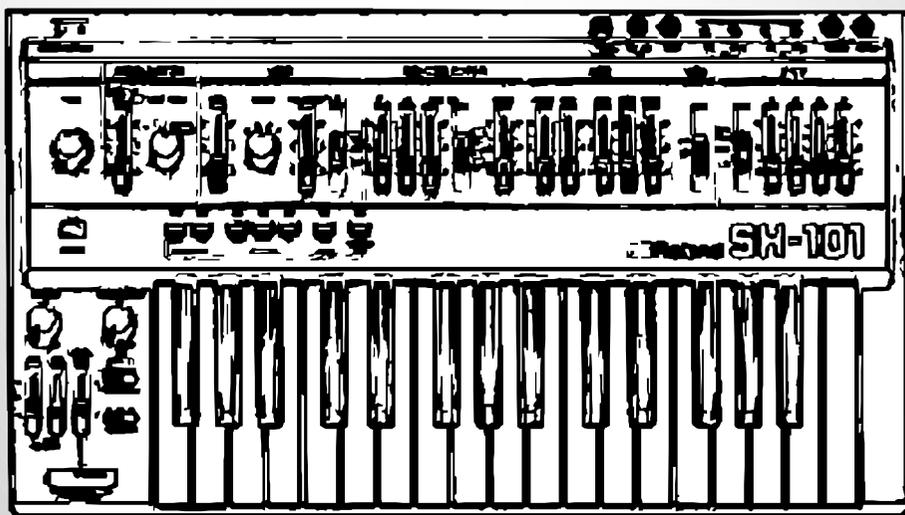


SH 101-M

MIDI Interface

for Roland SH-101

Model 8-438
ver. 1.0



OWNER'S MANUAL
Rev. 2





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1 DEVICE DESCRIPTION

SH101-M is a MIDI retrofit for Roland SH-101 synthesizer. The device enables the instrument to be controlled via MIDI as a MIDI expander via Standard Channel and Common System MIDI commands or System Exclusive messages.

The interface works in one direction only – it receives MIDI data and converts them to analogue signals for the SH-101's **VCO**, **VCF**, **VCA**, **envelope generator** and **bender** control and it also synchronizes the instrument's **arpeggiator** and **sequencer** speed with several sources of clock. The own SH-101's control elements (keyboard, switches, sliders, etc.) **are not transmitted** as a MIDI data and their status cannot be saved in the interface as a patch.

All interface's functions are driven via parameters adjusted by user. Standard CCs or System Exclusive messages are used for setting of the parameters values. The interface has own internal memory banks for saving of user setting of own interface's parameters.

1.1 INTERFACE FUNCTIONS

Functional block diagram (see pic. 1) shows the connection of the interface to the original circuits of the instrument.

When the interface controls the keyboard of the instrument, the instrument's keyboard (CV and GATE generators) is disconnected and the software generators of the interface are used **[1 and 2]**. External CV and GATE outputs and inputs remain fully functional as on non-retrofitted instrument and can be still used.

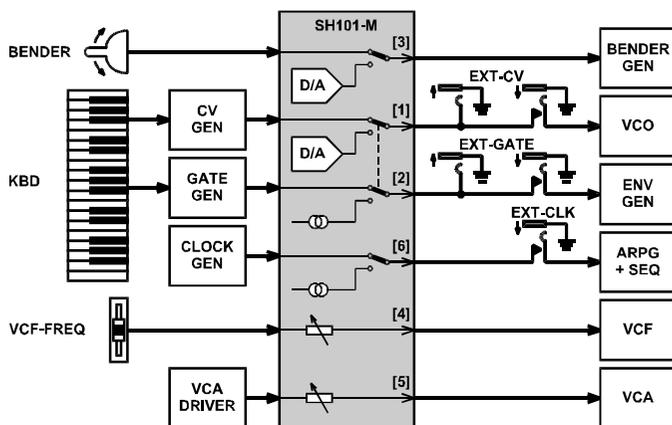
BENDER lever controller on the instrument's panel can be disconnected and replaced by the interface DAC **[3]**.

A voltage regulator is inserted between VCF-FREQ potentiometer of the instrument and VCF control circuits to control VCF frequency **[4]**.

Another voltage regulator is inserted between VCA driving and the VCA to control the VCA output level **[5]**.

Internal instrument's clock generator can be replaced with the software generator of the interface **[6]**. Input for external clock (EXT-CLK-IN) remains fully functional as on non-retrofitted instrument and can be still used.

Pic. 1 – Functional block diagram



2 CONNECTION TO MIDI SYSTEM

The interface has connectors for both MIDI input and output. Standard MIDI cables with DIN 41524 connectors (5 pins / 180°) are used to connect other MIDI devices.

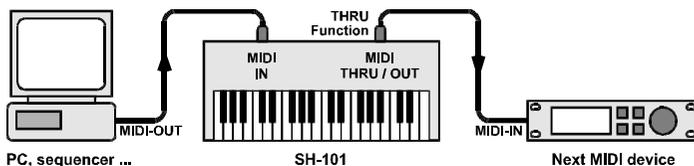
2.1 STANDARD WORKING MODE SET-UP

Data from host MIDI system (PC, DAW, sequencer, master keyboard, etc.) are coming to MIDI-IN input of the interface.

All MIDI data coming to MIDI input of the interface are transferred to MIDI-THRU/OUT output of the interface **unaffected** (THRU function). The THRU function enables another MIDI device(s) to be connected without additional MIDI Thru-Box. MIDI input of the other (next in chain) MIDI device can be simply fed from MIDI-THRU/OUT output of the interface (see pic. 2).

If there are no other MIDI devices to be used, only MIDI-IN cable is necessary (from host system to MIDI-IN input of the interface).

Pic. 2 – Connection to MIDI system for standard working mode

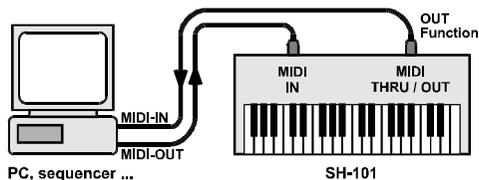


2.2 MEMORY BACK-UP SET-UP

The interface can transmit its own System Exclusive data. These messages are used for back-up / recovery of the internal memory settings.

To back-up the memory of the interface, connect interface's THRU/OUT MIDI output to MIDI input of the host system (PC, SAW, sequencer...)¹ (see pic. 3).

Pic. 3 – Connection to MIDI system for memory content transfer



¹ **Attention!** Disable the MIDI ECHO, THRU functions of your sequencer in this case to prevent communication loops that might "freeze" your MIDI system (see chapter xxx)!

3 INTERFACE OPERATION

The interface has a single manual control element – Reset button – which turns the interface to stand-by status. All other functions are controlled by MIDI commands. Working status of the interface is indicated by bi-color (red / green) LED.

3.1 INITIALIZATION SEQUENCE

When the SH-101 is switched on, the reset sequence of the interface is executed automatically. During this sequence, the system parameters are recalled from the system memory bank to the system working buffer ([3] on pic. 4) and default values of preset parameters are stored in the edit buffer (see table 2). The interface is now switched in the initial stand-by mode and it does not affect the SH-101. The instrument can be used usual way like no MIDI interface has been installed. The interface is now monitoring the incoming MIDI data. Accordingly to the type of MIDI data received the interface is activated (see chapter 3.2 for Operation modes details).

3.2 INSTRUMENT CONTROL

After the reset of the interface (see above), all control elements of the instrument, including its keyboard work normally. Interface's indication LED doesn't light and MIDI data are transferred from MIDI input to MIDI-THRU/OUT output of the interface. The interface is prepared for receiving of an acceptable MIDI command described in chapter 0. There are two basic operation modes available:

In **“Normal”** mode (set by default after the interface reset), instrument's keyboard works normally and Arpeggio, Sequencer, Hold (both the panel switch and external hold pedal input) and Key Transpose functions are fully functional. Also all other control switches and sliders on SH-101 panel remain unaffected.

When the interface is turned to **“Keyboard”** mode (CC #122 - Local Off/On – see chapter 5.1.2.2) or any incoming MIDI Note-On command is received (see chapter 5.1.1), SH-101 keyboard is disconnected and VCO / ENV circuits are controlled by Note-On/Off MIDI commands and various MIDI CCs (see table 2 for full list). Arpeggio, Sequencer, Hold (both panel switch and external hold pedal input) and Key Transpose functions are not available in the **“Keyboard”** mode. All other control switches and sliders on SH-101 panel remain fully functional.

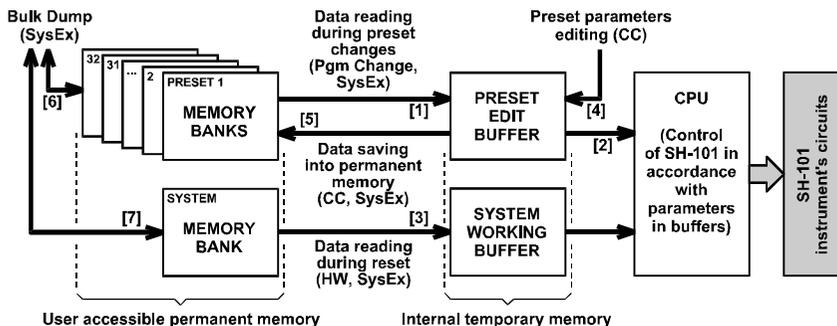
To return back to **“Normal”** mode (to control the instrument from its own keyboard again), use CC #122 (Local Off/On – see chapter 5.1.2.2) or press interface's Reset button mounted on panel or just switch the instrument off/on.

3.3 INDICATION OF WORKING STATUS

The actual interface status is indicated by the bi-color LED .

- The LED is off in **“Normal”** operation mode of the interface.
- After the interface is switched to **“Keyboard”** mode, the indication LED lights red continuously.
- If the LED indication function of the interface is enabled (for details see chapter 4.2.14), selected function is indicated by green light or blinking of the indication LED in **“Normal”** mode or yellow in **“Keyboard”** operation mode.
- If an error occurs, the indication LED starts to blink (for details see chapter 8.3).

4 PARAMETERS

Pic. 4 – Structure of the interface internal memory


The parameters are divided in two basic groups – global system parameters and preset parameters – see pic. 4. All parameters are stored in internal memory banks of the interface. There is one memory bank for system parameters and 32 memory banks for preset parameters available. Content of all memory banks can be backed-up / restored by Bulk Dump SysEx Messages [6] and [7] (for details see description of System Exclusive communication).

Content of the system memory bank is always loaded to system working buffer (controlling the interface CPU) during interface's reset [3].

The preset can be selected by MIDI Program Change or by SysEx command (for details see description of System Exclusive communication). Content of the preset memory bank is then loaded to preset edit buffer [1] controlling the interface's CPU [2].

