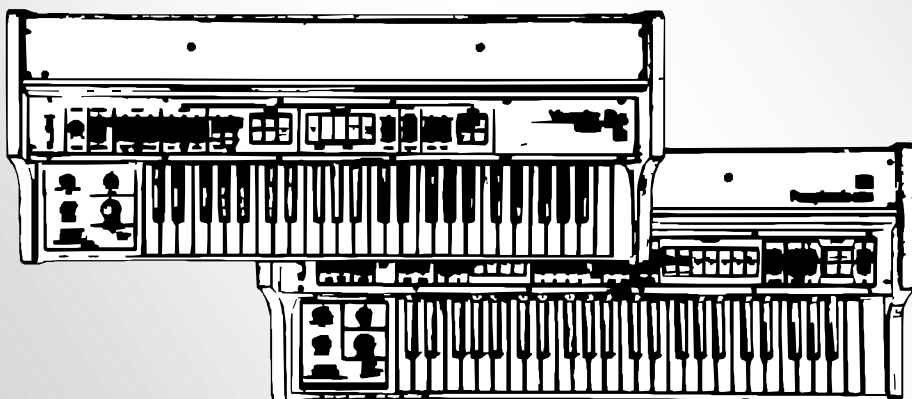


VP330-KBD RS550-KBD

MIDI Interface for Roland VP-330 / RS-550

Model 8-440 / 8-441
ver. 1.0



SYSTEM EXCLUSIVE COMMUNICATION



© 2015 CHD Elektroservis



Content

	page
1. System Exclusive communication	3
2. SysEx Messages structure	3
2.1. "Device ID" byte	3
2.2. "Command" byte	3
2.3. "Address" byte	3
2.4. "Data" byte(s)	4
2.5. "Checksum" byte	4
3. Command types overview	4
3.1. "Bulk Dump Data Request" commands	4
3.2. "Bulk Dump Data Save / Load" commands	5
3.2.1. Data for system parameters	5
3.2.2. Data for preset parameters	5
3.3. "Global Function" commands	6
3.3.1. MIDI channel temporary change / request	6
3.3.2. Autoreset temporary change / request	6
3.3.3. Preset number change / request	6
3.3.4. Store edit buffer	7
3.3.5. Reset of interface	7
3.3.6. Memory test	7
3.3.7. Listing of installed software version number	7
3.4. "Test" commands	7
4. Examples of SysEx Message creation	8

Manufacturer :

CHD Elektroservis

Nad kundratkou 27, 19000 Praha 9
Czech Republic

info@chd-el.cz

www.chd-el.cz



1. SYSTEM EXCLUSIVE COMMUNICATION

VP330-KBD / RS505-KBD 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 of the interface. Also, it is possible to list content of memory banks of the interface. These data can be then archived in PC then 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 VP330-KBD / RS505-KBD control is available on the supplemental CD-ROM or on manufacturer's web-pages (see pic. 1). The generator is based on Java scripts so it can be launched in any internet browser under any operational system. Any message for the interface setting described below can be created with a help of this generator.

Pic. 1 – SysEx Msg Generator

2. SYSEX MESSAGES STRUCTURE

VP330-KBD / RS505-KBD 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
- 5Dh** 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. Acceptable are only these values: 10h, 20h, 30h and 40h.

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 1 or 4 databytes. Some SysEx messages don't use the databytes at all.

2.5. "CHECKSUM" BYTE

The checksum "xx" confirms validity of System Exclusive message. It has to be calculated as 7-bit complement of sum from Model ID to Data bytes:

xx = 00h - (5Dh + cc + aa) → for message without a databyte

xx = 00h - (5Dh + cc + aa + dd) → for message with one databyte

xx = 00h - (5Dh + cc + aa + dd1 + dd2 + dd3 + dd4) → for message with four databytes

By other words, seven-bit sum of bytes from "Model ID" to "Checksum" must be equal to zero. The SysEx message is invalid and it is ignored by the device if this condition isn't satisfied.

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.

