SH2/9-M

MIDI Interface for Roland SH-2 / SH-09

Model 8-437
ver. 2.0
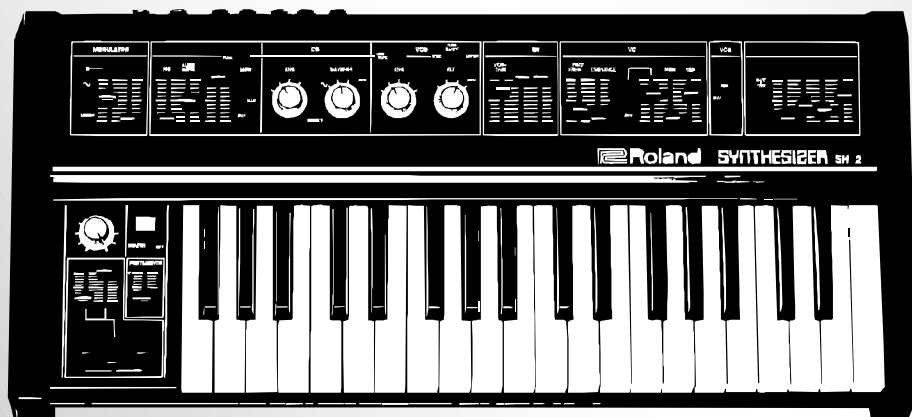
OWNER'S MANUAL

Content

Appendices

1. DEVICE DESCRIPTION

SH2/9-M is a MIDI retrofit for Roland SH-2 and SH-09 synthesizers. The device enables the instrument to be controlled via MIDI as a MIDI expander. The interface works in one direction only – it receives MIDI data and converts them to analogue control signals for the instrument's BENDER, VCO, VCF, VCA and ENV circuits. The synthesizers keyboard, control panel sliders and switches **are not transmitted** as MIDI data!

1.1. INTERFACE FUNCTIONS

Functional block schematics of the interface is on pic. 1. The interface controls instrument's VCO via CV generated by 16-bit DAC (it replaces instrument's KCV) [1] and it switches GATE generator for launching of ENV too [2]. Manual controller BENDER on instrument's panel can be disconnected and replaced with DAC of the interface [3]. Interface's voltage regulator is inserted between VCF and control circuits of VCF [4]. It allows additional changes of frequency of VCF. Interface's voltage regulator is inserted between VCA and control circuits of VCA too [5]. It allows additional changes of output level of VCA.

Pic. 1 – Functional block schematics
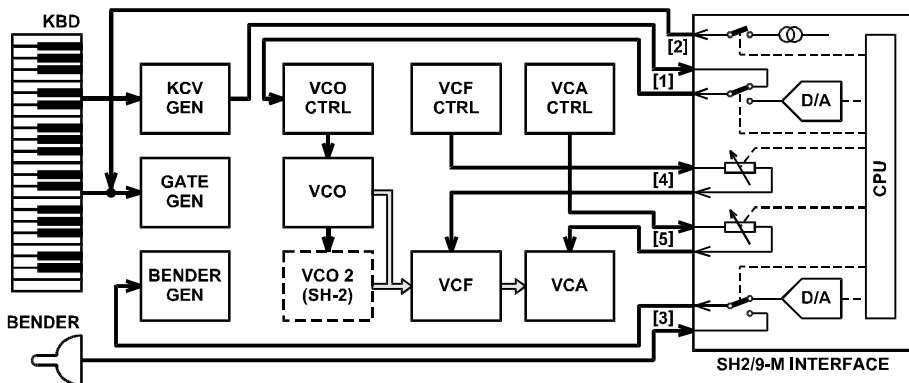
2. CONNECTION TO MIDI SYSTEM

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

2.1. CONNECTION FOR STANDARD WORKING MODE

Data from host MIDI system (PC, sequencer, master keyboard etc.) for control of SH-2 / SH-09 instrument are incoming to MIDI-IN input of the interface.

All MIDI data incoming to MIDI input of the interface are transferred to MIDI-THRU/OUT output of the interface without any changes (THRU function). It enables connection of next MIDI devices to host system without an additional Thru-Box etc. MIDI input of next MIDI device will be simply interconnected with MIDI-THRU/OUT output of the interface (see pic. 2).

If there are no other devices controlled from the MIDI host system, only MIDI-IN cable is necessary (from host syste to MIDI-IN input of the interface). MIDI-THRU/OUT output of the interface stays unconnected.

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

PC, sequencer ...   SH-2 / SH-09   Next MIDI device
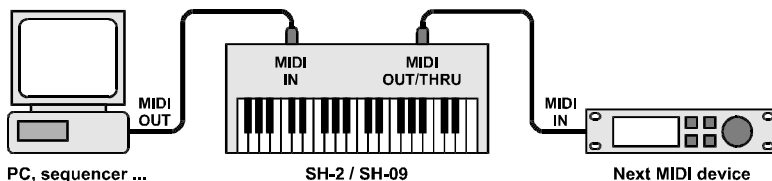
2.2. CONNECTION FOR MEMORY CONTENT TRANSFER

Except data from input MIDI-IN, own interface's System Exclusive messages are transmitted to output MIDI-THRU/OUT. These messages are transmitted as response of the interface to requests for memory banks content listing from host system.

If that function is used, MIDI output MIDI-THRU/OUT of the interface must be connected to MIDI input of host system (PC, sequencer…) in which data from interface's memory will be archived (see pic. 3).

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

PC, sequencer ...   SH-2 / SH-09
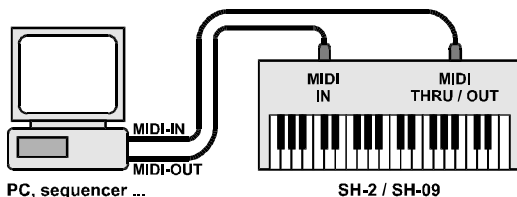
Attention! If this way of connection is used, function named MIDI ECHO, THRU etc. must be disabled in sequencer. In other case, communication loop can occur and whole MIDI system "freezes"!

3. INTERFACE OPERATION

The interface has only one manual control element – tumbler switch – which switches the interface on (activation of the interface) or off (deactivation of the interface). Working statuses and functions of the interface are indicated with help of two-color (red / green) LED.

Remark: Switch and indication LED need not to be installed unconditionally. The interface can be switched on and off remotely – with help of MIDI commands. Details are described in Appendix D.

3.1. INITIALIZATION SEQUENCE

Always when SH-2 / SH-09 instrument is switched on, reset sequence of interface's CPU is executed automatically. During this sequence, system parameters are read from memory (see chapter 4.1) and default values of preset parameters are stored into edit buffer (see table 2). This causes that the interface is set to initial non-active mode and it has no influence to the instrument. After that, status of tumbler switch is watched and in dependence on it, all next activity of the interface unwinds.

3.2. INSTRUMENT OPERATION

If the interface is switched off, it has no influence to the instrument and SH-2 / SH-09 instrument can be controlled by the same way like no MIDI interface is installed. In off status of the interface, all MIDI communication is disabled too – on both MIDI input and output of the interface. Also, indication LED doesn't light at all.

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After switching on (by manual switch), the interface stays still inactive (it has still no influence to the instrument) and indication LED doesn't still light. But MIDI communication is now enabled and the interface is prepared to take control over the instrument's circuits.

This occurs automatically after first MIDI command is received. Activation of the interface is indicated with LED – it lights red. Immediately after that, instrument's keyboard is disconnected and the interface takes control over instrument's VCO. Since this time, own instrument's keyboard can't be used yet. However, all other control elements on SH-2 / SH-09 instrument's panel stay fully functional except Bender – its function depends on setting of CONTROL - Bender Mode preset parameter (see chapter 4.2.16).