Preset parameters in edit buffer can be changed by MIDI CCs [4] anytime during the device operation. All such changed settings can be saved in any of the preset memory banks [5] by MIDI SysEx command (for details see description of System Exclusive communication) or by CC #119 (for details see chapter 5.1.2.2).

4.1 GLOBAL SYSTEM PARAMETERS

The system parameters control the basic functions of the interface. System parameters are always valid, independently on the actual selected preset.

Table 1 – Range of valid values and default values of system parameters

| Parameter name | Valid values | | Factory Reset values | | |
|------------------|--------------|---------|----------------------|-------|---------------|
| | [dec] | [hex] | [dec] | [hex] | Meaning |
| MIDI Channel | 0 ~ 15 | 00 ~ 0F | 0 | 00 | Channel Nr. 1 |
| Auto Local | 0 ~ 1 | 00 ~ 01 | 1 | 01 | On |
| Start Sync | 0 ~ 1 | 00 ~ 01 | 1 | 01 | On |
| Auto Reset | 0 ~ 1 | 00 ~ 01 | 1 | 01 | On |
| Mod Threshold | 0 ~ 127 | 00 ~ 7F | 64 | 40 | Middle pos. |
| Clk Pulse Length | 0 ~ 120 | 00 ~ 78 | 35 | 23 | 8 ms |



System parameters can be changed by Bulk Dump SysEx Messages only (see [7] on pic. 4, for details see description of System Exclusive communication). However, **all system parameters changes takes effect after interface reset** – to do so, press Reset button or switch the instrument off and on again!

The factory preset values of system parameters are listed in the table 1.

4.1.1 MIDI CHANNEL

The parameter selects the communication MIDI channel of the interface. It is possible to choose any of the 16 MIDI channels.

Valid parameter values are 0 ~ 15. Value 0 represents MIDI channel Nr.1, value 1 selects Nr. 2 etc. up to value 15 which selects MIDI channel Nr. 16.

4.1.2 AUTO LOCAL

The parameter enables automatic switching of the interface to the “Keyboard” mode after the first valid Note-On MIDI command is received (the MIDI Note must be sent on actual MIDI channel and its number must be in valid range). If the parameter it is set to “Off”, the automatic activation of the “Keyboard” mode after first received MIDI note is disabled.

Valid parameter values are 0 ~ 1. Value 0 is “Off”, value 1 is “On”.

4.1.3 START SYNC

This parameter works only if CTRL - Clock Mode parameter is set to “Fixed” or “MIDI” (see chapter 4.2.12). The parameter enables synchronization of clock pulses generated by the interface with Start and Continue MIDI commands. If the parameter is set to “On”, a clock pulse is generated immediately and new period of clock pulses starts each time the Start or Continue MIDI command is received. If the parameter is set to “Off”, the Start and Continue MIDI commands are ignored.

Valid parameter values are 0 ~ 1. Value 0 is “Off”, value 1 is “On”.

4.1.4 AUTO RESET

The parameter enables automatic reset of the interface if a MIDI communication problem occurs. If the parameter is set to “On” and a fatal error in the MIDI communication occurs, the interface stops operating and returns to basic stand-by mode automatically. If the parameter is set to “Off”, standard error procedures will be executed (see chapter 8.3).

Valid parameter values are 0 ~ 1. Value 0 is “Off”, value 1 is “On”.

4.1.5 MOD THRESHOLD

The SH-101 synthesizer Bender lever works as an On/Off switch for LFO MOD function (“forward move” of the Bender lever). This function can be controlled by the MIDI CC #1 (Modulation Wheel). Since the MIDI CC #1 uses continuous range of values 0 to 127, it is necessary to set the threshold value from which the CC #1 will be considered as being “On”.

Valid parameter values are 0 ~ 127. Value 0 disables the MIDI CC #1 totally. Values 1 to 127 set the “On” threshold level of the CC #1 directly to the selected value. It is recommended to set the parameter value to 64 (the LFO MOD is activated in the middle position of the modulation wheel of the MIDI master keyboard – it is also factory pre-defined value).

4.1.6 CLK PULSE LENGTH

The parameter defines duration of clock pulses generated by the interface. The duration is defined by the following formula:

$$\text{Pulse duration} = 0,2 * (\text{parametr value} + 5) [\text{ms}]$$

Valid parameter values are 0 ~ 120. 0 is equal to 1 ms duration up to value 120 that is equal to 25 ms.

4.2 PRESET PARAMETERS

The preset parameters set the functions of the interface that affect the sound of SH-101 instrument. The preset parameters define the MIDI commands controlling BENDER, VCO, VCF, VCA and CLOCK circuits of the instrument.

Preset parameters values in edit buffer can be modified by MIDI CCs - it is possible to change them in a real time during playing the instrument (see [4] on pic. 4). Default values of the preset parameters retrieved in the edit buffer after the reset (stand-by status) are described in table 2 bellow. These default values are also stored in all interface preset memory banks after "Factory Reset" procedure (for details see SysEx communication manual).

Table 2 – Range of valid values and a default values of preset parameters

| Parameter name | Range of valid values | | Stand-by and Factory Reset values | | MIDI CC Nr. | |
|-------------------------|-----------------------|---------|-----------------------------------|-------|-------------|-------|
| | [dec] | [hex] | [dec] | [hex] | [dec] | [hex] |
| VCO - Key Shift | 0 ~ 67 | 00 ~ 4F | 36 | 24 | 40 | 28 |
| VCO - Aftertouch Bend | 0 ~ 127 | 00 ~ 7F | 64 | 40 | 41 | 29 |
| VCF – Frequency | 0 ~ 127 | 00 ~ 03 | 127 | 7F | 42 | 2A |
| VCF - Key Follow | 0 ~ 127 | 00 ~ 03 | 64 | 40 | 43 | 2B |
| VCF - Velocity Amount | 0 ~ 127 | 00 ~ 7F | 0 | 00 | 44 | 2C |
| VCF - Aftertouch Amount | 0 ~ 127 | 00 ~ 7F | 0 | 00 | 45 | 2D |
| VCA - Key Follow | 0 ~ 127 | 00 ~ 7F | 64 | 40 | 46 | 2E |
| VCA - Velocity Amount | 0 ~ 127 | 00 ~ 02 | 0 | 00 | 47 | 2F |
| VCA - Aftertouch Amount | 0 ~ 127 | 00 ~ 7F | 0 | 00 | 48 | 30 |
| CTRL - Volume Mode | 0 ~ 3 | 00 ~ 7F | 0 | 00 | 49 | 31 |
| CTRL - Bender Mode | 0 ~ 1 | 00 ~ 7F | 0 | 00 | 50 | 32 |
| CTRL - Clock Mode | 0 ~ 3 | 00 ~ 7F | 0 | 00 | 51 | 33 |
| CTRL - Clock Rate | 0 ~ 127 | 00 ~ 7F | 122 | 7A | 52 | 34 |
| CTRL - Indicator Mode | 0 ~ 3 | 00 ~ 7F | 0 | 00 | 53 | 35 |

Any parameter settings modifications are stored in the edit buffer only and remain valid until the instrument is switched off or the interface reset by Reset button or a change of the actual preset number.

To keep the edited parameter values in the memory permanently, it is necessary to save them into a preset memory bank. There are 32 memory locations for user settings available. MIDI CC #119 (see chapter 5.1.2.2) or MIDI System Exclusive command are used to save the edited parameters (see [5] on pic. 4).

Memory backup / restore function for any of the 32 memory banks is also supported (see [6] on pic. 4).

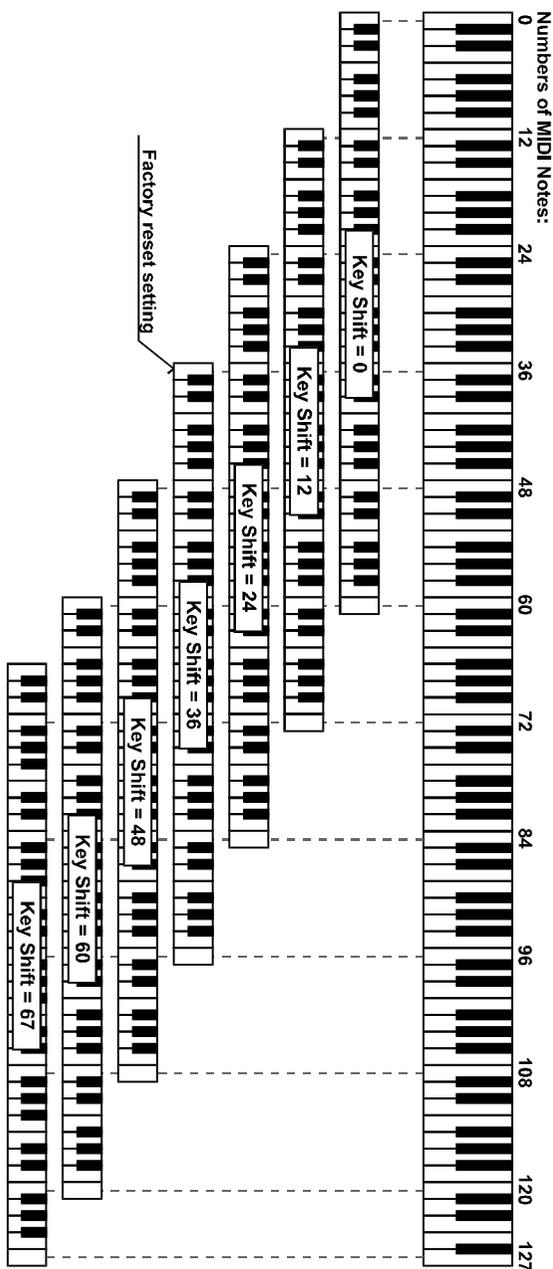
Pic. 5 – “VCO - Key Shift” parameter

4.2.1 VCO - KEY SHIFT (CC #40)

SH101-M interface accepts 61 MIDI notes i.e. five octaves keyboard range. The acceptable range can be shifted / transposed by VCO - Key Shift parameter in whole range of MIDI notes. Each value corresponds to one semitone. Valid range of the parameter is from 0 to 67 (equal to 0 to +67 semitones).

This parameter is active only in the “Keyboard” working mode of the interface. The parameter value can be controlled by MIDI CC Nr. 40 - see chapter 5.1.2.2.

If no shift is chosen (i.e. parameter value is equal to 0), lowest key of virtual keyboard corresponds to MIDI note Nr. 0 and highest key corresponds to MIDI note Nr. 60. If shift is +1 semitone (parameter value is equal to 1), lowest key corresponds to MIDI note Nr. 1 and highest key corresponds to MIDI note Nr. 61, etc. up to shift is +67 semitones (parameter value is equal to 67). In the other words, value of the parameter is equal to number of the lowest acceptable MIDI note (see pic. 5).