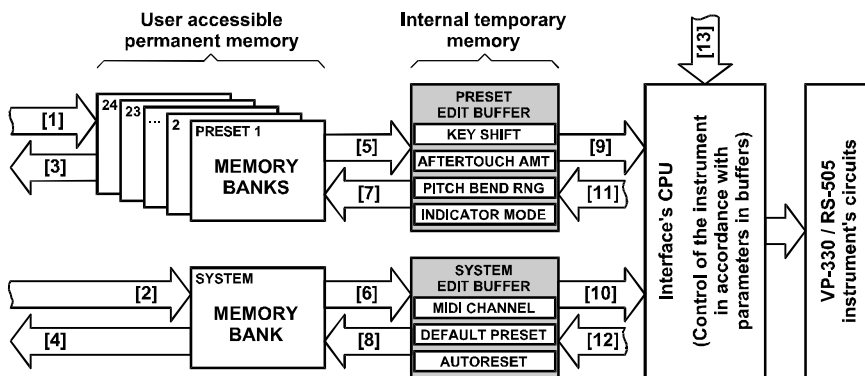
"cc"=20h - **Bulk Dump Data Save / Load** - response to the "Bulk Dump Data Request" or the change of a content of user memory bank in the internal interface's memory.

"cc"=30h - **Global Functions** – the launching of a global 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.

If any other value is received, the message is evaluated as invalid and it is ignored by the interface.

Pic. 2 – Memory area



3.1. "BULK DUMP DATA REQUEST" COMMAND

Form : **F0 00 20 21 ii 5D 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 user 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 "aa" address 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 ([3] and [4] on pic. 1). All data of parameters of requested memory bank are included in that message (see below).

3.2. "BULK DUMP DATA SAVE / LOAD" COMMAND

Form : **F0 00 20 21 ii 5D 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 the interface, 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 interface as reply to the "Bulk Dump Data Request" message (see above).

If the address "aa" is from 00h to 17h, the content of a preset memory bank (i.e. values of an one preset parameters) is included in the message ([1] on pic. 1). 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 (i.e. values of the system parameters, [2] on pic. 1). 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 always 4 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 4 bytes with this meaning:

- 1st byte: **MIDI CHANNEL** parameter value, valid range is from 00h to 0Fh
- 2nd byte: **DEFAULT PRESET** parameter value, valid range is from 00h to 17h
- 3rd byte: **AUTORESET** parameter value, valid range is from 00h to 01h
- 4th byte: the reserve, the value of this byte is not significant

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

If any of databytes has invalid value (out of acceptable range), whole message is evaluated as invalid and it is ignored by the interface.

Remark: The new values are stored in system memory bank but **the interface still works with values stored in edit buffer**. The new values of parameters will be transferred to system edit buffer ([6] on pic. 1) and the interface will work in accordance of them till **after reset** of the interface!

3.2.2. DATA FOR PRESET PARAMETERS

The datablock "dd...dd" of the preset parameters always contains 4 bytes with this meaning:

- 1st byte: **KEY SHIFT** parameter, valid range is from 00h to 4Fh
- 2nd byte: **CHNL AFTERTOUCH AMOUNT** parameter, valid range is from 00h to 7Fh
- 3rd byte: **PITCH BEND RANGE** parameter, valid range is from 00h to 7Fh
- 4th byte: **INDICATOR MODE**, valid range is from 00h to 02h

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

If any of databytes has invalid value (out of acceptable range), whole message is evaluated as invalid and it is ignored by the interface.

Remark: The new values are stored in system memory bank but the interface still works with values stored in edit buffer. The new values of parameters will be transferred to preset edit buffer ([5] on pic. 1) and **the interface will work in accordance of them till after a change of preset** occurs or **after reset** of the interface!

3.3. "GLOBAL FUNCTION" COMMANDS

Form: **F0 00 20 21 ii 5D 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 global function. The type of function is given by the address "aa":

"aa" = 00h → MIDI Channel Temporary Change / Request

"aa" = 01h → Autoreset Temporary Change / Request

"aa" = 02h → Preset Number Change / Request

"aa" = 03h → Store Edit Buffer

"aa" = 04h → Reset

"aa" = 05h → Memory test

"aa" = 06h → SW Version Request

The datablock "dd" always contains the only one databyte which specifies an activity of a global function exactly.



3.3.1. MIDI CHANNEL TEMPORARY CHANGE / REQUEST

Form : **F0 00 20 21 ii 5D 30 00 dd xx F7 [hex]**

(where "ii" = Device ID, "dd" = databyte, "xx" = checksum)

If the address "aa" is equal to 00h, the SysEx Msg is the command for temporary change of receiving MIDI channel (i.e. MIDI Channel system parameter value in edit buffer) or it is inquiry for the number of actual MIDI channel (i.e. MIDI Channel system parameter value in edit buffer). The value of databyte "dd" can be from 00h to 7Fh.

If the value of databyte "dd" is from 00h to 0Fh, the actual receiving MIDI channel is changed immediately after the command receiving ([12] on pic. 2). The databyte "dd" specifies the number of newly selected channel (from 1 to 16). Note that the change is **temporary only** - till next change or till the interface reset.

