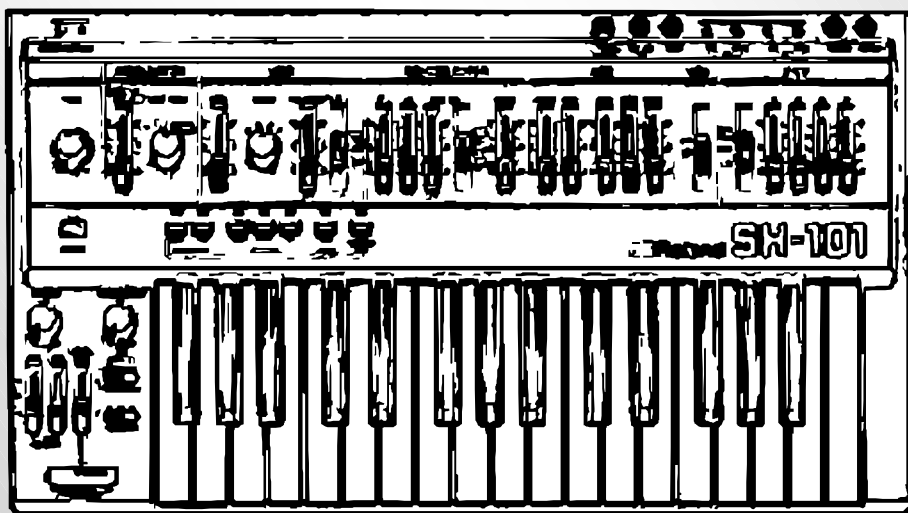


# SH 101-M

## MIDI Interface

### for Roland SH-101

Model 8-438  
ver. 1.0



INSTALLATION MANUAL  
Rev. 2





## Contents

page

<b>1</b>	<b>GENERAL INFORMATION</b>	<b>3</b>
1.1	MIDI INTERFACE KIT PARTS	3
<b>2</b>	<b>Chyba! Nenalezen zdroj odkazů.</b>	<b>4</b>
2.1	OPEN THE INSTRUMENT	5
2.2	DRILLING OF HOLES FOR MIDI SOCKETS, BUTTON AND INDICATION LED	5
2.3	MIDI SOCKETS, BUTTON AND INDICATION LED MOUNTING	6
2.4	GENERAL INFORMATION	7
2.4.1	CONTROL BOARD	8
2.4.2	SYNTH BOARD	10
2.4.3	BENDER BOARD	11
2.5	THE INTERFACE BOARD MOUNTING	12
2.6	FINISHING OF THE INSTALLATION	13
<b>3</b>	<b>CALIBRATION OF CONTROL VOLTAGE</b>	<b>14</b>
<b>4</b>	<b>INSTALLATION TIPS</b>	<b>15</b>
4.1	OUTPUT MIDI – THRU/OUT	15
4.2	RESET BUTTON AND INDICATION LED	15

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Manufacturer :

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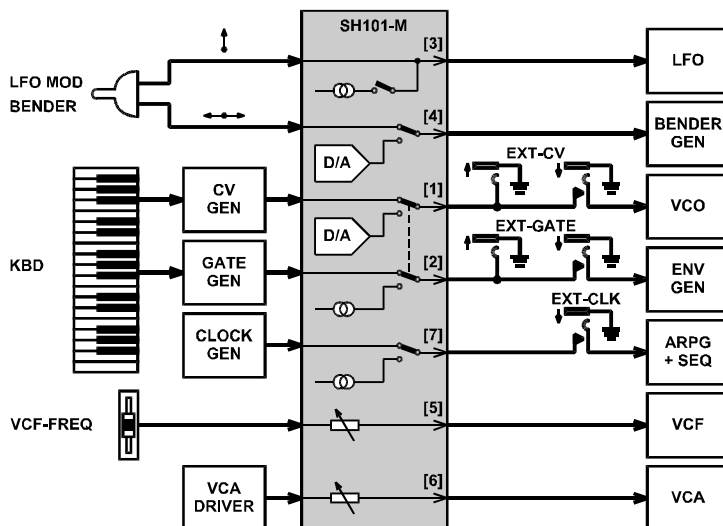
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www.chd-el.cz