For return back to control the instrument from its own keyboard again, use CC #122 (Local Off/On – see chapter 5.1.2.1) or turn off the interface off by manual switch mounted on panel or just switch the SH-2 / SH-09 instrument off/on.

3.3. INDICATION OF WORKING STATUS

The user is informed about the actual interface's status by the dual color indication LED installed on instrument's panel.

If the interface is inactive, the LED does not light at all.

Active status of the interface is indicated by red light of the indication LED.

If indication of some function of the interface is allowed by CONTROL - Indicator Mode preset parameter (see chapter 4.2.17), selected function is indicated by green light or blink of the indication LED.

If there is an error occurred in interface's function, the indication LED starts to blink – see Appendix B.

4. PARAMETERS

Settings of parameters affects significantly operation of the interface during incoming MIDI commands processing and during control of instrument's circuits. The parameters are divided in two basic groups – system parameters and preset parameters – see pic. 4.

Pic. 4 – Structure of internal interface's memory
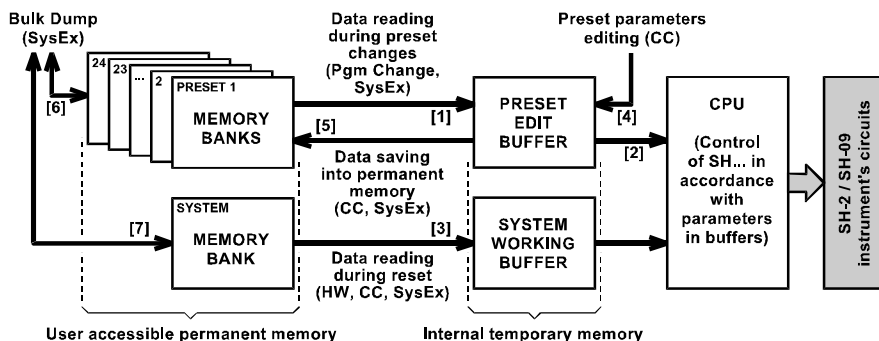
All parameters are stored in memory banks in internal memory of the interface. There is one memory bank for system parameters and 24 memory banks for preset parameters. Content of all memory banks can be read or changed with help of Bulk Dump SysEx Messages [6] and [7] (see description of System Exclusive communication).

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Content of system memory bank is read into working buffer and then to CPU always only during interface's reset [3].

Choice of requested preset can be done with help of standard MIDI command Program Change or with help of SysEx command (see description of System Exclusive communication). Always when preset is changed, content of selected preset memory bank is transferred to edit buffer [1] and from here, operation of interface's CPU is driven.

Preset parameters in edit buffer can be changed during the device operation with help of MIDI Control Changes [4]. Made changes then can be stored back to some of preset memory banks [5] (with help of SysEx command – see description of System Exclusive communication).

4.1. SYSTEM PARAMETERS

The system parameters control the basic function of the interface. System parameters are always valid independently on the actual preset settings – the change of the system parameters take effect the same way in all user presets.

System parameters can be changed only by Bulk Dump SysEx Messages (see description of System Exclusive communication). However, executed changes approve oneself till after interface's reset – when the instrument will be switched on next time!

The values of system parameters that are saved in factory or if "Factory Reset" is executed (see description of System Exclusive communication) shows table 1.

Table 1 – Range of valid values and a default values of system parameters				
Parameter name	Valid values		Default values (Factory Reset)	
	[dec]	[hex]	[dec]	[hex]
MIDI Channel	0 ~ 15	00 ~ 0F	0	00
ENV Break Pulse Duration	0 ~ 116	00 ~ 74	12	0C

4.1.1. MIDI CHANNEL

Parameter selects MIDI channel for the communication of the interface with MIDI system. It is possible to choose any of the 1-16 channels.

Parameter values are 0 - 15. Value 0 is for MIDI channel Nr.1, value 1 selects Nr. 2 etc. up to value 15 which selects MIDI channel Nr. 16

4.1.2. ENV BREAK PULSE DURATION

Parameter sets the duration of break impulses for the instrument's ENV circuits if the interface works in Legato mode (see description of MIDI controller Nr. 68 – chapter 5.1.2.1). Length of the break impulses is defined by the following formula:

ENV_BREAK_PULSE = (PARAMETER_VALUE + 4) / 4 [in milliseconds]

Parameter values range is 0 - 116, corresponding to the length of the break impulses 1 ms - 30 ms. Default value is 12 (e.g. impulse with the length of approx. 4 ms). It is suitable for the most situations, only in the exceptional situations the value of the parameter can be adjusted to provide reliable reaction of the ENV circuits.

4.2. PRESET PARAMETERS

The preset parameters set functions of the interface whose influence sound of SH-2 / SH-09 instrument. The preset parameters sets, which and how MIDI commands are going to control BENDER, VCO, VCF, VCA and ENV circuits of the instrument.

Values of the preset parameters in edit buffer (see pic. 4) are set by the MIDI controllers (Control Changes) - it is possible to change them during the playing the instrument thus. Default values of the preset parameters stored in the edit buffer after reset are shown in table 2. These default values are also stored stored in all interface preset memory banks after "Factory Reset" procedure (see manual for SysEx communication).

Table 2 – Range of valid values and a default values of preset parameters						
Parameter name	**Range of valid values**		**Default values**		**Setting with help of MIDI CC Nr.**	
	[dec]	**[hex]**	**[dec]**	**[hex]**	**[dec]**	**[hex]**
VCO – PITCH – Key Shift	0 ~ 79	00 ~ 4F	48	30	40	28
VCO – PITCH – Aftertouch Bend	0 ~ 127	00 ~ 7F	64	40	41	29
VCO – MOD – Wave	0 ~ 3	00 ~ 03	1	01	42	2A
VCO – MOD – Polarity	0 ~ 3	00 ~ 03	0	00	43	2B
VCO – MOD – Rate	0 ~ 127	00 ~ 7F	64	40	44	2C
VCO – MOD – Modulation Wheel Amt	0 ~ 127	00 ~ 7F	0	00	45	2D
VCO – MOD - Aftertouch Amount	0 ~ 127	00 ~ 7F	0	00	46	2E
VCO – MOD - Retrig	0 ~ 2	00 ~ 02	2	02	47	2F
VCF – Frequency	0 ~ 127	00 ~ 7F	127	7F	48	30
VCF – Key Follow	0 ~ 127	00 ~ 7F	64	40	49	31
VCF – Velocity Amount	0 ~ 127	00 ~ 7F	0	00	50	32
VCF – Aftertouch Amount	0 ~ 127	00 ~ 7F	0	00	51	33
VCA – Key Follow	0 ~ 127	00 ~ 7F	64	40	52	34
VCA – Velocity Amount	0 ~ 127	00 ~ 7F	0	00	53	35
VCA – Aftertouch Amount	0 ~ 127	00 ~ 7F	0	00	54	36
CTRL – Volume Mode	0 ~ 3	00 ~ 03	0	00	55	37
CTRL – Bender Mode	0 ~ 1	00 ~ 01	1	01	56	38
CTRL – Indicator Mode	0 ~ 3	00 ~ 03	0	00	57	39

Edited values of the parameters are stored in the edit buffer only. The content of the buffer is saved temporarily only (see pic. 4), till the preset change or instrument switch off or hardware reset. To save the edited parameters permanently, it is necessary to save them into a preset memory bank. There are 24 available spaces for user settings. Saving the values in a preset memory bank is done by the MIDI System Exclusive command (see manual for SysEx communication). With help of SysEx commands, it is also possible to change complete content of any preset memory bank.

