**cc**"=20h - **Bulk Dump Data Save / Load** - response to the "Bulk Dump Data Request" or the change of a content of user memory bank in the internal interface's memory.

"**cc**"=30h - **System Functions** – the launching of a system function, exact procedure is specified by the values of the "Address" and "Data" bytes.

"**cc**"=40h - **Test** – the launching of the testing functions for the interface's hardware checking.

## 3.1. "BULK DUMP DATA REQUEST" COMMAND

Form : **F0 00 20 21 ii 5B 10 aa xx F7 [hex]**
(where "**ii**" = Device ID, "**aa**" = Address, "**xx**" = Checksum)

With a help of the "Bulk Dump Data Request" command, it is possible to launch the listing of the data from the preset or system memory banks stored in user memory.

If the address "**aa**" is from 00h to 17h, the message is inquiry for a content of the preset memory bank. It corresponds to the number from 1 to 24 of a requested preset in that case. If the address "**aa**" is 18h, the message is inquiry for a content of the system memory bank. For the address "**aa**" in range from 19h to 7Fh, the message is evaluated as invalid and it is ignored by the interface.

Databyte "**dd**" is not used in this type of the SysEx message at all.

Immediately after the "Bulk Dump Data Request" message receiving the interface sends the "Bulk Dump Data Save / Load" message as reply. All data of parameters of requested memory bank are included in that message.

## 3.2. "BULK DUMP DATA SAVE / LOAD" COMMAND

Form : **F0 00 20 21 ii 5B 20 aa dd…dd xx F7 [hex]**
(where "**ii**" = Device ID, "**aa**" = Address, "**dd…dd**" = datablock, "**xx**" = checksum)

By transmitting of the "Bulk Dump Data Save / Load" message to SH2/9-M, it is allowed to change the content of a memory bank saved in the user interface's memory. Also, this SysEx Msg message is sent from the SH2/9-M as reply to the "Bulk Dump Data Request" message.

If the address "**aa**" is from 00h to 17h, the content of a preset memory bank (values of parameters) is included in the message. The address "**aa**" corresponds to the number from 1 to 24 of requested preset in that case. If the address "**aa**" is 18h, the message includes the content of a system memory bank (values of a system parameters). For the address "**aa**" in range from 19h to 7Fh, the message is evaluated as invalid and it is ignored by the interface.

The datablock "**dd ... dd**" contains 4 or 20 bytes in this case. The databytes represent a values of the requested parameters.

### 3.2.1. DATA FOR SYSTEM PARAMETERS

The datablock "**dd…dd**" of the system parameters always contains 8 bytes with this meaning:

1$^{st}$ byte: **MIDI CHANNEL**, valid range is from 00h to 0Fh
2$^{nd}$ byte: **ENV BREAK PULSE DURATION**, valid range is from 00h to 74h
3$^{rd}$ and 4$^{th}$ byte: the reserve, the value of this byte must be always 00h

Detailed description of the meaning of a system parameters is in the user manual of the device.

### 3.2.2. DATA FOR PRESET PARAMETERS

The datablock "**dd…dd**" of the system parameters always contains 15 bytes with this meaning:

1$^{st}$ byte: **VCO PITCH - KEY SHIFT**, valid range is from 00h to 4Fh
2$^{nd}$ byte: **VCO PITCH - AFTERTOUCH BEND**, valid range is from 00h to 7Fh
3$^{rd}$ byte: **VCO MOD - WAVE**, valid range is from 00h to 03h
4$^{th}$ byte: **VCO MOD - POLARITY**, valid range is from 00h to 03h
5$^{th}$ byte: **VCO MOD - RATE**, valid range is from 00h to 7Fh
6$^{th}$ byte: **VCO MOD - WHEEL AMOUNT**, valid range is from 00h to 7Fh
7$^{th}$ byte: **VCO MOD - AFTERTOUCH AMOUNT**, valid range is from 00h to 7Fh
8$^{th}$ byte: **VCO MOD - RETRIG**, valid range is from 00h to 02h
9$^{th}$ byte: **VCF CUTOFF - FREQUENCY**, valid range is from 00h to 7Fh
10$^{th}$ byte: **VCF CUTOFF - KEY FOLLOW**, valid range is from 00h to 7Fh
11$^{th}$ byte: **VCF CUTOFF - VELOCITY AMOUNT**, valid range is from 00h to 7Fh
12$^{th}$ byte: **VCF CUTOFF - AFTERTOUCH AMOUNT**, valid range is from 00h to 7Fh
13$^{th}$ byte: **VCA LEVEL - KEY FOLLOW**, valid range is from 00h to 7Fh
14$^{th}$ byte: **VCA LEVEL - VELOCITY AMOUNT**, valid range is from 00h to 7Fh
15$^{th}$ byte: **VCA LEVEL - AFTERTOUCH AMOUNT**, valid range is from 00h to 7Fh
16$^{th}$ byte: **VCA LEVEL - VOLUME MODE**, valid range is from 00h to 03h
17$^{th}$ byte: **CONTROL - BENDER MODE**, valid range is from 00h to 01h
18$^{th}$ byte: **CONTROL - INDICATOR MODE**, valid range is from 00h to 03h
19$^{th}$ and 20$^{th}$ byte: the reserve, the values of these bytes must be always 00h

Detailed description of the meaning of a preset parameters is in the user manual of the device.