## 1 GENERAL INFORMATION

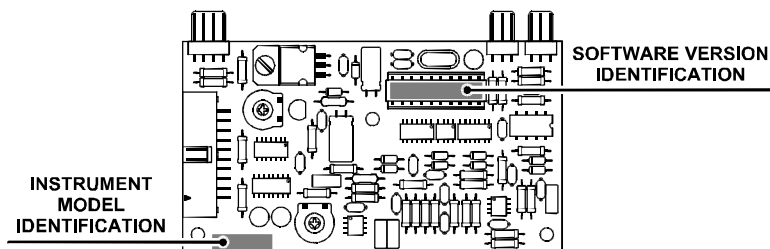
SH101-M MIDI interface controls various circuits of the Roland SH-101 synthesizer. Affected circuits are KEYBOARD (VCO [1] + ENV [2]), LFO [3], BENDER [4], VCF [5], VCA [6] and CLOCK [7]. Simplified block schematics of the interface installation in the instrument shows pic. 1.1.

**Pic. 1.1 – Connection to instrument circuits**



The interface firmware can be revised. Actual version of the firmware is printed on the identification label on the interface's processor (see pic. 1.2). It is also possible to read the actual version of software from the interface by MIDI System Exclusive message.

**Pic. 1.2 – Identification of the instrument model and SW version**

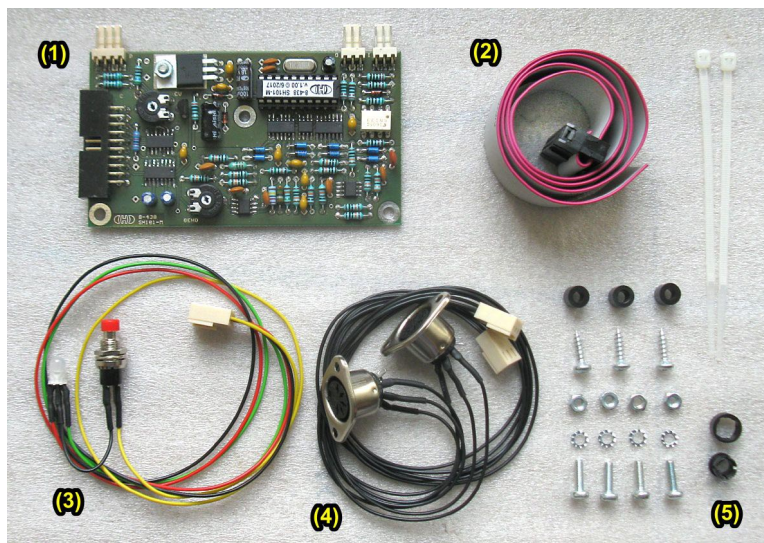


### 1.1 MIDI INTERFACE KIT PARTS

MIDI interface kit contents all necessary parts for installation incl. all support and coupling elements. The delivery also includes all installation, operation and SysEx communication manuals and CD-ROM with support software. Please check if the delivery is complete before installation (see pic. 1.1.1).



Pic. 1.1.1 – Parts of the interface kit



The SH101-M interface kit delivery contents :

- (1) MIDI Interface board
- (2) Flat control signals cable (20-core)
- (3) Bunched cables with button and LED
- (4) 2x DIN-5 socket with cable
- (5) Coupling elements (supports, screws, nuts, washers, LED holder, tightening strips ...)
- (6) Owner's and Installation manuals in printed form

## 2 MIDI INTERFACE INSTALLATION

Mounting of the interface in the Roland SH-101 synthesizer is very easy. If you follow the instructions from this manual, there should be no major problems during the installation. The interface installation procedure is thoroughly described in the following chapters. Please follow these instructions accurately to avoid any damage of the instrument.