4.2.1. VCO PITCH - KEY SHIFT (CC #40)

SH2/9-M interface accepts 49 MIDI notes – range of virtual keyboard is four octaves thus. Range of acceptable notes can be shifted with help of VCO PITCH - Key Shift parameter in whole scale of MIDI notes. Step is one semitone. Valid range of shift is from 0 to +79 semitones – value of the parameter can be from 0 to 79 thus.

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. 48. If shift is +1 semitone (parameter value is equal to 1), lowest key of corresponds to MIDI note Nr. 1 and highest key corresponds to MIDI note Nr. 49. And so on up to shift is +79 semitones (parameter value is equal to 79) when lowest key of virtual keyboard corresponds to MIDI note Nr. 79 and highest key corresponds to MIDI note Nr. 127. By other words, value of the parameter is equal to number of lowest acceptable MIDI note. Influence of parameter value shows pic. 5.

Pic. 5 – "VCO PITCH – Key Shift" parameter
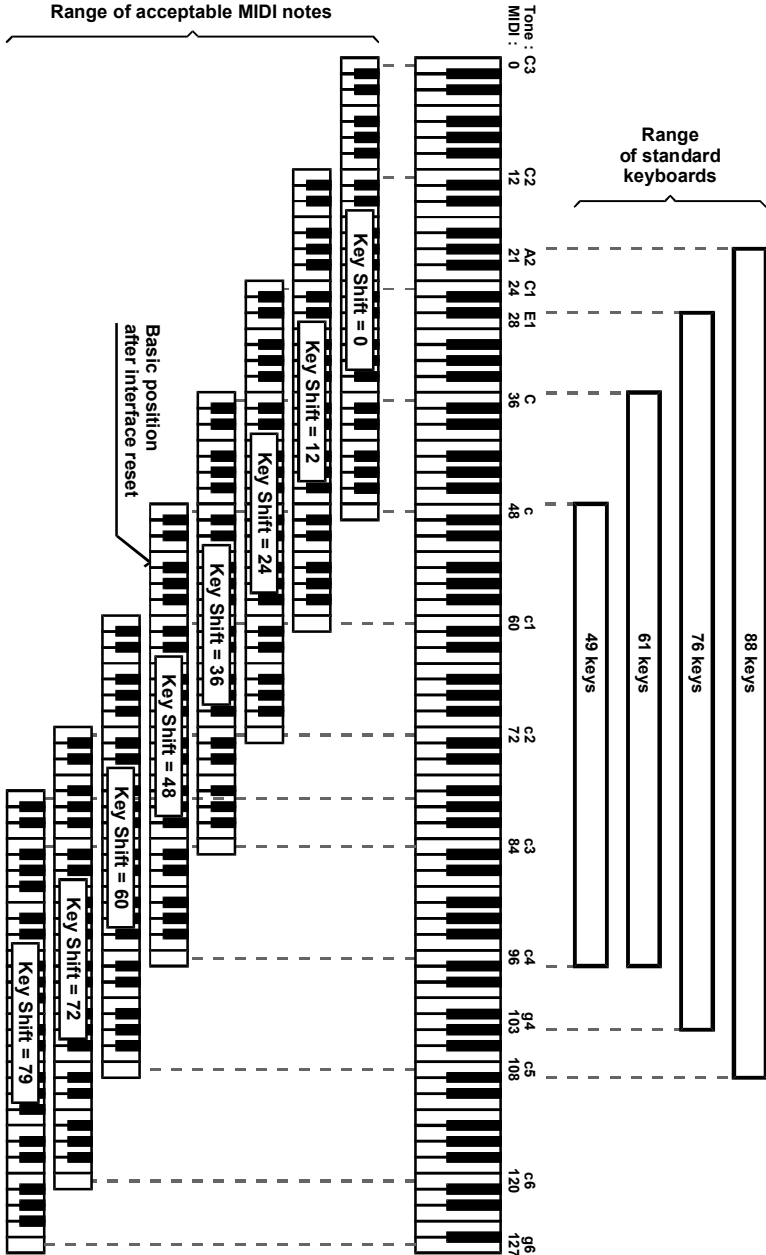
Range of acceptable MIDI notes

Range of standard keyboards

Tone : / MIDI :

C3	0
C2	12
A2	21
C1	24
E1	28
C	36
c	48
c1	60
c2	72
c3	84
c4	96
g4	103
c5	108
c6	120
g6	127

Key Shift = 0
Key Shift = 12
Key Shift = 24
Key Shift = 36
Key Shift = 48
Key Shift = 60
Key Shift = 72
Key Shift = 79

Basic position after interface reset

49 keys
61 keys
76 keys
88 keys

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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. 48. If shift is +1 semitone (parameter value is equal to 1), lowest key of corresponds to MIDI note Nr. 1 and highest key corresponds to MIDI note Nr. 49. And so on up to shift is +79 semitones (parameter value is equal to 79) when lowest key of virtual keyboard corresponds to MIDI note Nr. 79 and highest key corresponds to MIDI note Nr. 127. By other words, value of the parameter is equal to number of lowest acceptable MIDI note. Influence of parameter value shows pic. 5.

The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 40 – see chapter 5.1.2.2.

4.2.2. VCO PITCH – AFTERTOUCH BEND (CC #41)

Pic. 6 – "VCO PITCH - Aftertouch Bend" parameter

Frequency of instrument's VCO can be shifted ("bended") via MIDI command Channel Afterouch. The parameter sets level of influence of Channel Afterouch command to VCO frequency. Maximal possible VCO frequency shift is up to ±4 semitones.

Value of the parameter can be from 0 to 127. If value is equal to 64, MIDI command Channel Afterouch doesn't affect instrument's VCO frequency at all. For parameter values from 65 to 127, VCO frequency is increased directly proportional to value of Channel Aftertouch command (frequency is increased in +4 semitones for value 127 and Channel Aftertouch = 127). For parameter values from 63 to 0, VCO frequency is decreased directly proportional to value of Channel Aftertouch command (frequency is decreased in -4 semitones for value 0 and Channel Aftertouch = 127) – see pic. 6.

The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 41 – see chapter 5.1.2.2.
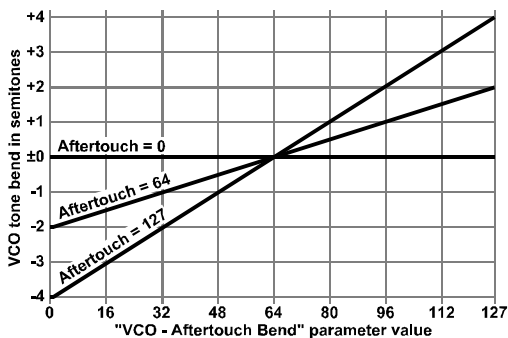
4.2.3. VCO MOD - WAVE (CC #42)

Pic. 7 – Modulation signal waveform

SH2/9-M interface includes internal software LFO, which can modulate (sweep) frequency of instrument's VCO. Parameter VCO MOD - Wave selects one from 4 possible waveforms of modulation signal (see pic. 7). Value of the parameter can be from 0 to 3. These values correspond to waveforms: **"Square"** (parameter value 0), **"Triangle"** (parameter value 1), **"Saw-Fall"** (parameter value 2) and **"Saw-Rise"** (parameter value 3).