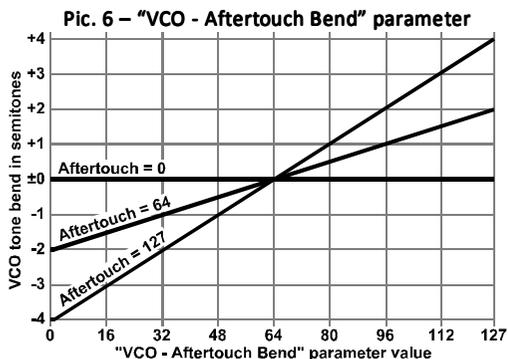


4.2.2 VCO - AFTERTOUCH BEND (CC #41)

Frequency of the VCO can be shifted (“bended”) by MIDI Channel Afterouch. The parameter sets the level of Channel Afterouch command to affect the VCO frequency. Maximal VCO frequency shift is ± 4 semitones.

This parameter is active only in the “Keyboard” working mode of the interface. The parameter value can be controlled by MIDI CC Nr. 41 – see chapter 5.1.2.2.

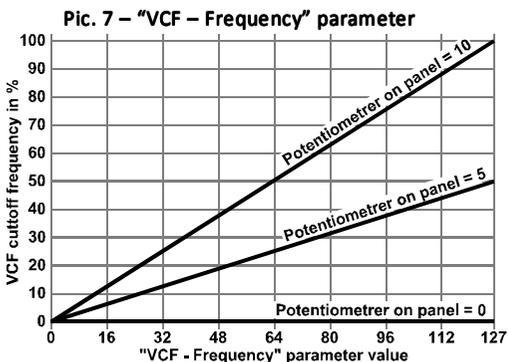
The parameter value can be set in range of 0 to 127. If the value is equal to 64, MIDI command Channel Aftertouch doesn’t affect instrument’s VCO frequency at all. For parameter values from 65 to 127, VCO frequency is increased directly proportionally to the value of the Channel Aftertouch command (frequency is increased by +4 semitones for maximum Channel Aftertouch value = 127). For parameter values from 63 to 0, VCO frequency is decreased directly proportionally to value of Channel Aftertouch command (frequency is decreased by -4 semitones for maximum Channel Aftertouch = 127) - see pic. 6.



4.2.3 VCF - FREQUENCY CONTROL (CC #42)

The parameter enables to decrease the basic cutoff frequency of the VCF (set by the VCF - FREQ slider on the instrument’s panel). Value of the parameter can be set in range of 0 to 127. If the parameter value is equal to 127, the basic frequency of VCF set by the VCF FREQ slider isn’t affected. When the parameter value is decreased, basic cut-off frequency of the VCF is decreased accordingly, up to the parameter value is equal to 0 when VCF is closed fully (see pic. 7).

The parameter value can be controlled by MIDI CC Nr. 42 – see chapter 5.1.2.2.



Remark: Since the interface cannot increase the frequency of the VCF (“move the VCF - FREQ slider upwards”) on the instrument’s panel, it is recommended to set the slider to maximum position (10) while the interface is active. This setting enables full VCF cut-off modulation range by MIDI commands.

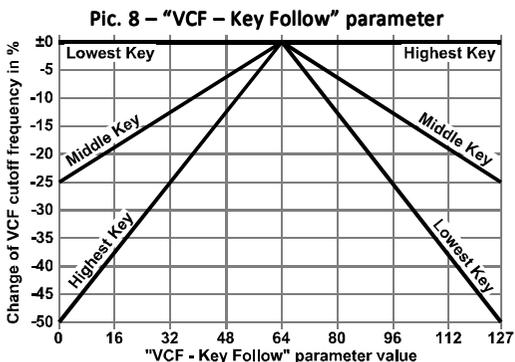
4.2.4 VCF - KEY FOLLOW (CC #43)

The parameter sets the level of VCF cut-off frequency modulation by the position of the played key on the master keyboard (i.e. tone height).

This parameter is active only in the “Keyboard” working mode of the interface. The parameter value can be controlled by MIDI CC Nr. 43 – see chapter 5.1.2.2.

The parameter value can be set in the range of 0 to 127. If the value is equal to 64, VCF isn’t affected by key position. For the parameter values from 65 to 127, VCF cut-off frequency is increased directly proportionally to MIDI note number. For parameter values from 63 to 0, VCF cut-off frequency is decreased directly proportionally to MIDI note number (see pic. 8).

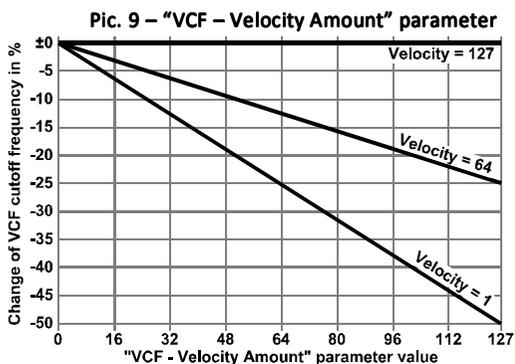
Remark: It is recommended to set the VCF - KYBD slider on the instrument’s panel to its minimum position (0) while the interface is active so that “key follow” function is not doubled.



4.2.5 VCF - VELOCITY AMOUNT (CC #44)

The parameter sets the key velocity modulation amount of the VCF cut-off frequency. Cut-off frequency of the VCF can be increased directly proportional to the MIDI velocity value. Value of the parameter can be set in the range of 0 to 127. For the value equal to 0, VCF isn’t affected by the velocity data, parameter value equal to 127 provides maximal modulation level (see pic. 9).

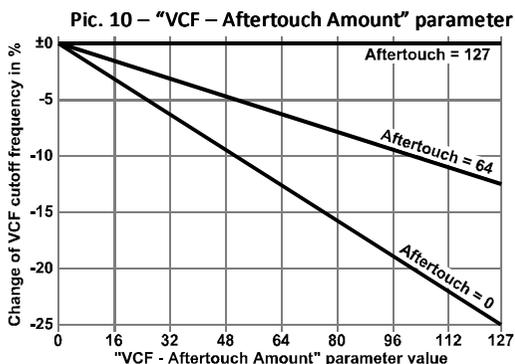
This parameter is active only in the “Keyboard” working mode of the interface. The parameter value can be controlled by MIDI CC Nr. 44 – see chapter 5.1.2.2.



4.2.6 VCF - AFTERTOUCH AMOUNT (CC #45)

The parameter sets the modulation amount of the VCF cut-off frequency by the Channel Aftertouch MIDI command (key pressure). Cut-off frequency of VCF can be increased directly proportional to the value of Channel Aftertouch. Value of the parameter can be set in the range of 0 to 127. For the value equal to 0, VCF isn’t affected by Channel Aftertouch, for parameter value equal to 127 provides maximal modulation level (see pic. 10).

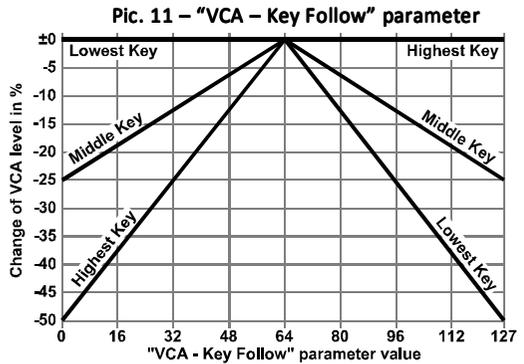
This parameter is active only in the “Keyboard” working mode of the interface. The parameter value can be controlled by MIDI CC Nr. 45 – see chapter 5.1.2.2.



4.2.7 VCA - KEY FOLLOW (CC #46)

The parameter sets the modulation amount of the VCA by the position of the played key on the master keyboard (i.e. tone height). Value of the parameter can be from 0 to 127. If the value is equal to 64, VCA isn't affected by key position. For the parameter values from 65 to 127, VCA level is increased directly proportionally to MIDI note number. For parameter values from 63 to 0, VCA level is decreased directly proportionally to MIDI note number (see pic. 11).

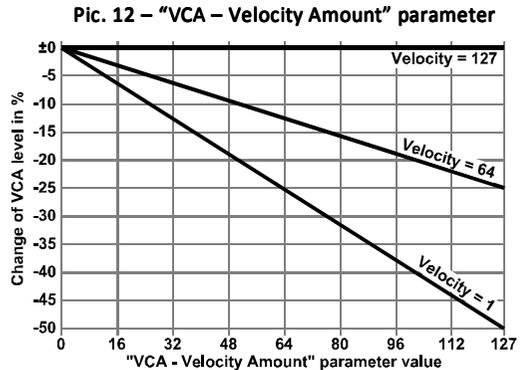
This parameter is active only in the "Keyboard" working mode of the interface. The parameter value can be controlled by MIDI CC Nr. 45 – see chapter 5.1.2.2.



4.2.8 VCA - VELOCITY AMOUNT (CC #47)

The parameter sets the key velocity modulation amount of the VCA level (volume). The level of the VCA can be increased directly proportional to the MIDI velocity value. Value of the parameter can be set in the range of 0 to 127. For the value equal to 0, VCA isn't affected by the velocity data, parameter value equal to 127 provides maximal modulation level (see pic. 12).

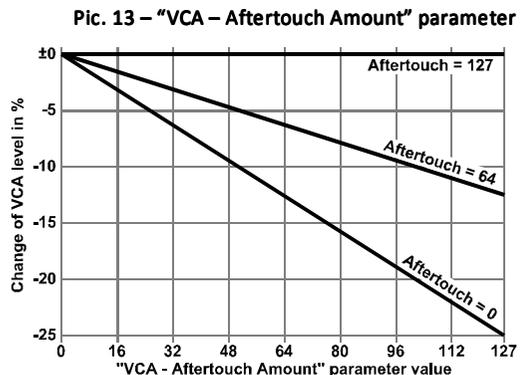
This parameter is active only in the "Keyboard" working mode of the interface. The parameter value can be controlled by MIDI CC Nr. 47 – see chapter 5.1.2.2.



4.2.9 VCA - AFTERTOUCH AMOUNT (CC #48)

The parameter sets the modulation amount of the VCA gain level by the Channel Aftertouch command (key pressure). Gain level of the VCA can be increased directly proportional to the value of Channel Aftertouch. Value of the parameter can be set in the range of 0 to 127. For the value equal to 0, VCA isn't affected by Channel Aftertouch, for parameter value equal to 127 provides maximal modulation level (see pic. 13).

This parameter is active only in the "Keyboard" working mode of the interface. The parameter value can be controlled by MIDI CC Nr. 48 – see chapter 5.1.2.2.



4.2.10 CONTROL - VOLUME MODE (CC #49)

The parameter sets the way of instrument's global loudness control by standard MIDI controllers "Volume" (CC #7) and „Expression" (CC #11). One of four modes can be selected: **"Off"** (parameter value 0), **"Volume "** (parameter value 1), **"Expression"** (parameter value 2) and **"Volume + Expression"** (parameter value 3). In all cases above, manual VOLUME knob on the instrument's panel is fully functional.