If the value of databyte "dd" is from 10h to 7Fh, the message is inquiry for the number of actual receiving MIDI channel. In this case, the actual MIDI channel is not changed and the interface only transmits info about an actual channel number to the MIDI output. The form of transmitted SysEx message is:

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

where "ii" is the Device ID, databyte "dd" is the number from 00h to 0Fh which defines the number of actual channel (from 1 to 16) and "xx" is the checksum.

3.3.2. AUTORESET TEMPORARY CHANGE / REQUEST

Form : **F0 00 20 21 ii 5D 30 01 dd xx F7 [hex]**

(where "ii" = Device ID, "dd" = databyte, "xx" = checksum)

If the address "aa" is equal to 01h, the SysEx Msg is the command for temporary change of Autoreset function (i.e. Autoreset system parameter value in edit buffer) or it is inquiry for the number of actual status of the Autoreset function (i.e. Autoreset system parameter value in edit buffer). The value of databyte "dd" can be from 00h to 7Fh.

If the value of databyte "dd" is from 00h to 01h, the actual status of Autoreset function is changed immediately after the command receiving ([12] on pic. 2). The databyte "dd" specifies the newly selected status (00h for Off, 01h for On). Note that the change is **temporary only** - till next change or till the interface reset.

If the value of databyte "dd" is from 02h to 7Fh, the message is inquiry for actual status of the Autoreset function. In this case, the actual status of Autoreset function is not changed and the interface only transmits info about an actual status to the MIDI output. The form of transmitted SysEx message is:

F0 00 20 21 ii 5D 30 01 dd xx F7 [hex],

where "ii" is the Device ID, databyte "dd" is the number from 00h to 01h which defines the actual status (00h for Off, 01h for On) and "xx" is the checksum.

3.3.3. PRESET NUMBER CHANGE / REQUEST

Form : **F0 00 20 21 ii 5D 30 02 dd xx F7 [hex]**

(where "ii" = Device ID, "dd" = databyte, "xx" = checksum)

If the address "aa" is equal to 02h, the SysEx Msg is the command for the change of actual preset number or it is inquiry for the number of just 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 immediately after the command receiving ([5] on pic. 2). The databyte "dd" specifies the number of newly selected



preset (from 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 just 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 5D 30 02 dd xx F7 [hex],

where "ii" is the Device ID, databyte "dd" is the number from 00h to 17h which defines the number of just actual preset (from 1 to 24) and "xx" is the checksum.

3.3.4. STORE EDIT BUFFER

Form : **F0 00 20 21 ii 5D 30 03 dd xx F7 [hex]**

(where "ii" = Device ID, "dd" = databyte, "xx" = checksum)

If the address "aa" is equal to 03h, the SysEx Msg is the command for the saving of a data (actual values of parameters) from an edit buffer to a memory bank in the user memory. The value of databyte "dd" can be from 00h to 18h.

If the value of databyte "dd" is from 00h to 17h, data from preset edit buffer will be stored into preset memory bank which is specified with the "dd" databyte - 00h for bank Nr. 1, 01h for bank Nr. 2 etc. up to 17h for bank Nr. 24 ([7] on pic. 2).

If the value of databyte "dd" is 18h, data from system edit buffer will be stored into system memory bank ([8] on pic. 2).

For "dd" value from 19h to 7Fh, the message is evaluated as invalid and it is ignored by the interface.

3.3.5. RESET OF INTERFACE

Form : **F0 00 20 21 ii 5D 30 04 dd xx F7 [hex]**

(where "ii" = Device ID, "dd" = databyte, "xx" = checksum)

If the address "aa" is equal to 04h, the SysEx Msg is the command for execution of reset of the interface ([13] on pic. 1). The value of databyte "dd" can be only 00h or 7Fh. For all other values (from 01h to 7Eh), 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".

3.3.6. MEMORY TEST

Form : **F0 00 20 21 ii 5D 30 05 dd xx F7 [hex]**

(where "ii" = Device ID, "dd" = databyte, "xx" = checksum)

If the address "aa" is equal to 05h, the SysEx Msg is inquiry for internal memory test execution ([13] on pic. 2). The value of databyte "dd" can be only 00h. For all other values (from 01h to 7Fh), the message is evaluated as invalid and it is ignored by the interface.

Immediately after the inquiry receiving, the interface launches test of its own internal memory. After the test is processed, the interface transmits the SysEx message:

F0 00 20 21 ii 5B 30 05 dd dd xx F7 [hex],



where "ii" is the Device ID, the databytes "dd dd" are result of the test and "xx" is the checksum.