The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 42 – see chapter 5.1.2.2.

4.2.4. VCO MOD - POLARITY (CC #43)

The parameter chooses sweeping polarity (orientation) of instrument's VCO by internal interface's LFO. Value of the parameter can be from 0 to 3. These values set four polarities: **"Center-1"** (value 0), **"Center-2"** (value 1), **"Up"** (value 2) and **"Down"** (value 3) – see pic. 8.

The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 43 – see chapter 5.1.2.2.

Polarity **"Center 1 - 0°"**

Frequency of VCO is swept symmetrically around basic frequency.

Polarity **"Center 2 - 180°"**

Same as previously, Frequency of VCO is swept symmetrically around basic frequency, but phase shift of modulation signal is 180°.

Polarity **"Up"**

Frequency of VCO is swept only up from basic frequency (i.e. VCO frequency is only increased by modulation).

Polarity **"Down"**

Frequency of VCO is swept only down from basic frequency (i.e. VCO frequency is only decreased by modulation).

Pic. 8 – Modulation signal polarity
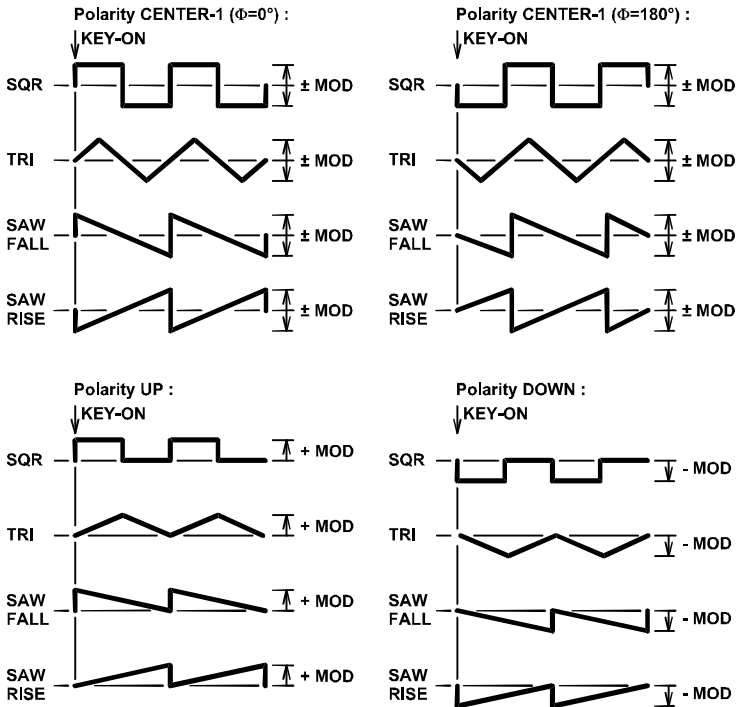
4.2.5. VCO MOD - RATE (CC #44)

The parameter sets rate of interface's internal software LFO. Duration of period and frequency respectively of internal LFO correspond to parameter value from 0 to 127 shows table 3 and pic. 9.

The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 44 – see chapter 5.1.2.2.

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Pic. 9 – Rate of internal modulation signal

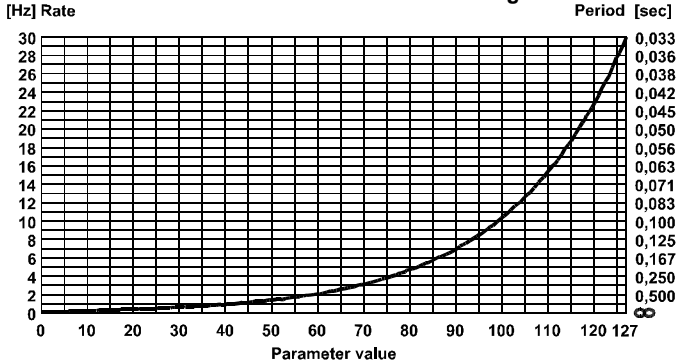| Table 3 - Period duration / frequency of internal LFO											
Param.	Mod- Rate		Param.	Mod – Rate		Param.	Mod - Rate		Param.	Mod - Rate	
	Period	Freq.		Period	Freq.		Period	Freq.		Period	Freq.
[dec]	[sec]	[Hz]	[dec]	[sec]	[Hz]	[dec]	[sec]	[Hz]	[dec]	[sec]	[Hz]
0	5,000	0,200	32	1,415	0,707	64	0,400	2,498	96	0,113	8,830
1	4,807	0,208	33	1,360	0,735	65	0,385	2,599	97	0,109	9,185
2	4,621	0,216	34	1,307	0,765	66	0,370	2,703	98	0,105	9,555
3	4,442	0,225	35	1,257	0,796	67	0,356	2,812	99	0,101	9,939
4	4,270	0,234	36	1,208	0,828	68	0,342	2,925	100	0,097	10,339
5	4,105	0,244	37	1,161	0,861	69	0,329	3,043	101	0,093	10,755
6	3,946	0,253	38	1,116	0,896	70	0,316	3,166	102	0,089	11,188
7	3,793	0,264	39	1,073	0,932	71	0,304	3,293	103	0,086	11,638
8	3,647	0,274	40	1,032	0,969	72	0,292	3,425	104	0,083	12,107
9	3,506	0,285	41	0,992	1,008	73	0,281	3,563	107	0,079	12,594
10	3,370	0,297	42	0,953	1,049	74	0,270	3,707	106	0,076	13,101
11	3,240	0,309	43	0,917	1,091	47	0,259	3,856	107	0,073	13,628
12	3,114	0,321	44	0,881	1,135	76	0,249	4,011	108	0,071	14,176
13	2,994	0,334	45	0,847	1,181	77	0,240	4,172	109	0,068	14,747
14	2,878	0,347	46	0,814	1,228	78	0,230	4,340	110	0,065	15,340
15	2,767	0,361	47	0,783	1,277	79	0,221	4,515	111	0,063	15,958
16	2,660	0,376	48	0,753	1,329	80	0,213	4,697	112	0,060	16,600
17	2,557	0,391	49	0,723	1,382	81	0,205	4,886	113	0,058	17,268
18	2,458	0,407	50	0,695	1,438	82	0,197	5,082	114	0,056	17,963
19	2,363	0,423	51	0,669	1,496	83	0,189	5,287	118	0,054	18,686
20	2,271	0,440	52	0,643	1,556	84	0,182	5,500	116	0,051	19,438
21	2,183	0,458	53	0,618	1,619	58	0,175	5,721	117	0,049	20,220
22	2,099	0,476	54	0,594	1,684	86	0,168	5,951	118	0,048	21,034
23	2,018	0,496	55	0,571	1,752	87	0,162	6,191	119	0,046	21,880
24	1,940	0,516	56	0,549	1,822	88	0,155	6,440	120	0,044	22,760
25	1,865	0,536	57	0,528	1,895	89	0,149	6,699	121	0,042	23,676
26	1,793	0,558	58	0,507	1,972	90	0,144	6,969	122	0,041	24,629
27	1,723	0,580	59	0,488	2,051	91	0,138	7,249	123	0,039	25,620
28	1,657	0,604	60	0,469	2,134	92	0,133	7,541	124	0,038	26,651
29	1,592	0,628	61	0,451	2,219	93	0,127	7,844	125	0,036	27,724
30	1,531	0,653	62	0,433	2,309	94	0,123	8,160	126	0,035	28,840
31	1,472	0,680	63	0,416	2,402	95	0,118	8,488	127	0,033	30,000

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4.2.6. VCO MOD - MODULATION WHEEL AMOUNT (CC #45)

Parameter sets maximal possible depth of instrument's VCO modulation allowed for MIDI controller Modulation (CC1). Value of the parameter can be from 0 to 127. If parameter value is equal to 0, MIDI controller Modulation (CC1) doesn't affect instrument's VCO modulation at all. For parameter values from 1 to 127 is maximal modulation depth increased directly proportional to value of the parameter (maximal depth of instrument's VCO modulation is ±4 semitones for value equal to 127 and CC1 = 127). VCO frequency is swept around frequency given by sum of basic VCO frequency and shift of Channel Aftertouch in dependence on VCO PITCH - Aftertouch Bend parameter (see pic. 10).