"Off" mode

Global loudness control by MIDI controllers "Volume" (CC #7) and "Expression" (CC #11) is disabled. Both controllers are ignored.

"Volume" mode

Only MIDI "Volume" controller (CC #7) is used for control of the global loudness. "Expression" controller (CC #11) is ignored.

"Expression" mode

Only MIDI "Expression" controller (CC #11) is used for control of the global loudness. "Volume" controller (CC #7) is ignored.

"Volume + Expression" mode

Both MIDI controllers "Volume" (CC #7) and „Expression" (CC #11) are used for control of global loudness of the instrument.

The parameter value can be controlled by MIDI CC Nr. 49 – see chapter 5.1.2.2.

4.2.11 CONTROL - BENDER MODE (CC #50)

The parameter enables to choose the way for control of instrument's Bender left and right action (the VCO and VCF depth sliders functionality remains unchanged as well as forward move of the BENDER lever). Two modes are available: **„Normal"** (parameter value 0) or **„MIDI"** (parameter value 1).

"Normal" mode

Manual BENDER controller (lever) on instrument's panel works as normally and MIDI Pitch Bend (Pitch Wheel) command is ignored.

"MIDI" mode

Manual BENDER controller (lever) on instrument's panel is disconnected and MIDI Pitch Bend command (Pitch Wheel) is used instead of the SH-101 BENDER lever.

The parameter value can be controlled by MIDI CC Nr. 50 – see chapter 5.1.2.2.

4.2.12 CONTROL - CLOCK MODE (CC #51)

The parameter selects the source of synchronization clock pulses for arpeggiator and sequencer. Four modes are available: **"Normal"** (parameter value 0), **"Fix"** (parameter value 1), **"MIDI"** (parameter value 2) and **"CC"** (parameter value 3).

"Normal" mode

The arpeggiator and the sequencer are controlled by SH-101 internal tempo generator. "Control - Clock Rate" parameter (see chapter 4.2.13) is ignored.

"Fixed" mode

The arpeggiator and the sequencer are controlled by interface clock generator. The tempo is set by "Control - Clock Rate" parameter (see chapter 4.2.13).



"MIDI" mode

The rate of the synchronization clock pulses for the arpeggiator and the sequencer is derived from the external MIDI Clock. MIDI Clock impulses can be divided - dividing ratio is selected by "Control - Clock Rate" parameter (see chapter 4.2.13).

"CC" mode

The arpeggiator and the sequencer are controlled directly by CC #52. Every time the CC #52 is received (any value), one clock pulse is generated.

This parameter is active only in the "Normal" working mode of the interface. The parameter value can be controlled by MIDI CC Nr. 51 – see chapter 5.1.2.2.

Remark: EXT-CLK-IN connector on the SH-101's panel is functional in all modes. It is still possible to use external clock signal if necessary.

4.2.13 CONTROL - CLOCK RATE (CC #52)

The parameter selects the rate of synchronization clock pulses for arpeggiator and sequencer if "Fixed", "MIDI" or "CC" modes are active (see CTRL – Clock Mode section above). The parameter is ignored in "Normal" mode. "CTRL – Clock Rate" parameter values are 0 to 127 for "Fixed" and "MIDI" modes. Table 3 shows conversion rates of the parameter value to clock pulses. For "CC" mode, the parameter value is insignificant.

This parameter is active only in the "Normal" working mode of the interface. The parameter value can be controlled by MIDI CC Nr. 52 – see chapter 5.1.2.2.

Table 3 – Conversion of "Control - Clock Rate" parameter value to clock pulses rate

| Param. value | Mode (param. "CNTRL - Clk Mode") | | | | Param. value | Mode (param. "CNTRL - Clk Mode") | | | |
|--------------|----------------------------------|--------------|----------------|-------------|--------------|----------------------------------|--------------|----------------|-------------|
| | FIXED | | MIDI | | | FIXED | | MIDI | |
| | Freq. [Hz] | Period [sec] | Period [ticks] | Note length | | Freq. [Hz] | Period [sec] | Period [ticks] | Note length |
| 0 | 0,50 | 2,000 | 128 | - | 20 | 1,11 | 0,902 | 108 | - |
| 1 | 0,52 | 1,908 | 127 | - | 21 | 1,15 | 0,871 | 107 | - |
| 2 | 0,55 | 1,822 | 126 | - | 22 | 1,19 | 0,842 | 106 | - |
| 3 | 0,57 | 1,742 | 125 | - | 23 | 1,23 | 0,814 | 105 | - |
| 4 | 0,60 | 1,667 | 124 | - | 24 | 1,27 | 0,788 | 104 | - |
| 5 | 0,63 | 1,597 | 123 | - | 25 | 1,31 | 0,762 | 103 | - |
| 6 | 0,65 | 1,531 | 122 | - | 26 | 1,36 | 0,738 | 102 | - |
| 7 | 0,68 | 1,468 | 121 | - | 27 | 1,40 | 0,714 | 101 | - |
| 8 | 0,71 | 1,409 | 120 | - | 28 | 1,45 | 0,691 | 100 | - |
| 9 | 0,74 | 1,354 | 119 | - | 29 | 1,49 | 0,670 | 99 | - |
| 10 | 0,77 | 1,301 | 118 | - | 30 | 1,54 | 0,649 | 98 | - |
| 11 | 0,80 | 1,252 | 117 | - | 31 | 1,59 | 0,629 | 97 | - |
| 12 | 0,83 | 1,204 | 116 | - | 32 | 1,64 | 0,610 | 96 | 1/1 |
| 13 | 0,86 | 1,160 | 115 | - | 33 | 1,69 | 0,591 | 95 | - |
| 14 | 0,90 | 1,117 | 114 | - | 34 | 1,74 | 0,573 | 94 | - |
| 15 | 0,93 | 1,077 | 113 | - | 35 | 1,80 | 0,556 | 93 | - |
| 16 | 0,96 | 1,038 | 112 | - | 36 | 1,85 | 0,539 | 92 | - |
| 17 | 1,00 | 1,002 | 111 | - | 37 | 1,91 | 0,523 | 91 | - |
| 18 | 1,03 | 0,967 | 110 | - | 38 | 1,97 | 0,508 | 90 | - |
| 19 | 1,07 | 0,933 | 109 | - | 39 | 2,03 | 0,493 | 89 | - |

**Table 3 – Conversion of "Control - Clock Rate" parameter value to clock pulses rate (continue)**

| Param. value | Mode (param. "CNTRL - Clk Mode") | | | | Param. value | Mode (param. "CNTRL - Clk Mode") | | | |
|--------------|----------------------------------|--------------|----------------|------------------|--------------|----------------------------------|--------------|----------------|-------------------|
| | FIXED | | MIDI | | | FIXED | | MIDI | |
| | Freq. [Hz] | Period [sec] | Period [ticks] | Note length | | Freq. [Hz] | Period [sec] | Period [ticks] | Note length |
| 40 | 2,09 | 0,479 | 88 | - | 84 | 6,87 | 0,146 | 44 | - |
| 41 | 2,15 | 0,465 | 87 | - | 85 | 7,05 | 0,142 | 43 | - |
| 42 | 2,22 | 0,451 | 86 | - | 86 | 7,23 | 0,138 | 42 | - |
| 43 | 2,28 | 0,438 | 85 | - | 87 | 7,42 | 0,135 | 41 | - |
| 44 | 2,35 | 0,426 | 84 | - | 88 | 7,61 | 0,131 | 40 | - |
| 45 | 2,42 | 0,414 | 83 | - | 89 | 7,80 | 0,128 | 39 | - |
| 46 | 2,49 | 0,402 | 82 | - | 90 | 8,00 | 0,125 | 38 | - |
| 47 | 2,56 | 0,391 | 81 | - | 91 | 8,21 | 0,122 | 37 | - |
| 48 | 2,63 | 0,380 | 80 | - | 92 | 8,42 | 0,119 | 36 | - |
| 49 | 2,71 | 0,369 | 79 | - | 93 | 8,63 | 0,116 | 35 | - |
| 50 | 2,78 | 0,359 | 78 | - | 94 | 8,85 | 0,113 | 34 | - |
| 51 | 2,86 | 0,349 | 77 | - | 95 | 9,08 | 0,110 | 33 | - |
| 52 | 2,94 | 0,340 | 76 | - | 96 | 9,31 | 0,107 | 32 | 1/2 ³ |
| 53 | 3,03 | 0,330 | 75 | - | 97 | 9,54 | 0,105 | 31 | - |
| 54 | 3,11 | 0,321 | 74 | - | 98 | 9,79 | 0,102 | 30 | - |
| 55 | 3,20 | 0,313 | 73 | - | 99 | 10,03 | 0,100 | 29 | - |
| 56 | 3,29 | 0,304 | 72 | - | 100 | 10,29 | 0,097 | 28 | - |
| 57 | 3,38 | 0,296 | 71 | - | 101 | 10,55 | 0,095 | 27 | - |
| 58 | 3,47 | 0,288 | 70 | - | 102 | 10,81 | 0,092 | 26 | - |
| 59 | 3,57 | 0,280 | 69 | - | 103 | 11,08 | 0,090 | 25 | - |
| 60 | 3,67 | 0,273 | 68 | - | 104 | 11,36 | 0,088 | 24 | 1/4 |
| 61 | 3,77 | 0,266 | 67 | - | 105 | 11,65 | 0,086 | 23 | - |
| 62 | 3,87 | 0,258 | 66 | - | 106 | 11,94 | 0,084 | 22 | - |
| 63 | 3,97 | 0,252 | 65 | - | 107 | 12,24 | 0,082 | 21 | - |
| 64 | 4,08 | 0,245 | 64 | 1/1 ³ | 108 | 12,55 | 0,080 | 20 | - |
| 65 | 4,19 | 0,239 | 63 | - | 109 | 12,86 | 0,078 | 19 | - |
| 66 | 4,31 | 0,232 | 62 | - | 110 | 13,18 | 0,076 | 18 | - |
| 67 | 4,42 | 0,226 | 61 | - | 111 | 13,51 | 0,074 | 17 | - |
| 68 | 4,54 | 0,220 | 60 | - | 112 | 13,85 | 0,072 | 16 | 1/4 ³ |
| 69 | 4,66 | 0,215 | 59 | - | 113 | 14,19 | 0,070 | 15 | - |
| 70 | 4,78 | 0,209 | 58 | - | 114 | 14,55 | 0,069 | 14 | - |
| 71 | 4,91 | 0,204 | 57 | - | 115 | 14,91 | 0,067 | 13 | - |
| 72 | 5,04 | 0,198 | 56 | - | 116 | 15,28 | 0,065 | 12 | 1/8 |
| 73 | 5,18 | 0,193 | 55 | - | 117 | 15,66 | 0,064 | 11 | - |
| 74 | 5,31 | 0,188 | 54 | - | 118 | 16,05 | 0,062 | 10 | - |
| 75 | 5,45 | 0,183 | 53 | - | 119 | 16,45 | 0,061 | 9 | - |
| 76 | 5,60 | 0,179 | 52 | - | 120 | 16,86 | 0,059 | 8 | 1/8 ³ |
| 77 | 5,74 | 0,174 | 51 | - | 121 | 17,27 | 0,058 | 7 | - |
| 78 | 5,89 | 0,170 | 50 | - | 122 | 17,70 | 0,056 | 6 | 1/16 |
| 79 | 6,05 | 0,165 | 49 | - | 123 | 18,14 | 0,055 | 5 | - |
| 80 | 6,20 | 0,161 | 48 | 1/2 | 124 | 18,59 | 0,054 | 4 | 1/16 ³ |
| 81 | 6,36 | 0,157 | 47 | - | 125 | 19,05 | 0,052 | 3 | 1/32 |
| 82 | 6,53 | 0,153 | 46 | - | 126 | 19,52 | 0,051 | 2 | 1/32 ³ |
| 83 | 6,70 | 0,149 | 45 | - | 127 | 20,00 | 0,050 | 1 | 1/64 ³ |



4.2.14 LED INDICATION MODE (CC #53)

The parameter sets the function of interface's green LED indicator. Four functions are available: **"Off"** (parameter value 0), **"Gate"** (parameter value 1), **"MIDI"** (parameter value 2) and **"Clock"** (parameter value 3).