**Attention! Disconnect the instrument from the mains prior to the installation. There is a risk of the electric shock!**



**Attention! Observe precautions for handling electrostatic discharge sensitive devices!**



**The producer is not responsible for any eventual mechanical or electrical damage of the SH-101 instrument caused by the infringement of the described installation procedure or by careless manipulation during the installation of the MIDI interface!**

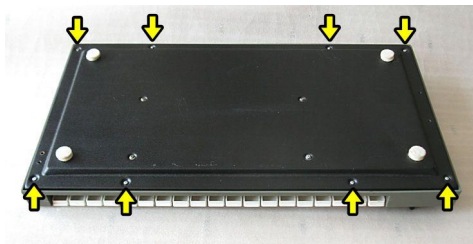


**It is recommended to calibrate the SH-101 accordingly to the instructions in service manual of the SH-101 prior the interface installation. This ensures trouble-free operation of the interface.**

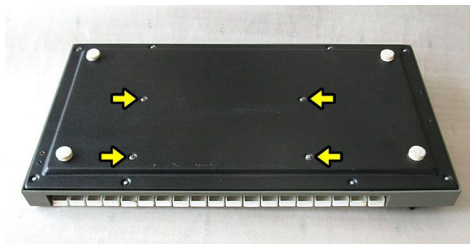
## 2.1 OPEN THE INSTRUMENT

a) Unscrew eight self-tapping screws fixing the metal bottom to the plastic cover body of the instrument (pic. 2.1.1) and two metric screws and two self-tapping screws fixing the keyboard (pic. 2.1.2) from the metal bottom cover of the instrument. Keep the screws. They will be used again after the MIDI kit installation is finished.

Pic. 2.1.1

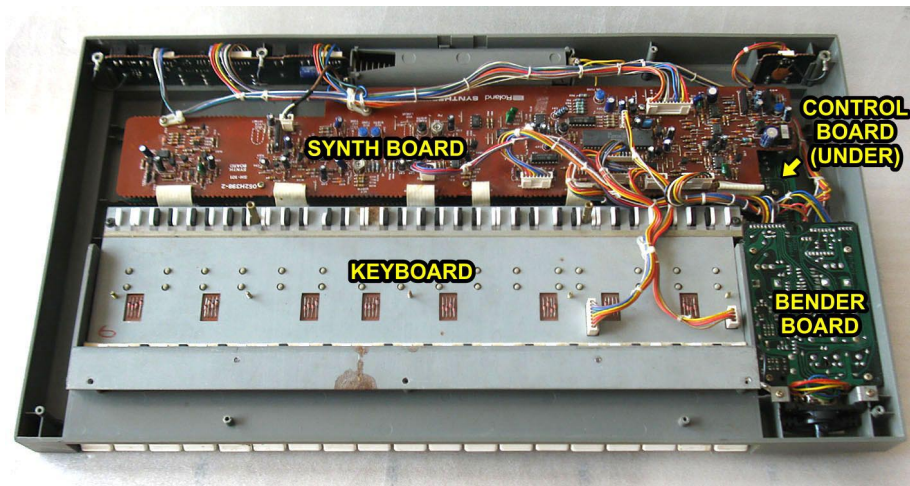


Pic. 2.1.2



b) Remove bottom cover of the instrument. All instrument's parts and boards needed for the interface installation are now accessible (pic. 2.1.3).