The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 45 – see chapter 5.1.2.2.

Pic. 10 – Resulting VCO frequency
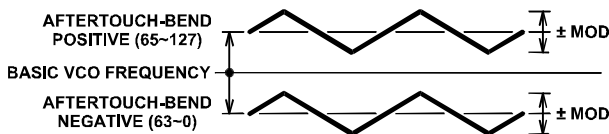
4.2.7. VCO MOD - AFTERTOUCH AMOUNT (CC #46)

Parameter sets maximal possible depth of instrument's VCO modulation allowed for MIDI command Channel Aftertouch. Value of the parameter can be from 0 to 127. If parameter value is equal to 0, Channel Aftertouch command doesn't affect instrument's VCO modulation at all. For parameter values from 1 to 127 is maximal modulation depth increased directly proportional to value of the parameter (maximal depth of instrument's VCO modulation is ±4 semitones for value equal to 127 and Channel Aftertouch = 127). VCO frequency is swept around frequency given by sum of basic VCO frequency and shift of Channel Aftertouch in dependence on VCO PITCH - Aftertouch Bend parameter (see pic. 9).

The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 46 – see chapter 5.1.2.2.

4.2.8. VCO MOD - RETRIG (CC #47)

The parameter disables or enables synchronization of start of internal LFO period (repeated triggering) with receiving of Note-On MIDI commands. Parameter is of use only if more keys are pressed simultaneously – see pic. 11. One of three types of synchronization can be chosen: **"Off"** (parameter value 0), **"On"** (parameter value 1) and **"Legato"** (parameter value 2).

"Off" Synchronization
Start of LFO period (LFO launching) is synchronized only with pressing of first key after previous releasing of all keys. Any next pressed key has no influence.

"On" Synchronization
Start of LFO period is always synchronized with pressing of any acceptable key (i.e. each time when acceptable Note-On command is received) - LFO is launched repeatedly and independently on previous releasing of all keys.

"Legato" Synchronization
Repeated launching of LFO is controlled by Legato MIDI controller (CC#68). LFO synchronization is always "On" in Legato mode (CC#68 values 64 to 127) and it is always "Off" in Non-Legato mode (CC#68 values 0 to 63) - see above.

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Pic. 11 – LFO synchronization in accordance with Retrig parameter
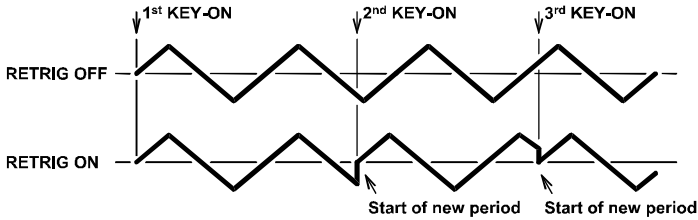
The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 47 – see chapter 5.1.2.2.

4.2.9. VCF – FREQUENCY (CC #48)

The parameter allows to decrease basic frequency of VCF set by potentiometer CUTOFF FREQUENCY on instrument's panel. Value of the parameter can be from 0 to 127. If parameter value is equal to 127, basic frequency of VCF set by potentiometer CUTOFF FREQUENCY isn't affected at all. When parameter value is decreased, cut-off frequency of VCF is decreased too, up to parameter value is equal to 0 when VCF is totally closed.

This parameter is useful for creation of atypical sound effects or frequency responses of VCF if the instrument is controlled via sequencer or PC.

The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 48 – see chapter 5.1.2.2.

Pic. 12 – "VCF – Frequency" parameter

4.2.10. VCF – KEY FOLLOW (CC #49)

Parameter sets affecting level of instrument's VCF by position of key on the master keyboard (i.e. in dependence on tone height).

Value of the parameter can be from 0 to 127. If value is equal to 64, VCF isn't affected by key position at all. For parameter values from 65 to 127, VCF cut-off frequency is increased directly proportional to MIDI note number. For parameter values from 63 to 0, VCF cut-off frequency is decreased directly proportional to MIDI note number.
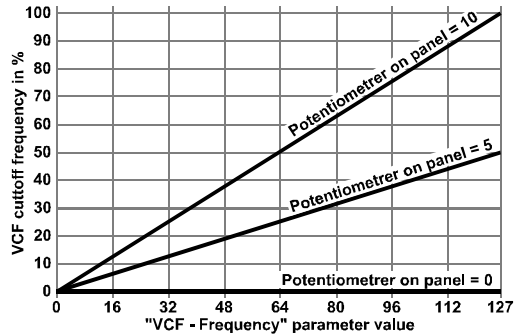
The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 49 – see chapter 5.1.2.2.

Pic. 13 – "VCF – Key Follow" parameter

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4.2.11. VCF – VELOCITY AMOUNT (CC #50)

Parameter sets affecting level of instrument's VCF by velocity value of MIDI Note-On commands. Cut-off frequency of VCF can be increased directly proportional to velocity value. Value of the parameter can be from 0 to 127. For value equal to 0, VCF isn't affected by velocity at all. For parameter value equal to 127, maximal affecting is allowed.

The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 50 – see chapter 5.1.2.2.
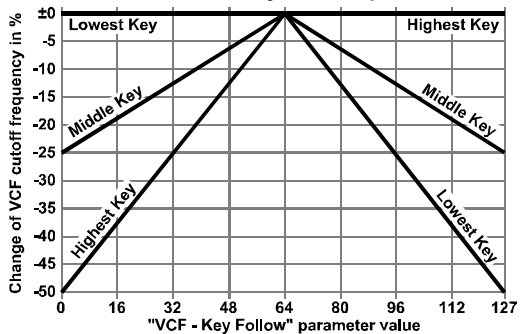
Pic. 14 – "VCF – Velocity Amount" parameter
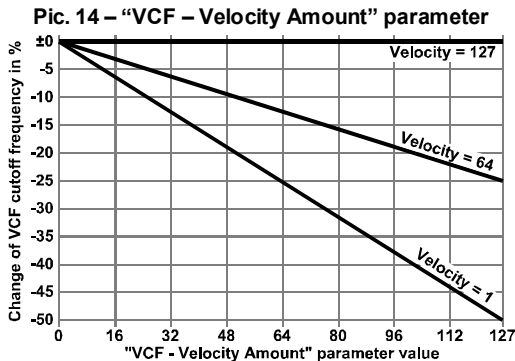
4.2.12. VCF – AFTERTOUCH AMOUNT (CC #51)

Parameter sets affecting level of instrument's VCF by value of last received Channel Aftertouch command. Cut-off frequency of VCF can be increased directly proportional to value of Channel Aftertouch. Value of the parameter can be from 0 to 127. For value equal to 0, VCF isn't affected by Channel Aftertouch at all. For parameter value equal to 127, maximal affecting is allowed.

The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 51 – see chapter 5.1.2.2.