"Off" mode

The LED indicator is turned off – The green LED doesn't light.

"Gate" mode

The LED indicator is copying status of envelope generator (ENV) - signal GATE. LED lights green when GATE signal is active.

"MIDI" mode

The LED indicator indicates acceptable incoming MIDI commands. Transferred MIDI data (THRU function) are not indicated. When an acceptable MIDI data is received, the green LED blinks. If an acceptable data flow is continuous, green LED lights constantly.

"Clock" mode

The LED indicator indicates clock pulses for arpeggiator and sequencer generated by the interface. The green LED indicator blinks each time a clock pulse is generated.

The parameter value can be controlled by MIDI CC Nr. 53 – see chapter 5.1.2.2.

5 MIDI IMPLEMENTATION

SH101-M interface uses all available MIDI communication methods – Channel Commands, Common System Commands as well as SysEx messages.

5.1 CHANNEL COMMANDS

The interface recognizes "Note-Off", "Note-On", "Control Changes (CCs)", "Channel Aftertouch", "Pitch Bend" and "Program Change" channel MIDI commands. So-called Running Status mode of MIDI communication is fully kept for all commands. All MIDI channel commands are received on the MIDI channel defined by the global system parameter "MIDI Channel".

5.1.1 NOTE ON/OFF

The interface accepts Note-On and Note-Off commands in the range of max. 61 notes (5 octaves). Accepted note numbers are defined by the VCO - Key Shift parameter (for details see chapter 4.2.1).

Although the SH-101 is monophonic instrument, the interface keeps last six active Note-On commands in its memory. If more keys are pressed and hold on the master keyboard in sequence and the last is released, the interface switches back to the previous pressed note (key). If more than six MIDI notes has been received, the last received note replaces the first received note (last received note has the highest priority).

Note-On MIDI command is also used for automatic switching the interface to "Keyboard" working mode: If Auto Local system parameter (see chapter 4.1.2) is "On" and a valid MIDI Note is received, the interface is switched to the "Keyboard" working mode automatically.

5.1.2 MIDI CONTROL CHANGES (CCs)

The interface recognizes standard MIDI controllers (CC) Nr. 7, 11, 64, 120, 121, 122, 123 and individually defined CCs Nr. 40 - 53 and 119 (for details see table 4 and description below).

5.1.2.1 STANDARD CONTROLLERS

CC #1 – Modulation Wheel

Controls the LFO MOD instrument's function ("forward move" of the Bender lever) in dependence on "Mod Threshold" system parameter setting (see chapter 4.1.5). The interface accepts whole range of controller values from 0 to 127.

CC #7 – Volume

Controls the overall loudness (drives VCA). Works only if "CONTROL - Volume Mode" preset parameter is set to „Volume“ or "Volume + Expression" modes. The interface accepts whole range of controller values from 0 to 127.

CC #11 – Expression

Controls the overall loudness (drives VCA). Works only if "CONTROL - Volume Mode" preset parameter is set to "Expression" or "Volume + Expression" modes. The interface accepts whole range of controller values from 0 to 127.

**Table 4 – Acceptable CC overview**

| CC Nr. | Name | Function | Valid value |
|-------------------|-----------------------|--|---|
| 1 | Modulation Wheel | Standard MIDI function | 0 ~ 127 |
| 7 | Volume | Standard MIDI function | 0 ~ 127 |
| 11 | Expression | Standard MIDI function | 0 ~ 127 |
| 40 ¹⁾ | VCO – Key Shift | Controls “VCO – Key Shift” preset parameter | 0 ~ 67 |
| 41 ¹⁾ | VCO – Aftertouch Bend | Controls “VCO – Aftertouch Bend” preset parameter | 0 ~ 63 = negative 64 = off 65 ~ 127 = positive |
| 42 | VCF – Frequency | Controls “VCF – Frequency” preset parameter | 0 ~ 127 |
| 43 ¹⁾ | VCF – Key Follow | Controls “VCF – Key Follow” preset parameter | 0 ~ 63 = negative 64 = off 65 ~ 127 = positive |
| 44 ¹⁾ | VCF – Velocity Amount | Controls “VCF – Velocity Amount” preset parameter | 0 ~ 127 |
| 45 ¹⁾ | VCF – Aftertouch Amt | Controls “VCF – Aftertouch Amount” preset parameter | 0 ~ 127 |
| 46 ¹⁾ | VCA – Key Follow | Controls “VCA – Key Follow” preset parameter | 0 ~ 63 = negative 64 = off 65 ~ 127 = positive |
| 47 ¹⁾ | VCA – Velocity Amount | Controls “VCA – Velocity Amount” preset parameter | 0 ~ 127 |
| 48 ¹⁾ | VCA – Aftertouch Amt | Controls “VCA – Aftertouch Amount” preset parameter | 0 ~ 127 |
| 49 | CTRL – Volume Mode | Controls “CTRL – Volume Mode” preset parameter | 0 ~ 31 = Off 32 ~ 63 = Volume 64 ~ 95 = Expression 96 ~ 127 = Vol.+Exp |
| 50 | CTRL – Bender Mode | Controls “CTRL – Bender Mode” preset parameter | 0 ~ 63 = Normal 64 ~ 127 = MIDI |
| 51 ²⁾ | CTRL – Clock Mode | Controls “CTRL – Clock Mode” preset parameter | 0 ~ 31 = Normal 32 ~ 63 = Fixed 64 ~ 95 = MIDI 96 ~ 127 = CC |
| 52 ²⁾ | CTRL – Clock Rate | Controls “CTRL – Clock Rate” preset parameter or generates one clock pulse | 0 ~ 127 |
| 53 | CTRL – Indicator Mode | Controls “CTRL – Indicator Mode” preset parameter | 0 ~ 31 = Off 32 ~ 63 = Gate 64 ~ 95 = MIDI 96 ~ 127 = Clock |
| 64 ¹⁾ | Hold | Standard MIDI function | 0 ~ 63 = Off 64 ~ 127 = On |
| 119 | Save Preset | Saves edited parameters in the buffer to actual preset memory bank | 0 = Not significant 1 ~ 127 = Save |
| 120 ¹⁾ | All Sound Off | Standard MIDI function | 0 |
| 121 | Reset All Controllers | Standard MIDI function | 0 |
| 122 | Local Off / On | Standard MIDI function | 0 ~ 63 = Off 64 ~ 127 = On |
| 123 ¹⁾ | All Notes Off | Standard MIDI function | 0 |

Remarks:
¹⁾ The CC is only relevant in “Keyboard” working mode of the interface
²⁾ The CC is only relevant in “Normal” working mode of the interface

CC #64 – Hold

The controller works standard way: holds tone generator of the instrument (active) during the hold pedal is pressed. Values from 64 to 127 are recognized as on-status, values from 0 to 63 as off-status.

CC #120 – All Sound Off (ASO)

The instrument is muted (GATE signal is switched off immediately after reception of this controller – independently on MIDI Note-On commands received previously. Note that the value of this CC must be always zero.

CC #121 – Reset All Controllers (RAC)

MIDI CCs and all other controls are set to their initial status after reception of this controller:

CC#1 Modulation → off (value 0)

CC#7 Volume → maximum (value 127)

CC#11 Expression → maximum (value 127)

CC#42 Own controller VCF– Frequency → maximum (value 127)

CC#64 Hold → off (value 0)

Pitch Bend (Wheel) → middle position (value 4096)

Note that the value of this CC must be always 0.

CC #122 – Local On / Off

For the values from 0 to 63 (i.e. “Local Off”), SH-101 keyboard is disconnected and the instrument’s keyboard is controlled by Note On/Off MIDI commands. (The interface is in the “Keyboard” working mode.

Values from 64 to 127 (i.e. “Local On”) returns control back to SH-101 keyboard. (The interface is in the “Normal” working mode.

CC #123 – All Notes Off (ANO)

The instrument is muted (GATE signal is switched off immediately after reception of this controller – independently on MIDI Note-On commands received previously. Note that the value of this CC must be always zero.

5.1.2.2 CONTROLLERS FOR PRESET PARAMETERS EDITING AND SAVING**CC #40 – VCO - Key Shift**

Controls VCO – Key Shift parameter (see chapter 4.2.1). Note that acceptable range of the CC#40 is 0 to 67 only (corresponds to the VCO – Key Shift parameter). All other received values (68 to 127) are converted to the closest valid value (i.e. 67).

CC #41 – VCO - Aftertouch Bend

Controls VCO – Aftertouch Bend parameter (see chapter 4.2.2).

CC #42 – VCF – Frequency

Controls VCF – Frequency parameter (see chapter 4.2.3).

**CC #43 – VCF – Key Follow**

Controls VCF – Key Follow parameter (see chapter 4.2.4).

CC #44 – VCF - Velocity Amount

Controls VCF – Velocity Amount parameter (see chapter 4.2.5).

CC #45 – VCF - Aftertouch Amount

Controls VCF – Aftertouch Amount parameter (see chapter 4.2.6).

CC #46 – VCA – Key Follow

Controls VCA – Key Follow parameter (see chapter 4.2.7).

CC #47 – VCA - Velocity Amount

Controls VCA – Aftertouch Amount parameter (see chapter 4.2.8).

CC #48 – VCA - Aftertouch Amount

Controls VCA – Aftertouch Amount parameter (see chapter 4.2.9).