Pic. 2.1.3



## 2.2 DRILLING OF HOLES FOR MIDI SOCKETS, BUTTON AND INDICATION LED

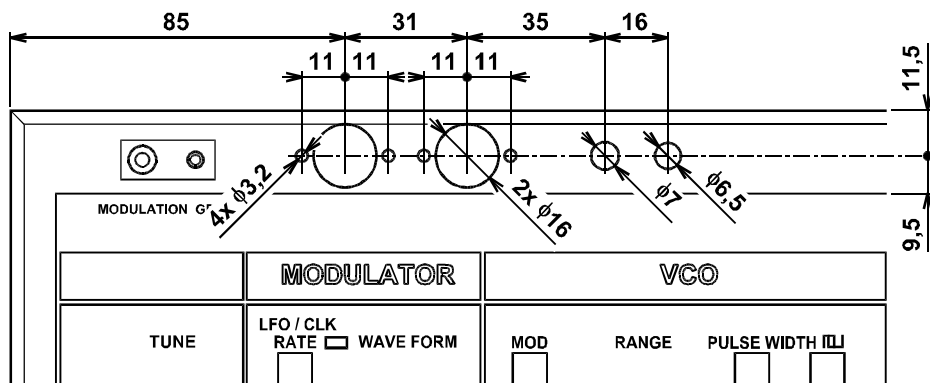
The interface has both MIDI input and output. Only MIDI input is necessary for the interface operation. MIDI output has not to be installed – see chapter 4. Nevertheless, having both MIDI input and output (MIDI-IN and MIDI-THRU/OUT sockets) is more convenient for an easy integration in the more advanced MIDI system. There are two control elements on the interface - button and two-color LED. They are not necessary for the interface operation, so they need not to be installed (if you prefer to maintain the vintage status of the instrument) – see chapter 4. Nevertheless having both of them installed is more convenient for easier device control.



a) Suitable place for MIDI sockets and control elements is on upper left side of the instrument (see pic. 2.2.1). It is necessary to drill a holes for them to the plastic cover of the instrument.

**Pic. 2.2.1**

- b) Drill two holes with diameter 16 mm, four holes with diameter 3,5 mm (for DIN sockets), one hole with diameter 7 mm (for button) and one hole with diameter 6,5 mm (for LED) to the top cover of the instrument – see pic. 2.2.2. Use sharp drills and **work carefully** so that the cover is not damaged during drilling!
- c) Clean the edge of all holes with small rasp or with point of bigger drill after the holes are drilled.

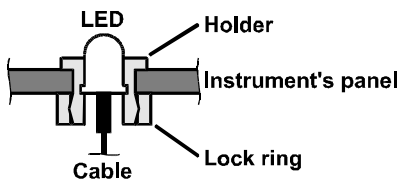
**Pic. 2.2.2**

## 2.3 MIDI SOCKETS, BUTTON AND INDICATION LED MOUNTING

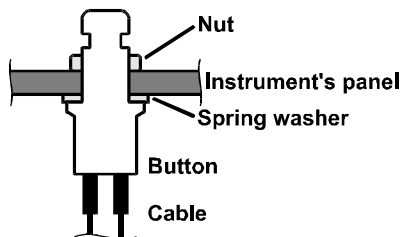
- a) Insert LED holder (from the interface accessory) into 6,5 mm hole in the instrument's panel from the outer side. Pull the lock ring of the LED holder over the supplied LED. Then insert the LED into the holder (from inner side of the instrument's panel) and fix it by the overthrust of the ring on the holder (pic. 2.3.1).
- b) Insert button into 7 mm hole in the instrument's panel from inner side. Fix the button to the panel with the nut and washer (pic. 2.3.2).



Pic. 2.3.1



Pic. 2.3.2

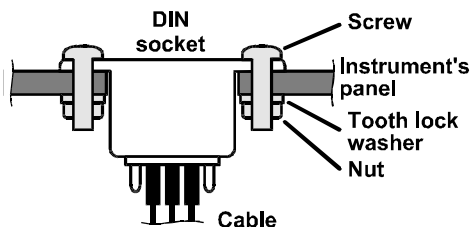


c) Pull flat connectors of MIDI cables through 16 mm holes in the instrument's panel from outer side and insert DIN sockets of the cables into the holes. Both MIDI cables are identical and can be swapped.

d) Fix DIN sockets to the drilled holes using screws, nuts and tooth lock washers from the interface accessory (pic. 2.3.3).

e) It is suitable to label the DIN sockets and the button ("MIDI IN", "MIDI THRU/OUT", "RESET" for example) with self-adhesive foil glued near the sockets, the LED and the button (pic. 2.3.4).