### 3.3. "SYSTEM FUNCTION" COMMANDS

Form : **F0 00 20 21 ii 5B 30 aa dd xx F7 [hex]**
(where "**ii**" = Device ID, "**aa**" = Address, "**dd**" = databyte, "**xx**" = checksum)

The commands "System Function" ("**cc**"=30h) are direct commands for the execution of a system function. The type of function is given by the address "**aa**". The datablock "**dd**" always contains the only one databyte which specifies an activity of a system function exactly.

### 3.3.1. PRESET CHANGE

If the address "**aa**" is equal to 00h, the SysEx Msg is the command for the change of a preset or it is inquiry for the number of actual preset. The value of databyte "**dd**" can be from 00h to 7Fh.

If the value of databyte "**dd**" is from 00h to 17h, the actual preset is changed after the command receiving. The databyte "**dd**" specifies the number of newly selected preset (1 to 24). This command is equivalent for the channel MIDI command the "Program Change".

If the value of databyte "**dd**" is from 18h to 7Fh, the message is inquiry for the number of actual preset. In this case, the preset is not changed and the interface transmits the info about an actual preset number to the MIDI output only. The form of transmitted SysEx message is:

**F0 00 20 21 ii 5B 30 00 dd xx F7 [hex]**,

where "**ii**" is the Device ID, databyte "**dd**" is the number from 00h to 17h which defines the number of actual preset (1 to 24) and "**xx**" is the checksum. No preset is selected after the interface's reset – the databyte "**dd**" is the 7Fh in that case.

### 3.3.2. SAVING OF PRESET DATA INTO MEMORY BANK IN USER MEMORY

If the address "**aa**" is equal to 01h, the SysEx Msg is the command for the saving of a preset data from the edit buffer to a memory bank in the user memory.

The value of databyte "**dd**" can be from 00h to 17h. This value specifies the number of a preset bank (1 to 24) to which the data will be stored.

For "**dd**" from 18h to 7Fh, the message is evaluated as invalid and it is ignored by the interface.

### 3.3.3. RESET OF INTERFACE

If the address "**aa**" is equal to 02h, the SysEx Msg is the command for execution of reset of the interface. The value of databyte "**dd**" can be only 00h or 7Fh. For all other values the message is evaluated as invalid and it is ignored by the interface.

If the value of databyte "**dd**" is 00h, the hardware reset of the interface is executed. The interface is set to the same status as after 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 are set to the default values). **WARNING - All data stored by user in the internal memory are fully erased after the execution 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".

### 3.3.4. LISTING OF INSTALLED SOFTWARE VERSION NUMBER

If the address "**aa**" is equal to 02h, the SysEx Msg is inquiry for the number of version of installed operational system. The value of databyte "**dd**" can be only 00h. For all other values the message is evaluated as invalid and it is ignored by the interface.

Immediately after the inquiry receiving the interface transmits the SysEx message:

**F0 00 20 21 ii 5B 30 03 dd dd xx F7 [hex]**,

where "**ii**" is the Device ID, the databytes "**dd…dd**" are the data identifying SW version and "**xx**" is the checksum.

Two databytes "**dd…dd**" specify the numbers of the installed SW version and revision directly. For example - bytes 01h 00h denote the version 1.00.

### 3.4. "TEST" COMMANDS

Form : **F0 00 20 21 ii 5B 40 aa dd xx F7 [hex]**
(where "**ii**" = Device ID, "**aa**" = Address, "**dd**" = databyte, "**xx**" = Checksum)

The commands "Test" ("**cc**"=40h) are assigned only for the debugging in production and for the service procedures of the interface. Their usage is not assumed in normal working.

## 4. EXAMPLE OF SYSEX MESSAGE CREATION

*Task:*

Set the system parameters of the interface to these values:
- MIDI CHANNEL :        0Fh (i.e. channel Nr. 16)
- BREAK PULSE LENGTH :     74h (i.e. 30 ms)

*Solution:*

- We don't know what number of the MIDI channel is just an active so the universal Device ID (7Fh) will be used,
- The necessary command is the "**Bulk Dump Data Save / Load**", the command byte will be **20h**
- Data will be stored to a system memory bank, the address byte will be **18h**

Start of SysEx Msg will be then :

| | |
|---|---|
| Start SysEx : | **F0h** |
| Mfr ID : | **00h 20h 21h** |
| Device ID : | **7Fh** |
| Model ID : | **5Bh** |
| Command : | **20h** |
| Address : | **18h** |

- First two bytes of the datablock are given by the task. It is necessary to fill in the datablock to requested length (eight databyte) with 00h byte

Data :   **0Fh 74h 00h 00h**

- Now, the checksum must be calculated as 7-bit complement of the sum of bytes from 'Model ID' to 'Data', i.e.:

**00h – (5Bh + 20h + 18h + 0Fh + 74h + 00h + 00h) = 6Ah**

- The form of the whole required System Exclusive message is after the checksum refilling:

**F0h 00h 20h 21h 7Fh 5Bh 20h 18h 0Fh 74h 00h 00h 6Ah F7h**

After that message is received the values of all system parameters in a system memory bank will be set according to the SysEx message data. The interface will start the working with newly stored data till the next reset.

Similar method can be used for the creation of the SysEx Msg for the changes of parameter's values in a preset memory banks. For the calculation of the checksum, a special software Checksum Calculator can be used. The calculator is based on Java script. The calculator is available on the supplemental CD-ROM.