CC #49 – CTRL - Volume Mode

Controls CTRL – Volume Mode parameter (see chapter 4.2.10). Note that CC#49 values from 0 to 31 correspond to “Off” mode, 32 to 63 to “Volume” mode, 64 to 95 to “Expression” mode and 96 to 127 to “Volume + Expression” mode of the parameter.

CC #50 – CTRL - Bender Mode

Controls CTRL – Bender Mode parameter (see chapter 4.2.11). Note that CC#50 values from 0 to 63 correspond to “Normal” mode and values from 64 to 127 to “MIDI” mode of the parameter.

CC #51 – CTRL - Clock Mode

Controls CTRL – Clock Mode parameter (see chapter 4.2.12). Note that CC#51 values from 0 to 31 correspond to “Off” mode, 32 to 63 to “Fixed” mode, 64 to 95 to “MIDI” mode and 96 to 127 to “CC” mode of the parameter.

CC #52 – CTRL – Clock Rate

Function of CC #52 depends on clock mode set by CTRL – Clock Mode parameter (see chapter 4.2.12).

- In “Off” mode, CC #52 is ignored.
- In “Fixed” and “MIDI” modes, CC #52 controls CTRL – Clock Rate parameter (i.e. rate of clock pulses – see chapter 4.2.13)
- In “CC” mode, each time the CC #52 is received (any value), one clock pulse is generated.

CC #53 – CTRL - Indicator Mode

Controls CTRL – Indicator Mode parameter (see chapter 4.2.14). Note that CC#53 values from 0 to 31 correspond to “Off” mode, 32 to 63 to “Gate” mode, 64 to 95 to “MIDI” mode and 96 to 127 to “Clock” mode of the parameter.

**CC #119 – Preset Save**

Content of preset edit buffer can be saved to preset memory bank by CC #119 (any value). The data are saved to actual preset number selected previously by MIDI Program Change command. After the reset of the interface (in stand-by mode) when no preset is selected, the data are saved to preset Nr. 1 and this preset is selected as active.

Acceptable range of CC #119 value is 1 to 127. Value equal 0 is ignored.

5.1.3 CHANNEL AFTERTOUC

Channel Aftertouch command can affect instrument's VCO, VCF and VCA accordingly to the VCO - Aftertouch Bend, VCF - Aftertouch Amount and VCA - Aftertouch Amount preset parameters settings. The interface accepts whole range of command's values from 0 to 127.

5.1.4 PITCH BEND (WHEEL)

Pitch Bend (Wheel) command can control instrument's bender lever accordingly to the CTRL - Bender Mode preset parameter setting.

In "Normal" mode, frequencies of VCO and VCF can be "bended" (accordingly to the positions of VCO / VCF BENDER sliders on instrument's panel) with BENDER lever. Pitch Bend (Wheel) MIDI command is ignored in this mode.

In "MIDI" mode, BENDER lever is disconnected and frequencies of VCO and VCF can be "bended" with MIDI Pitch Bend (Wheel) command. The interface accepts whole range of the command values from -8192 to +8191. However, only 12 bits of command's data are used.

5.1.5 PROGRAM CHANGE

Program Change command selects the user parameter presets. Only program numbers from 0 to 31 are accepted corresponding to presets numbers from 1 to 32. Program numbers 32 to 127 are ignored.

When an acceptable Program Change command is received, the interface starts to work accordingly to the parameters of newly selected preset (program).



5.2 COMMON SYSTEM COMMANDS

5.2.1 CLOCK

If any other mode than “MIDI” mode is selected by CTRL - Clock Mode parameter, MIDI Clock commands are ignored.

In “MIDI” mode, the interface receives MIDI Clock commands for the synchronization pulses for arpeggiator and sequencer – they are synchronized with the tempo of played song. Rate of generated synchronization pulses is controlled by “CTRL – Clock Rate” parameter (see table 3).

Maximal speed is limited by the hardware construction of the SH-101. This may cause under extremely fast MIDI song tempos, the synchronized arpeggio / sequencer irregularities or some tones might be omitted.

5.2.2 START, CONTINUE

START and CONTINUE commands can be accepted only in “Fixed” and “MIDI” modes selected by CTRL - Clock Mode parameter. The Start Sync system parameter has to be allowed (“On”) as well.

If START and CONTINUE commands are allowed, clock pulses generated by the interface are synced with Start and Continue MIDI commands. A clock pulse is generated immediately and new period of clock pulses starts each time the Start or Continue MIDI command is received.

5.2.3 RESET

When the Reset command is received, a complete hardware reset of the interface is executed – all interface’s circuits are set to their default status (same as after the instrument is switched on) and the interface is switched to stand-by mode.

5.3 SYSTEM EXCLUSIVE MESSAGES

The System Exclusive communication enables user to adjust the values of all preset parameters in edit buffer and values of system parameters in system memory bank. Further it is possible to rewrite content of partial preset memory banks or to store data from edit buffer to any preset memory bank. Also, actual preset can be changed or if necessary, hardware reset or total “Factory” reset can be done. System Exclusive communication is described in detail in standalone manual.

For easier creation of SysEx messages, please use the software generator available at manufacturer’s web pages: **www.chd-el.cz**

6 SYSEX MESSAGES GENERATOR

As a support for the users we have made software generator to create System Exclusive messages to control the interface. Any necessary SysEx message can be created with this generator without difficult calculating of binary or hexadecimal numbers.

The generator is based on Java scripts so it can run on any computer with web browser (Windows, OSX, etc.)². To send the generated commands you will also need an utility to send the generated text³ as a MIDI SysEx dump (see chapter 7 for recommended software⁴).

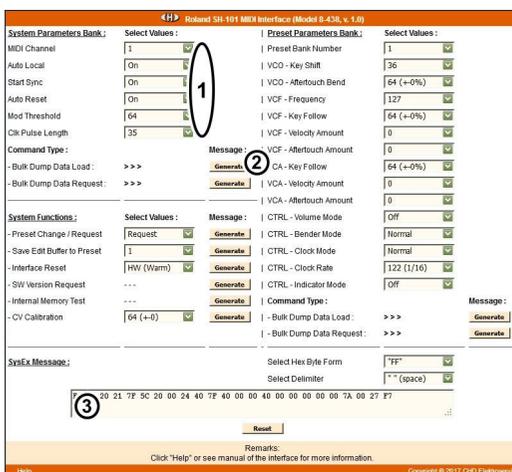
Visit our website and download the “SH101-M_syxgen.zip” archive. Expand the archive to a selected folder on your computer’s hard drive (i.e. “SH101M.html” and “SH101M_help.html” files and “media” sub-folder).

To launch the SysEx messages generator, simply open the “SH101-M.html” file in your web browser (e.g. by clicking on the file icon). The generator window opens.

6.1 SYSTEM PARAMETERS SETTING

To change / adjust the system parameters (System Parameters Bank section of the generator window):

1. Select requested values of all system parameters ①.
2. Click the “Bulk Dump Data Load - Generate” button ②.
3. The required hexadecimal MIDI SysEx message is generated as a text in text field on bottom of the window ③.
4. Copy the text in clipboard (CTRL+C) and paste (CTRL+V) to a MIDI Sysex software⁵.
5. Send the message to the interface.
6. Switch the SH-101 instrument off and then on again after a moment. Now the interface starts operation with the new system parameters settings.



² Note that scripts and ActiveX elements must be enabled in web browser for proper function of the generator.

³ The generated format of the message is **text**. The text can not be saved as a *.syx or *.mid file directly, hence a text to SysEx utility is needed.

⁴ It is not necessary to use the recommended utility. The same function is provided by various DAW and MIDI SysEx softwares. For required text format and instructions check the documentation of your DAW/software.

⁵ See chapter 7.2 for recommended MIDI SysEx software.



6.2 SYSTEM PARAMETERS REQUEST

To request actual system parameters values (System Parameters Bank section of the generator window):

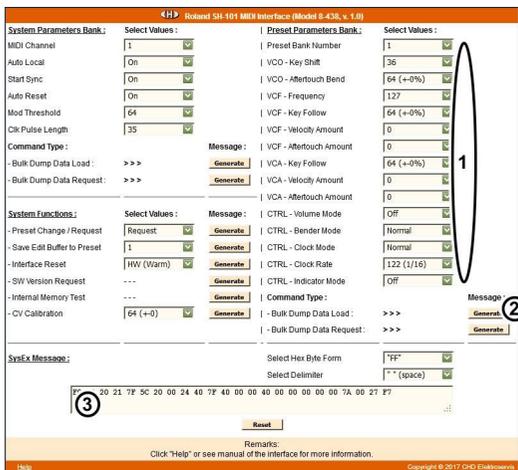
1. Click the **“Bulk Dump Data Request - Generate”** button ①.
2. The required hexadecimal MIDI SysEx message is generated as a text in text field on bottom of the window ②.
3. **Copy** the text in clipboard (CTRL+C) and **paste** (CTRL+V) to a MIDI Sysex software⁶.
4. Send the message to the interface.
5. The interface responds immediately – it sends **“Bulk Dump Data Load”** type SysEx message.
6. Now you can save the received message in your computer for further use.



6.3 PRESET PARAMETERS SETTING

To change / adjust parameters of a preset (Preset Parameters Bank section of the generator window):

1. Select number of requested preset and values of all parameters ①.
2. Click the **“Bulk Dump Data Load - Generate”** button ②.
3. The required hexadecimal MIDI SysEx message is generated as a text in text field on bottom of the window ③.
4. **Copy** the text in clipboard (CTRL+C) and **paste** (CTRL+V) to a MIDI Sysex software⁷.
5. Send the message to the interface.
6. The interface stores new values of parameters to chosen permanent preset memory.
7. Note that the changes becomes audible till after the changed preset is recalled.



⁶ See chapter 7.2 for recommended MIDI SysEx software.

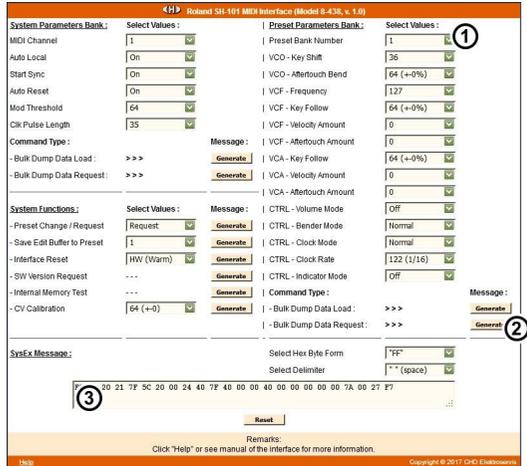
⁷ See chapter 7.2 for recommended MIDI SysEx software.