Pic. 15 – "VCF – Aftertouch Amount" parameter

4.2.13. VCA – KEY FOLLOW (CC #52)

Parameter sets affecting level of instrument's VCA by position of key on the master keyboard (i.e. in dependence on tone height). Value of the parameter can be from 0 to 127. If value is equal to 64, VCA isn't affected by key position at all. For parameter values from 65 to 127, VCA gain is increased directly proportional to MIDI note number. For parameter values from 63 to 0, VCA gain is decreased directly proportional to MIDI note number.

The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 52 – see chapter 5.1.2.2.

Pic. 16 – "VCA – Key Follow" parameter

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4.2.14. VCA – VELOCITY AMOUNT (CC #53)

Parameter sets affecting level of instrument's VCA by velocity value of MIDI Note-On commands. Gain of VCA can be increased directly proportional to velocity value. Value of the parameter can be from 0 to 127. For value equal to 0, VCA isn't affected by velocity at all. For parameter value equal to 127, maximal affecting is allowed.
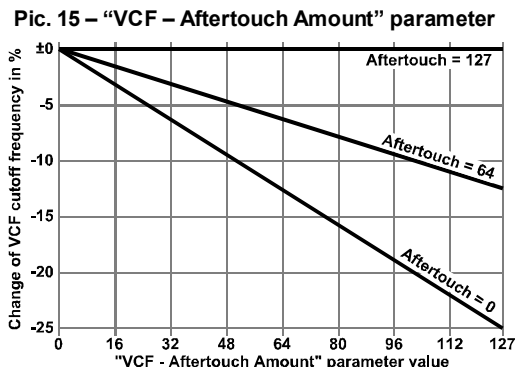
The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 53 – see chapter 5.1.2.2.

Pic. 17 – "VCA – Velocity Amount" parameter

4.2.15. VCA – AFTERTOUCH AMOUNT (CC #54)

Parameter sets affecting level of instrument's VCA by value of last received Channel Aftertouch command. Gain of VCA can be increased directly proportional to value of Channel Aftertouch. Value of the parameter can be from 0 to 127. For value equal to 0, VCA isn't affected by Channel Aftertouch at all. For parameter value equal to 127, maximal affecting is allowed.
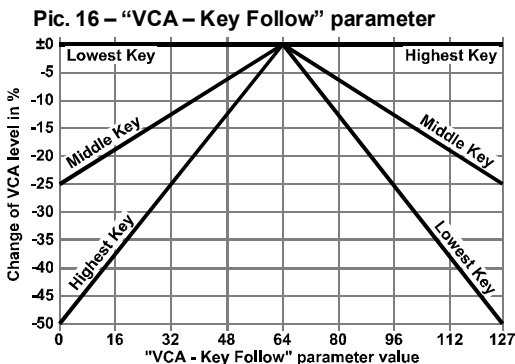
The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 54 – see chapter 5.1.2.2.

Pic. 18 – "VCA – Aftertouch Amount" parameter

4.2.16. CTRL – VOLUME MODE (CC #55)

The parameter allows to choose method of instrument's global loudness control via standard MIDI controllers Volume (CC7) and Expression (CC11). One of four methods can be chosen: **"Off"** (parameter value 0), **"Volume "** (parameter value 1), **"Expression"** (parameter value 2) and **"Volume + Expression"** (parameter value 3). In all cases, manual controller VOLUME on instrument's panel stays fully functional.

Mode **"Off"**
Control of instrument's global loudness via MIDI controllers Volume (CC7) and Expression (CC11) is disabled. Both controllers are ignored.

Mode **"Volume"**
Only MIDI controller Volume (CC7) is used for control of instrument's global loudness. Controller Expression (CC11) is ignored.
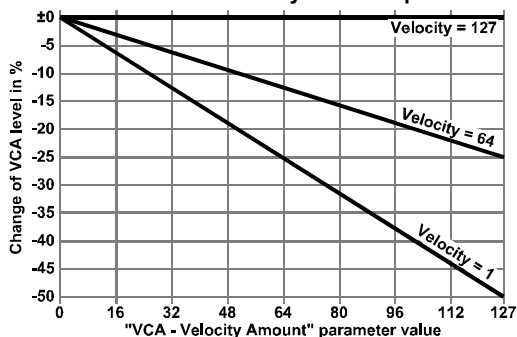
Mode **"Expression"**
Only MIDI controller Expression (CC11) is used for control of instrument's global loudness. Controller Volume (CC7) is ignored.
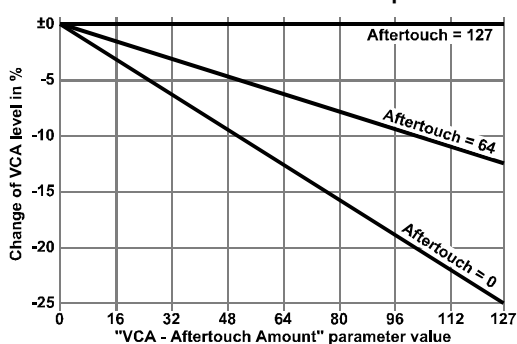
Mode **"Volume + Expression"**
Both MIDI controllers Volume (CC7) and Expression (CC11) are used for control of instrument's global loudness.

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The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 55 – see chapter 5.1.2.2.

4.2.17. CTRL – BENDER MODE (CC #56)

The parameter allows to choose method for control of instrument's bender. One of two modes can be chosen: „MIDI" (parameter value 0) or „**Instrument**" (parameter value 1).

Mode **"MIDI"**

Manual controller (lever) BENDER on instrument's panel is disconnected and MIDI command Pitch Bend (Pitch Wheel) takes control over the bender.

Mode **"Instrument"**

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

The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 56 – see chapter 5.1.2.2.

4.2.18. CTRL – INDICATOR MODE (CC #57)

The parameter allows to choose function of interface's LED indicator. One of four functions can be chosen: **"Off"** (parameter value 0), **"Gate** " (parameter value 1), **"MIDI-Msg"** (parameter value 2) and **"Mod-Rate"** (parameter value 3). LED indicator works only if the interface is active (i.e. the instrument is switched to MIDI mode – see chapter 3.2). If the interface is inactive, LED indicator doesn't light at all.

Mode **"Off"**

LED indicator is turned off in this mode – it light in red continuously.

Mode **"Gate"**

In this mode, LED indicator is copying status of envelope generator (ENV) - signal GATE. Indication LED lights in red in quiescent status and it lights in green if GATE signal is active.

Mode **"MIDI-Msg"**

In this mode, LED indicator indicates incoming MIDI commands which are acceptable for control of the interface. Only transfered MIDI data (THRU function) are not indicated - LED indicator lights in red. Always when acceptable MIDI data are received, the LED blinks in green.. If acceptable data flow is continuous, green LED lights seemingly constantly.

Mode **"Mod-Rate"**

In this mode, LED indicator indicates rate of interface's internal software LFO. LED indicator lights in red or in green alternatively (ratio 1:1) in dependence on internal LFO frequency.

The parameter value in edit buffer can be set during operation with help of MIDI controller (Control Changes) Nr. 56 – see chapter 5.1.2.2.

5. MIDI IMPLEMENTATION

SH2/9-M interface can communicate by all available methods – it recognizes MIDI channel commands, common system commands as well as SysEx MIDI commands.

5.1. CHANNEL COMMANDS

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

5.1.1. NOTE ON/OFF

Interface accepts Note-On and Note-Off commands in the range of max. 49 notes. Accepted note numbers are defined by VCO PITCH - Key Shift parameter (see chapter 4.2.1).