Pic. 2.3.3



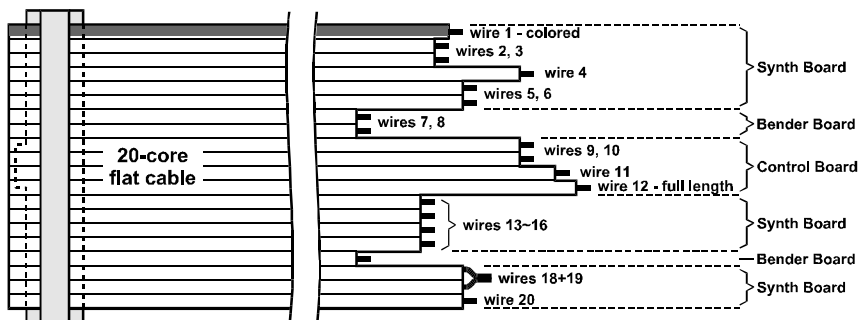
Pic. 2.3.4



## 2.4 CONTROL SIGNALS CABLE MOUNTING

20-core flat signal cable is fitted with 20-pin connector (pic. 2.4). Wires outgoing from this connector must be connected to several places at the instrument's boards.

Pic. 2.4







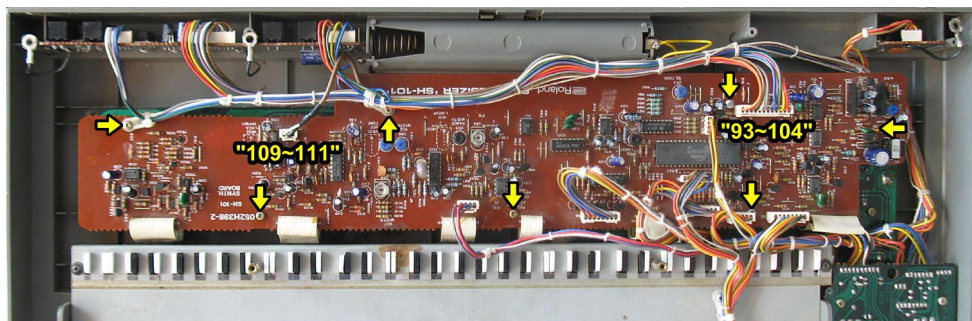
Split up free end of the cable (by ripping or cutting) to individual wires and adapt their lengths as necessary during the cable installation. Wire Nr. 1 (terminal) is signed with red color. Stripe ends of all wires in length about 2 mm and tin them before they are connected to the instrument. Individual control signals wires must be connected accordingly to the table 1 below.