6.4 PRESET PARAMETERS REQUEST

To request actual parameters of a preset (Preset Parameters Bank section of the generator window):

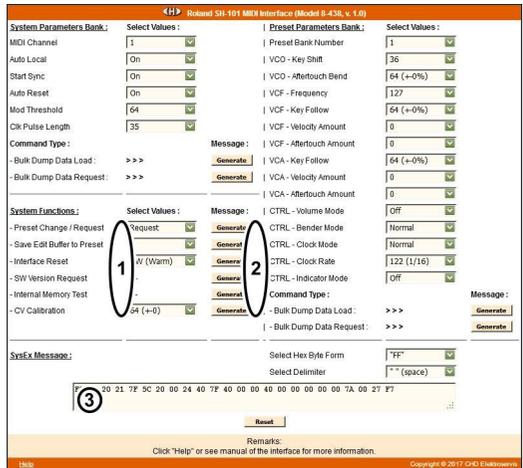
1. Select number of requested preset ①.
2. Click the “Bulk Dump Data Request - Generate” button ②.
3. The required hexadecimal MIDI SysEx message is generated as a text in text field on bottom of the window ③.
4. Copy the text in clipboard (CTRL+H) and paste (CTRL+V) to a MIDI Sysex software⁸.
5. Send the message to the interface.
6. The interface responds immediately – it sends “Bulk Dump Data Load” type SysEx message.
7. Now you can save the received message in your computer for further use.



6.5 GLOBAL SYSTEM FUNCTIONS PROCESSING

To execute a process with interface’s presets etc. (System Functions section of the generator window):

1. Select value or type⁹ of one requested global function ①.
2. Click the corresponding “Generate” button (in the same row) ②.
3. The required hexadecimal MIDI SysEx message is generated as a text in text field on bottom of the window ③.
4. Copy the text in clipboard (CTRL+C) and paste (CTRL+V) to a MIDI Sysex software¹⁰.
5. Send the message to the interface.
6. The interface executes requested function immediately.



Remark: For details about Global System Functions see separate manual of MIDI System Exclusive communication.

⁸ Not all functions need to select value or type. Skip this step for that functions.

⁹ See chapter 7.2 for recommended MIDI SysEx software.

¹⁰ See chapter 7.2 for recommended MIDI SysEx software.

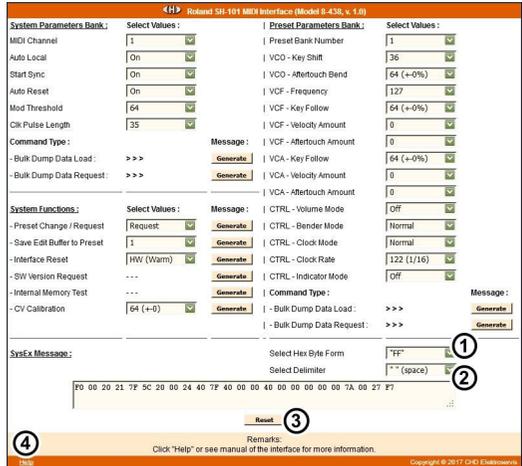


6.6 OTHER FUNCTIONS

Select "Hex Byte Form" ① and "Delimiter" ② as required for your MIDI SysEx software¹¹. Default setting of the generator is optimized for the recommended **Pocket MIDI** utility (see Chapter 7). However some DAW or MIDI SysEx utilities require different format of the generated text message. Required form of hex bytes and delimiter must be set before a Generate button is pressed.

To clear the text field and return all values to their defaults, click the "Reset" button ③.

"Help" link ④ opens new window with brief help.



¹¹ See the documentation of your DAW for required format.

7 RECOMMENDED MIDI SOFTWARE

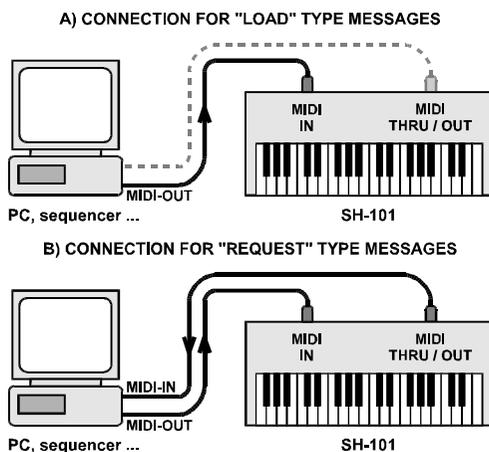
The hexadecimal MIDI SysEx messages created in the Generators (as described in chapter 6) are in plain text format. The text can not be saved as a *.syx or *.mid file directly, hence a text to SysEx capable utility or DAW is needed.

Pocket MIDI¹² is a utility that can be used to send the text as a SysEx message. It is a simple MIDI monitoring tool for both Windows and Mac OSX platforms. **Pocket MIDI** is a freeware for commercial, non-profit or private use.

7.1 SETTING UP THE COMPUTER AND SOFTWARE

1. Download the **Pocket MIDI** utility at <https://www.morson.jp/pocketmidi-webpage/>
2. Install the utility in your computer.
3. Select the MIDI interface **Outputs** to device where the interface is connected to¹³ (drop-down menu **Views** → **MIDI Settings** → **Input Port / Output Port**).
4. Connect the computer with SH101-M interface (accordingly to the picture 14)¹⁴.
5. Send and receive required SysEx messages to / from the interface

Pic. 14 – Connection for Bulk Dump



¹² Pocket MIDI is Copyright © MORSON JAPAN Co.,Ltd. All rights reserved.

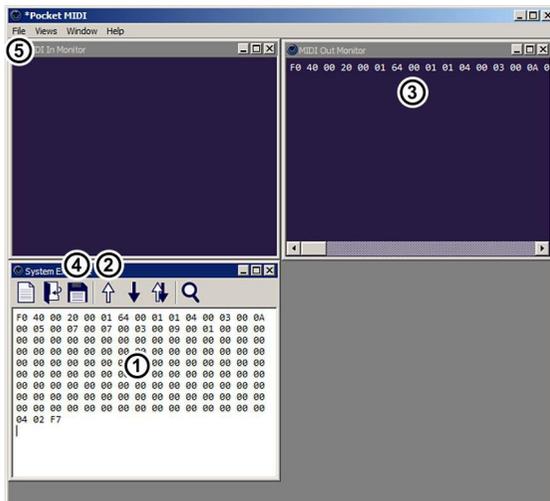
¹³ Computer's MIDI interface must be active / switched on and all necessary MIDI drivers correctly installed.

¹⁴ MIDI cable from interface's MIDI output to computer's MIDI input is not necessary for "Load" type messages but it can remain connected. There is no need to disconnect it.

7.2 SEND THE TEXT SYSEX MESSAGE TO THE INTERFACE

Basic procedure to send any SysEx data to a MIDI device:

1. Generate required (“Request” or “Function”¹⁵ type) SysEx message in the SysEx Messages Generator (as described in Chapter 6)¹⁶.
2. **Copy** the text in clipboard (CTR+C) and **paste** (CTRL+V) in “System Exclusive” window ①.
3. Click the “↑” (“Transmit”) arrow ② to send the data to the interface.
4. The sent message appears in the “MIDI Out Monitor” window ③.
5. Alternatively you can **save** the **file** for future use (either by the floppy icon ④ as a *.txt file or in the drop-down “File” menu ⑤ as a *.pocketmidi file).



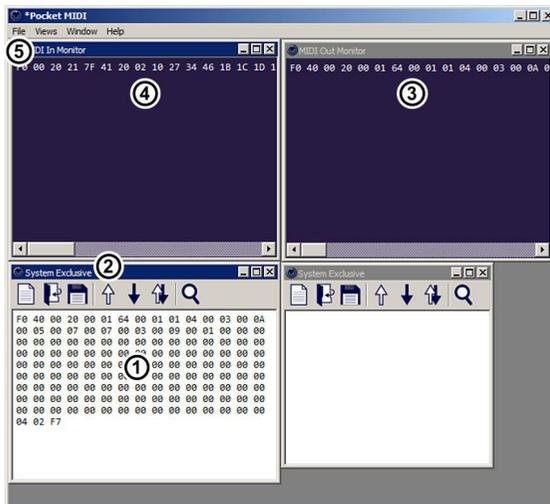
¹⁵ Preset Change, Save Edit Buffer, Reset or CV Calibration functions.

¹⁶ The correct “FF” Hex Byte Form and “ (space)” for Delimiter are the initial values after the SysEx Generator is launched, so there is no need to change them for Pocket MIDI.

7.3 REQUEST THE SYSEX DATA FROM THE INTERFACE

Basic procedure to request a SysEx data from a MIDI device and to record the received data:

1. Generate required (“**Request**” or “**Function**”¹⁷ type) SysEx message in the SysEx Messages Generator (as described in Chapter 6)¹⁸.
2. **Copy** the text in clipboard (CTR+C) and **paste** (CTRL+V) in “System Exclusive” window ①.
3. Click the “↑” (“**Transmit**”) arrow ② to send the data to the interface.
4. The sent message appears in the “**MIDI Out Monitor**” window ③.
5. The interface responds with “**Load**” type SysEx message. The received message appears in the “**MIDI In Monitor**” window ④.
6. Click on the “**MIDI In Monitor**” window heading and **Save** the data (File dropdown menu ⑤) as a *.pocketmidi file for future use.
7. Alternatively you can **copy** the **data** (CTRL+C) from “**MIDI In Monitor**” window ④ and paste (CTRL+V) to any text editor and **save** as a *.txt or **document file**.



¹⁷ Preset Request, SW Version Request or Memory Test functions.

¹⁸ The correct “FF” Hex Byte Form and “ ” (space) for Delimiter are the initial values after the generator is launched, so there is no need to change them for Pocket MIDI.



8 APPENDICES

8.1 MIDI IMPLEMENTATION CHART

MIDI IMPLEMENTATION CHART

Device : **SH101-M**

Date : **5 / 2017**

Model : **8-438**

Version : **1.0**

| Function | | Transmission | Reception | Remarks |
|--|----------------|--------------|---------------|-----------------------------------|
| Basic Channel | Default | X | 1~16 | ¹⁾ |
| | Changed | X | 1~16 | ¹⁾ |
| Mode Messages | Default | X | Mode 3 | Not Altered ²⁾ |
| | | X | X | |
| Note Number | | X | 0~127 | ³⁾ |
| Velocity | Note ON | X | O | |
| | Note OFF | X | X | |
| After Touch | Key's | X | X | |
| | Channel's | X | O | |
| Pitch Bender | | X | O | |
| Control Changes | 7 | X | O | Volume |
| | 11 | X | O | Expression |
| | 40 to 53 | X | O | Own controllers – see description |
| | 64 | X | O | Hold |
| | 119 | X | O | Own controller – see description |
| | 120 | X | O | All Sound Off |
| | 121 | X | O | Reset All Controllers |
| 123 | X | O | All Notes Off | |
| Program Change | | X | O | Preset Change |
| System Exclusive | | O | O | See description |
| System Common | Song Position | X | X | |
| | Song Select | X | X | |
| | Tune | X | X | |
| System Real Time | Clock | X | O | |
| | Command | X | O | Start, Continue |
| Others | Local ON/OFF | X | O | |
| | All Notes Off | X | O | |
| | Active Sensing | X | X | |
| | Reset | X | O | |
| Notes : ¹⁾ Can be changed by user | | | | |
| ²⁾ Last six notes are stored in interface's buffer | | | | |
| ³⁾ Position of 61 acceptable notes depends on Key Shift setting | | | | |

Mode 1 : **OMNI ON, POLY**

Mode 2 : **OMNI ON, MONO**

O : Yes

Mode 3 : **OMNI OFF, POLY**

Mode 4 : **OMNI OFF, MONO**

X : No

8.2 LIMITATION OF THE INTERFACE OPERATION AND RECOMMENDED SETTING

It is recommended to calibrate the SH-101 accordingly to the instructions in service manual of the SH-101 prior the interface installation. Especially instrument's keyboard DAC and VCO should be adjusted as precisely as possible. This ensures trouble-free operation of the interface. However, a minor shifts from ideal setting can be eliminated by calibration procedure of the interface's DAC (see chapter 8.6).