Although SH-2 a SH-09 are monophonic instruments, the interface remembers last six active Note-On commands. This is important if more keys are pressed on master keyboard in sequence and the last is released. In this case, the interface switches back to the previous pressed note (key). If there are six MIDI notes received yet, next received note replaces the first received note (last received note has the highest priority).

5.1.2. CONTROL CHANGES

The interface recognizes standard controllers Nr. 1, 7, 11, 64, 68, 120, 121, 123. Some other controllers are used for temporary setting of parameters values in edit buffer (CC Nr. from 40 to 57) and for control of interface's functions (CC Nr. 119).

CC Nr.	Name	Function	Valid value
**Table 4 – Acceptable CC overview**			
1	Modulation Wheel	Standard MIDI function	0 ~ 127
7	Volume	Standard MIDI function	0 ~ 127
11	Expression	Standard MIDI function	0 ~ 127
40	VCO PITCH – Key Shift	Controls "VCO PITCH – Key Shift" preset parameter	0 ~ 79
41	VCO PITCH – Aftertouch Bend	Controls "VCO PITCH – Aftertouch Bend" preset parameter	0 ~ 63 = Negative 64 = Off 65 ~ 127 = Positive
42	VCO MOD – Wave	Controls "VCO MOD – Wave" preset parameter	0 ~ 31 = Square 32 ~ 63 = Triangle 64 ~ 95 = Saw-Fall 96 ~ 127 = Saw-Rise
43	VCO MOD – Polarity	Controls "VCO MOD – Polarity" preset parameter	0 ~ 31 = Center 1 32 ~ 63 = Center 2 64 ~ 95 = Up 96 ~ 127 = Down
44	VCO MOD – Rate	Controls "VCO MOD – Rate" preset parameter	0 ~ 127
45	VCO MOD – Modulation Wheel Amount	Controls "VCO MOD – Modulation Wheel Amount" preset parameter	0 ~ 127
46	VCO MOD – Aftertouch Amount	Controls "VCO MOD – Aftertouch Bend" preset parameter	0 ~ 127
47	VCO MOD – Retrig	Controls "VCO MOD – Retrig" preset parameter	0 ~ 41 = Off 42 ~ 83 = On 84 ~ 127 = Legato
48	VCF – Frequency	Controls "VCF – Frequency" preset parameter	0 ~ 127
49	VCF – Key Follow	Controls "VCF – Key Follow" preset parameter	0 ~ 63 = Negative 64 = Off 65 ~ 127 = Positive
50	VCF – Velocity Amount	Controls "VCF – Velocity Amount" preset parameter	0 ~ 127
51	VCF – Aftertouch Amt	Controls "VCF – Aftertouch Amount" preset parameter	0 ~ 127
52	VCA – Key Follow	Controls "VCA – Key Follow" preset parameter	0 ~ 63 = Negative 64 = Off 65 ~ 127 = Positive
53	VCA – Velocity Amount	Controls "VCA – Velocity Amount" preset parameter	0 ~ 127
54	VCA – Aftertouch Amt	Controls "VCA – Aftertouch Amount" preset parameter	0 ~ 127

Table 4 – Acceptable CC overview (Continue)			
CC Nr.	**Name**	**Function**	**Valid value**
55	CTRL – Volume Mode	Controls "CTRL – Volume Mode" preset parameter	0 ~ 31 = Off 32 ~ 63 = Volume 64 ~ 95 = Expression 96 ~ 127 = Vol.+Exp
56	CTRL – Bender Mode	Controls "CTRL – Bender Mode" preset parameter	0 ~ 63 = Normal 64 ~ 127 = MIDI
57	CTRL – Indicator Mode	Controls "CTRL – Indicator Mode" preset parameter	0 ~ 31 = Off 32 ~ 63 = Gate 64 ~ 95 = MIDI 96 ~ 127 = Mod
64	Hold	Standard MIDI function	0 ~ 63 = Off 64 ~ 127 = On
68	Legato	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	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	All Notes Off	Standard MIDI function	0

5.1.2.1. STANDARD CONTROLLERS

CC #1 – Modulation Wheel

Controls modulation of instrument's VCO by signal of internal software LFO of the interface. Maximal depth of modulation is given by preset parameter VCO MOD – Modulation Wheel Amount. It can be up to ±4 semitones. The interface accepts whole range of controller values from 0 to 127.

CC #7 – Volume

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

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 #68 – Legato

The controller enables (values from 64 to 127) or disables (values from 0 to 63) Legato mode of playing, i.e. repeated start of the instrument's envelope generator (ENV) while receiving more MIDI Note-On commands simultaneously. The controller affects repeated start of internal interface's LFO too in dependence on setting of preset parameter VCO MOD - Retrig.

If the Legato mode is off, envelope generator (ENV) starts always repeatedly when any key is pressed (i.e. if acceptable Note-On command is received) independently on previous releasing of all keys.

If the Legato mode is on, envelope generator (ENV) starts only if first key is pressed after previous releasing of all keys. If any next key is pressed, the new key only changes the control voltage for VCO and the ENV remains unaffected.

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 0.

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 → minimum - off (0)
CC#7 Volume → maximum (127)
CC#11 Expression → maximum (127)
CC#48 Own controller VCF CUTOFF - Frequency → maximum (127)
CC#64 Hold → off (0)
CC#68 Legato → off (0)
Pitch Bend (Wheel) → middle position (4096)

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

CC #122 – Local Off / On

For the values from 0 to 63 (i.e. "Local Off"), instrument's keyboard is disconnected and instrument's VCO is controlled by Note On/Off MIDI commands.

Values from 64 to 127 (i.e. "Local On") returns control back to instrument's keyboard (the same status as after the interface reset.)

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 0.

5.1.2.2. CONTROLLERS FOR PRESET PARAMETERS EDITING AND SAVING

CC #40 – Own controller : VCO PITCH - Key Shift

Controls VCO PITCH – Key Shift parameter (see chapter 4.2.1). Note that acceptable range of the CC#40 is 0 to 79 only (corresponds to the VCO PITCH – Key Shift parameter). All other received values (80 to 127) are converted to the closest valid value (i.e. 79).

CC #41 – Own controller : VCO PITCH - Aftertouch Bend

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

CC #42 – Own controller : VCO MOD - Wave

Controls VCO MOD – Wave parameter (see chapter 4.2.3). Note that CC#42 values from 0 to 31 correspond to "Square" waveform, 32 to 63 to "Triangle" waveform, 64 to 95 to "Saw - Fall" waveform and 96 to 127 to "Saw - Rise" waveform.

CC #43 – Own controller : VCO MOD - Polarity

Controls VCO MOD – Polarity parameter (see chapter 4.2.4). Note that CC#43 values from 0 to 31 correspond to "Center 1" polarity, 32 to 63 to "Center 2" polarity, 64 to 95 to "Up" polarity and 96 to 127 to "Down" polarity.

CC #44 – Own controller : VCO MOD - Rate

Controls VCO MOD – Rate parameter (see chapter 4.2.5).

CC #45 – Own controller : VCO MOD - Modulation Wheel Amount

Controls VCO MOD – Modulation Wheel Amount parameter (see chapter 4.2.6).

CC #46 – Own controller : VCO MOD - Aftertouch Amount

Controls VCO MOD – Aftertouch Amount parameter (see chapter 4.2.7).

CC #47 – Own controller : VCO MOD - Retrig

Controls VCO MOD – Retrig parameter (see chapter 4.2.8). Note that CC#47 values from 0 to 41 correspond to "Off" synchronization, 42 to 83 to "On" synchronization and 84 to 127 to "Legato" synchronization.