If the two databytes "dd dd" are equal to 00h 7Fh, no malfunction of the memory was detected – the memory is fully functional thus.

If an error occurs during the test, the "dd...dd" databytes specify type of error (first byte – different from zero) and address of the memory area where the error was detected (second byte – 00h to 7Fh). Possible types of the errors defined by first byte are:

- 01h → The memory was not detected at all
- 02h → Timeout of "Busy" interval of the memory
- 04h → Failed cell detected

3.3.7. LISTING OF INSTALLED SOFTWARE VERSION NUMBER

Form : **F0 00 20 21 ii 5D 30 06 dd xx F7 [hex]**

(where "ii" = Device ID, "dd" = databyte, "xx" = checksum)

If the address "aa" is equal to 06h, the SysEx Msg is inquiry for the number of version of installed operational system ([13] on pic. 2). The value of databyte "dd" can be only 00h. For all other values (from 01h to 7Fh), 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 06 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. Using of these functions in normal device operation is not assumed. Launching of testing functions without interconnection of the interface with special measuring set has no signification.

4. EXAMPLES OF SYSEX MESSAGE CREATION

Task 1:

Set the system parameters in the system memory bank of the interface to these values:

- MIDI CHANNEL : 0Fh (i.e. channel Nr. 16)
- DEFAULT PROGRAM NR. : 02h (i.e. pgm Nr. 3)
- AUTORESET : 00h (i.e. disabled)

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 : **5Dh**
Command : **20h**
Address : **18h**

- First three bytes of the datablock are given by the task. It is necessary to fill-in the datablock to requested length (four databytes) with 00h byte for example

Data : **0Fh 02h 00h 00h**

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

$$00h - (5Dh + 20h + 18h + 0Fh + 02h + 00h + 00h) = 5Ah$$

- The form of the whole required System Exclusive message is after the checksum and End SysEx byte refilling:

F0h 00h 20h 21h 7Fh 5Dh 20h 18h 0Fh 02h 00h 00h 5Ah 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 of the interface.

Task 2:

Set the preset parameters in the preset memory bank Nr. 24 of the interface to these values:

- KEY SHIFT : 24h (i.e. shift 36)
- CHNL AFTERTOUCH AMOUNT : 7Fh (i.e. maximum)
- PITCH BEND RANGE : 00h (i.e. none)
- INDICATOR MODE : 02h (i.e. MIDI event)

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 preset memory bank Nr. 24, the address byte will be **17h**

Start of SysEx Msg will be then :

Start SysEx : **F0h**
Mfr ID : **00h 20h 21h**
Device ID : **7Fh**
Model ID : **5Dh**
Command : **20h**
Address : **17h**

- All four bytes of the datablock are given by the task:

Data : **24h 7Fh 00h 02h**

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

$$00h - (5Dh + 20h + 17h + 24h + 7Fh + 00h + 02h) = 47h$$



- The form of the whole required System Exclusive message is after the checksum and End SysEx byte refilling:

F0h 00h 20h 21h 7Fh 5Dh 20h 17h 24h 7Fh 00h 02h 47h 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 of the interface.

Task 3:

Change the actual receiving MIDI channel to channel Nr. 16 temporarily.

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 "System Functions", the command byte will be 30h
- Required function is "MIDI Channel Temporary Change / Request", the address byte will be 00h

Start of SysEx Msg will be then :

Start SysEx : **F0h**
 Mfr ID : **00h 20h 21h**
 Device ID : **7Fh**
 Model ID : **5Dh**
 Command : **30h**
 Address : **00h**

- Requested channel is 16 so the only one databyte of the function is 0Fh
- Now, the checksum must be calculated as 7-bit complement of the sum of bytes from 'Model ID' to 'Data', i.e.:

$$00h - (5Dh + 30h + 00h + 0Fh) = 5Ah$$

- The form of the whole required System Exclusive message is after the checksum and End SysEx byte refilling:

F0h 00h 20h 21h 7Fh 5Dh 30h 00h 0Fh xxh F7h

After that message is received, the interface will receive data on MIDI channel Nr. 16. New MIDI channel is valid temporarily only – just to reset of the interface.

For the calculation of the checksum, a special software Checksum Calculator can be used (see pic. 3). The calculator is based on Java script so it can be launched in any internet browser under any operational system. The calculator is available on the supplemental CD-ROM or on manufacturer's web-pages.

Pic. 3 – ChSum Calculator