When the interface is in "Keyboard" working mode (see chapter 3.2), it is impossible to use Arpeggio, Sequencer, Hold and Key Transpose functions and keyboard of the instrument. If any key on instrument's keyboard is pressed or any of the above mentioned functions are switched on, there is no response since the CPU of the instrument is disconnected from other circuits in the "Keyboard" mode. However, all other control elements on SH-101 instrument's panel stay fully functional when the instrument's keyboard is played from MIDI.

BENDER lever controller functionality depends on CTRL - Bender Mode parameter settings. In "MIDI" mode, manual BENDER lever controller is disconnected and its function is substituted by MIDI Pitch Bend (Wheel) command.

It is recommended to set the VCF - FREQ slider on the SH-101 panel to its maximum level (10) while the interface is active. It enables full VCF modulation range by the interface.

Similarly, we recommend to set VCF - KYBD slider on the instrument's panel to its minimum (0) while the interface is active. This eliminates doubled modulation of instrument's VCF (by the interface and by instrument's control circuit simultaneously).

8.3 ERROR STATUS INDICATION

If any fatal error occurs during the interface operation, the interface disconnects itself from instrument's circuits and stops the MIDI communication. However, the instrument still can be controlled by its own keyboard, panel knobs and switches.

The error status is indicated by blinking indication LED (green blinking). The number of LED blinks is indicating the error type:

- (A): 1x → error in MIDI communication with host system (e.g. input or output MIDI data buffer overflow).
- (B): 2x → error in internal communication between interface's CPU and peripheral circuits,

Error (A) can be solved automatically if "Auto Reset" system parameter is set "On" (see chapter 4.1.4). In that case the interface returns automatically to basic stand-by mode.

Error (B) is fatal. If this error occurs, the interface must be reset to restore the operation. It is necessary to turn the SH-101 instrument off and on after a while.

8.4 ERRORS CAUSED BY MIDI LOOP

When SH101-M interface is controlled by a sequencer (HW or SW) and the devices are connected bi-directionally (with both MIDI cables) and the sequencer isn't set correctly, communication loop might occur and the entire MIDI system "freezes". It is caused that all MIDI data incoming from sequencer to interface's input are transferred to interface's output (THRU function) and back to the sequencer. This causes infinite cyclic transfer of the same MIDI data.

To avoid this situation, throughput of MIDI data from input to output must be turned off in the DAW / Sequencer. This function is usually called MIDI ECHO or MIDI THRU. Check the user manual of your DAW / Sequencer.

8.5 CLOCK PULSES DURATION

Duration of generated clock pulses (controlled by system parameter Clk Pulse Length) need not be changed from the factory pre-defined setting in most cases. Only if the instrument reacts unreliable (i.e. some pulses are omitted and the sequencer and arpeggiator run irregularly) it is necessary to adjust the duration of the clock pulses (set the longer duration).

8.6 DAC CALIBRATION PROCEDURE

If an exactly same tuning of the instrument keyboard and master MIDI keyboard is required, D/A converter controlling VCO of the instrument must be calibrated. The calibration range is approx. ± 90 cents, calibration step is 1,465 cent (see table 5). The calibration constant is stored in interface memory so the new value remains unchanged after the instrument is switched off. The value of the calibration constant is set to 64 (± 0 cent, no shift) ex-factory.

Remarks:

Calibration procedure is not necessary if keyboard DAC and VCO of the SH-101 are adjusted exactly as described in service manual of the instrument.

*The calibration **eliminates only shift** of instrument's control voltage! Wrong range and non-linearity of CV cannot be removed.*

Calibration procedure consists in adjusting of "CV Calibration" constant (stored in the interface's memory). This procedure is executed via MIDI System Exclusive Message:

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

where "ii" is Device ID byte, "dd" is databyte and "xx" is checksum. The "dd" databyte contents the calibration constant depending on required fine tuning as shown in table 2.

For an easy creation of necessary SysEx message, special software generator is available. Please see separate manual for MIDI System Exclusive communication.

The calibration procedure is following:

1. Switch on the SH-101 – the interface is in "Normal" mode.
2. Tune the instrument With TUNE knob as exactly as possible – with good tuner. Use the SH-101 keyboard !
3. Switch the interface to "Keyboard" mode (by CC#122 or by pressing a key on MIDI master keyboard.
4. Check tuning of the instrument playing the MIDI master keyboard. Read eventual tuning difference on the tuner and remember it.
5. In table 2, find closest value to the detected difference in cents and corresponding value of calibration constant.
6. Send this calibration constant to the interface as SysEx message.
7. Check the tuning again and if it is still not correct, repeat the procedure from paragraph 4.

**Table 5 – CV Calibration Constant**

| Const. Value | Shift [cent] |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 0 | -93,77 | 22 | -61,54 | 44 | -29,30 | 66 | +2,93 | 88 | +35,16 | 110 | +67,40 |
| 1 | -92,31 | 23 | -60,07 | 45 | -27,84 | 67 | +4,40 | 89 | +36,63 | 111 | +68,86 |
| 2 | -90,84 | 24 | -58,61 | 46 | -26,37 | 68 | +5,86 | 90 | +38,10 | 112 | +70,33 |
| 3 | -89,38 | 25 | -57,14 | 47 | -24,91 | 69 | +7,33 | 91 | +39,56 | 113 | +71,79 |
| 4 | -87,91 | 26 | -55,68 | 48 | -23,44 | 70 | +8,79 | 92 | +41,03 | 114 | +73,26 |
| 5 | -86,45 | 27 | -54,21 | 49 | -21,98 | 71 | +10,26 | 93 | +42,49 | 115 | +74,73 |
| 6 | -84,98 | 28 | -52,75 | 50 | -20,51 | 72 | +11,72 | 94 | +43,96 | 116 | +76,19 |
| 7 | -83,52 | 29 | -51,28 | 51 | -19,05 | 73 | +13,19 | 95 | +45,42 | 117 | +77,66 |
| 8 | -82,05 | 30 | -49,82 | 52 | -17,58 | 74 | +14,65 | 96 | +46,89 | 118 | +79,12 |
| 9 | -80,59 | 31 | -48,35 | 53 | -16,12 | 75 | +16,12 | 97 | +48,35 | 119 | +80,59 |
| 10 | -79,12 | 32 | -46,89 | 54 | -14,65 | 76 | +17,58 | 98 | +49,82 | 120 | +82,05 |
| 11 | -77,66 | 33 | -45,42 | 55 | -13,19 | 77 | +19,05 | 99 | +51,28 | 121 | +83,52 |
| 12 | -76,19 | 34 | -43,96 | 56 | -11,72 | 78 | +20,51 | 100 | +52,75 | 122 | +84,98 |
| 13 | -74,73 | 35 | -42,49 | 57 | -10,26 | 79 | +21,98 | 101 | +54,21 | 123 | +86,45 |
| 14 | -73,26 | 36 | -41,03 | 58 | -8,79 | 80 | +23,44 | 102 | +55,68 | 124 | +87,91 |
| 15 | -71,79 | 37 | -39,56 | 59 | -7,33 | 81 | +24,91 | 103 | +57,14 | 125 | +89,38 |
| 16 | -70,33 | 38 | -38,10 | 60 | -5,86 | 82 | +26,37 | 104 | +58,61 | 126 | +90,84 |
| 17 | -68,86 | 39 | -36,63 | 61 | -4,40 | 83 | +27,84 | 105 | +60,07 | 127 | +92,31 |
| 18 | -67,40 | 40 | -35,16 | 62 | -2,93 | 84 | +29,30 | 106 | +61,54 | | |
| 19 | -65,93 | 41 | -33,70 | 63 | -1,47 | 85 | +30,77 | 107 | +63,00 | | |
| 20 | -64,47 | 42 | -32,23 | 64 | 0,00 | 86 | +32,23 | 108 | +64,47 | | |
| 21 | -63,00 | 43 | -30,77 | 65 | +1,47 | 87 | +33,70 | 109 | +65,93 | | |

8.7 TECHNICAL SPECIFICATION

| | |
|-------------------------------------|---|
| MIDI bus : | fully according to MIDI Manufacturer Association standards |
| MIDI connectors : | 2x DIN 41524 (5 pins / 180°) |
| Transit data delay MIDI IN → THRU : | max. 1 ms, typ. 0,32 ms |
| Electrical design : | under the regulations of the ČSN EN 60335-1+A55, ČSN EN 60335-2-45 |
| EMC : | under the regulations of the ČSN EN 55014 |
| Operating environment : | standard |
| Range of operating temperature : | +10 to +35 °C |
| Relative environmental humidity : | up to 85 % |
| Board dimensions : | 100 x 56 mm |



8.8 WARRANTY CONDITIONS

The equipment is provided with **thirty-months warranty** starting from the date of the equipment take-over by the customer. This date must be specified on warranty list together with dealer's confirmation.

During this period of time, all defects of equipment or its accessories, caused by defective material or faulty manufacturing, will be removed free of charge.

Warranty repair is asserted by the customer against the dealer.

Warranty period is to be extended for the time period, during which the product was under the warranty repair.

The relevant legal regulations take effect in case of cancellation of purchase contract.

The customer will lose the right for free warranty repair, if he will not be able to submit properly filled out warranty list or if the defects of the product had been caused by:

- unavoidable event (natural disaster),
- connecting the device to the incorrect supply voltage,
- inputs or outputs overloading by connecting the signals source or load source with not-corresponding characteristics etc.,
- faulty equipment operation, which is at variance with the instructions referred-to in the operating manual,
- mechanical damage caused by consumer during transportation or usage of equipment,
- unprofessional interference with the equipment or by equipment modification without manufacturer's approval.

Document :
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Manufacturer :
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