CC #48 – Own controller : VCF - Frequency

Controls VCF – Frequency parameter (see chapter 4.2.9).

CC #49 – Own controller : VCF – Key Follow

Controls VCF – Key Follow parameter (see chapter 4.2.10).

CC #50 – Own controller : VCF - Velocity Amount

Controls VCF – Velocity Amount parameter (see chapter 4.2.11).

CC #51 – Own controller : VCF - Aftertouch Amount

Controls VCF – Aftertouch Amount parameter (see chapter 4.2.12).

CC #52 – Own controller : VCA – Key Follow

Controls VCA – Key Follow parameter (see chapter 4.2.13).

CC #53 – Own controller : VCA - Velocity Amount

Controls VCA – Velocity Amount parameter (see chapter 4.2.14).

CC #54 – Own controller : VCA - Aftertouch Amount

Controls VCA – Aftertouch Amount parameter (see chapter 4.2.15).

CC #55 – Own controller : CTRL - Volume Mode

Controls CTRL – Volume Mode parameter (see chapter 4.2.16). Note that CC#55 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.

CC #56 – Own controller : CTRL - Bender Mode

Controls CTRL – Bender Mode parameter (see chapter 4.2.17). Note that CC#56 values from 0 to 63 correspond to "Normal" mode and 64 to 127 to "MIDI" mode.

CC #57 – Own controller : CTRL - Indicator Mode

Controls CTRL – Indicator Mode parameter (see chapter 4.2.18). Note that CC#57 values from 0 to 31 correspond to "Off" mode, 32 to 63 to "Gate" mode, 64 to 95 to "MIDI - Msg" mode and 96 to 127 to "LFO - Rate" mode.

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 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 AFTERTOUCH

Channel Aftertouch command can affect instrument's VCO, VCF and VCA accordingly to the VCO PITCH - 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 switches the user presets of the interface. Only program numbers from 0 to 23 are accepted and they correspond to presets numbers from 1 to 24. Program numbers from 24 to 127 are ignored.

Always when acceptable Program Change command is received, instrument's VCO is muted and envelope generator (ENV) is switched off. When the next MIDI Note-On command is received, the interface starts to work normally accordingly to the parameters of newly selected preset (program).

5.2. COMMON SYSTEM COMMAND - RESET

Only "System Reset" common system command is recognized. 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 (the same as after the instrument is switched on) and they don't affect the instrument.

5.3. SYSTEM EXCLUSIVE MESSAGES

The interface is equipped by the System Exclusive communication protocol, that enables bi-directional data flow of the memory bulk dumps and some system functions. Detailed description of the System Exclusive communication is in separate manual.

Attached CD-ROM contains software generator for creation of SysEx Messages for communication between the interface and MIDI host system. The software generator can create easily any kind of message necessary for control of the interface.

6. LIMITATION DURING THE INTERFACE USAGE AND RECOMMENDED SETTING

When the interface is active, it is impossible to use own instrument's keyboard. If a key on instrument's keyboard is pressed, instrument's VCO will not be affected (detuned) but unadvisable launching of envelope generator will occur.

Also portamento circuit (PORTAMENTO slider) of the instrument is totally functionless after the interface activation! Unfortunately, instrument's hardware design don't allow usage of portamento if instrument's VCO is controlled by external voltage.

Function of BENDER controller on instrument's panel depends on setting of CONTROL - Bender Mode parameter – see chapter 4.2.17.

All other control elements on SH-2 / SH-09 instrument's panel stay fully functional although the instrument is driven via MIDI bus with help of SH2/9-M interface.

We recommend to disuse GATE+TRIG position of selector for choice of envelope generator (ENV) launching if the instrument is controlled via MIDI. In this mode, unwanted triggering of envelope can occur. It is caused by influence of frequency jumping if VCO is modulated by interface's internal software LFO.

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 %

8. WARRANTY CONDITIONS

The equipment is provided with **thirty-month 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.

APPENDIX A. - MIDI IMPLEMENTATION CHART

MIDI IMPLEMENTATION CHART

Device : **SH2/9-M**   Date : 10 / 2011

Model : **8-437**   Version : 1.0

Function		Transmission	Reception	Remarks
Basic	Default	X	1~16	[1]
Channel	Changed	X	1~16	[1]
Mode	Default	X	Mode 3	Not Altered [2]
	Messages	X	X	
Note Number		X	0~127	[3]
Velocity	Note ON	X	O	
	Note OFF	X	X	
After	Key's	X	X	
Touch	Channel's	X	O	
Pitch Bender		X	O	
Control	1	X	O	Modulation
Changes	7	X	O	Volume
	11	X	O	Expression
	40 to 57	X	O	Own controllers – see description
	64	X	O	Hold
	68	X	O	Legato
	119	X	O	Own controller – see description
	120	X	O	All Sound Off
	121	X	O	Reset All Controllers
Program Change		X	O	Preset Change
System Exclusive		O	O	See description
System	Song Position	X	X	
Common	Song Select	X	X	
	Tune	X	X	
System	Clock	X	X	
Real Time	Command	X	X	
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 49 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

APPENDIX B. - ERROR STATUS INDICATION

If any fatal error occurs rarely during interface operation, the interface disconnects itself from instrument's circuits ant it stops MID communication too. However, the instrument still can be controlled via its own keyboard and panel knobs.

User is informed about that situation by fast blinking of indication LED. LED indicator blinks in green if fatal error occurs in MIDI communication with host system (e.g. input MIDI data buffer overflows). Any error in communication between interface's CPU and memory is indicated by blinking of red LED indicator.

If a fatal error occurs, it is necessary to reset the interface totally for proper operation refresh - it is necessary turn the SH-2 / SH-09 instrument off and turn it on repeatedly after a moment.

APPENDIX C. – EMERGENCE OF LOOP IN MIDI COMMUNICATION

When SH2/9-M interface is controlled by a sequencer (HW or SW) and the devices are interconnected bidirectionally (with both MIDI cables) and the sequencer isn't set correctly, communication loop might occur and the entire MIDI system "freezes". It is caused due to the fact that all MIDI data incoming from sequencer to interface's input are transferred to interface's output (THRU function) and back to the sequencer thus. But the sequencer can also transfer MIDI data from input to its output in dependence on specific setting of the sequencer. This causes infinite cyclic transfer of the same MIDI data.

To avoid this situation, throughpass of MIDI data from input to output must be turned off in used sequencer. This function used to be name MIDI ECHO or MIDI THRU and the like in a sequencers.

APPENDIX D. – AUTOMATIC ACTIVATION OF INTERFACE

If manual switch of the interface is not installed and it is replaced by jumper (see installation manual for more info), the interface goes to active status immediately after initialization sequence (i.e. after the instrument is switched on – see chapter 3.1). MIDI communication is allowed but the interface still doesn't affect the instrument – it can be used by the same way as without installed interface.

The interface takes control over the instrument's circuits not until first MIDI command is incoming to interface's input MIDI-IN. Since this time, instrument's keyboard is disconnected and the interface takes control over instrument's VCO. However, all other controllers on instrument's panel stay fully functional.

The interface must be reset for return to status when the instrument isn't affected by the interface at all (i.e. instrument's keyboard can be used again). For reset of the interface, it is necessary turn the instrument off and then turn it on after a moment. Interface's reset can be invoked by software too – with help of common system MIDI command "Reset", with help of SysEx command "HW Reset" (see description of SysEx communication) or with help of MIDI controller (CC) Nr. 122 (see chapter 5.1.x.x).

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