**Table 1 – Wires of flat cable of control signals connection**

Wire	Signal	Connection			Remarks	
		Board	Point / Soldering pad	Picture		
1	+15V	Synth	+ pole of C12 capacitor	2.4.2.7	Colored wire	
2	-5V	Synth	Pin Nr. 7 of IC2 integrated circuit	2.4.2.8		
3	5Vref	Synth	Pin Nr. 1 of IC2 integrated circuit	2.4.2.8		
4	GND-A	Synth	Lead of C42 capacitor	2.4.2.2		
5	KBD-OUT	Synth	Pin "96" of connector "93~104"	2.4.2.6		
6	KBD-IN	Synth	Lead of R73 resistor	2.4.2.3		
7	BEND-OUT	Bender	Lead of C8 capacitor	2.4.3.2		
8	BEND-IN	Bender	Lead of R6 resistor	2.4.3.2		
9	VCF-OUT	Control	Lead of R186 resistor	2.4.1.4		
10	VCF-IN	Control	Wiper of VR17 potentiometer	2.4.1.4		
11	VCA-OUT	Control	Pin "80" of flat cable jumper "74~82"	2.4.1.3		
12	VCA-IN	Control	Common lead of S6 switch	2.4.1.3		
13	CLK-LOCK	Synth	Lead of R34 resistor	2.4.2.4	Full length, do not cut.	
14	CLK-OUT	Synth	Lead of C15 capacitor	2.4.2.4		
15	GATE-LOCK	Synth	Lead of R49 resistor	2.4.2.5		
16	GATE-OUT	Synth	Lead of R47 resistor	2.4.2.5		
17	MOD-OUT	Bender	Lead of R21 resistor	2.4.3.2	Both wires 18, 19 are soldered to the pad	
18	GND	Synth	Pin "95" of flat cable jumper "93~104"	2.4.2.6		
19						
20	+9V	Synth	+ pole of C11 capacitor	2.4.2.7		

## 2.4.1 CONTROL BOARD

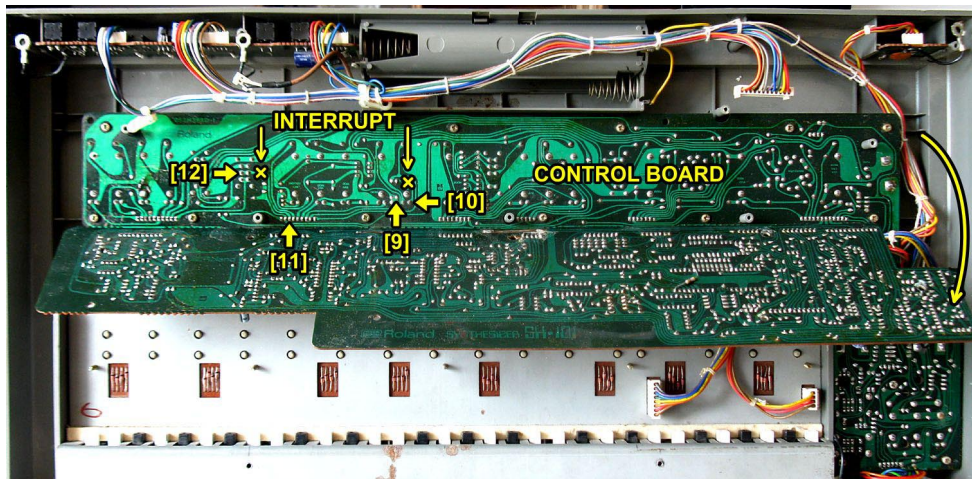
a) Wires from Nr. 9 to Nr. 12 of control signal cable will be connected to control board (OPH177-1). It is mounted to the instrument's panel under the synth board. It is necessary to disassemble the synth board (OPH177-2) first. It is fixed to the instrument body with seven self-tapping screws – they must be unscrewed (pic. 2.4.1.1). Keep the screws. They will be used again after the MIDI kit installation is finished.

**Pic. 2.4.1.1**



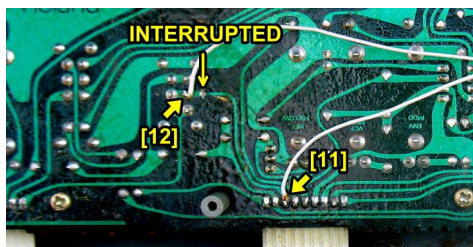
- b) Remove the “93~104” and “109~111” connectors from the synth board (pic. 2.4.1.1).
- c) Then turn the synth board over the instrument’ keyboard (pic. 2.4.1.2). Now, the control board is accessible.

**Pic. 2.4.1.2**

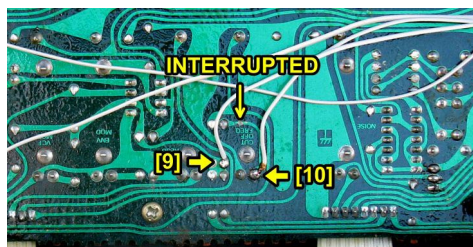


- d) On the control board - interrupt (e.g. using thick needle) connection between common lead of S6 switch and pin “80” of the “74~82” interconnecting flat cable jumper - between the synth and control boards (pic. 2.4.1.3). This connection is marked by crossline on pic. 2.4.1.2.
- e) Solder wire Nr. 12 “VCA-IN” to common lead of S6 switch ([12] on pic. 2.4.1.3). This wire has full length of the flat control signal cable (i.e. approx. 500 mm). It is not necessary to shorten this wire. The whole flat control signal cable leads up to the right from this soldering pad (to bender board).
- f) Solder wire Nr. 11 “VCA-OUT” to “80” pin of the “74~82” interconnecting flat cable jumper ([11] on pic. 2.4.1.3).

**Pic. 2.4.1.3**



**Pic. 2.4.1.4**

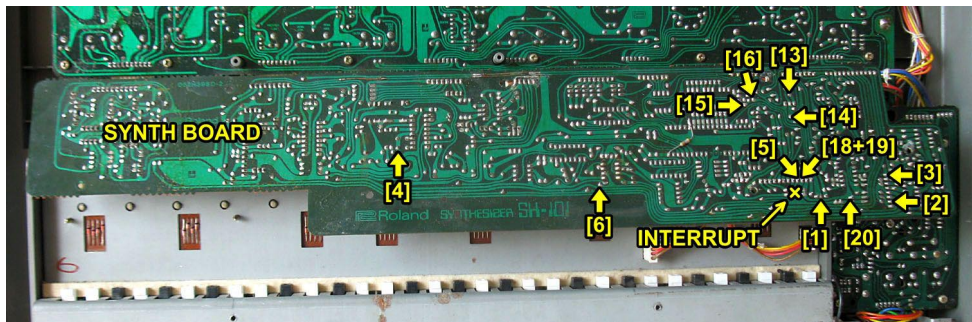


- g) On the control board - interrupt (e.g. using thick needle again) connection between wiper of VR17 potentiometer and lead of R186 resistor (pic. 2.4.1.4). This connection is marked by crossline on pic. 2.4.1.2.
- h) Solder wire Nr. 10 “VCF-IN” to wiper pad of VR17 potentiometer ([10] on pic. 2.4.1.4).
- i) Solder wire Nr. 9 “VCF-OUT” to lower lead of R186 resistor ([9] on pic. 2.4.1.4).

## 2.4.2 SYNTH BOARD

a) Wires Nr. 1 to Nr. 6 and Nr. 13 to Nr. 20 of flat control signal cable will be connected to the synth board (OPH177-2, pic. 2.4.2.1).

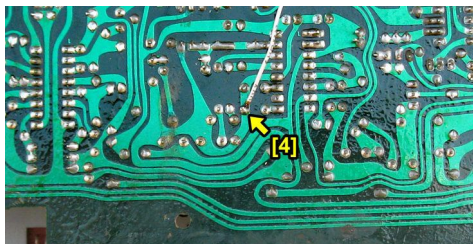
**Pic. 2.4.2.1**



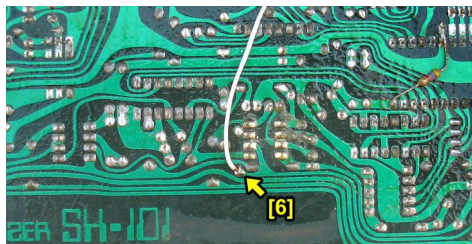
b) Solder wire Nr. 4 "GND-A" to left lead of C42 capacitor ([4] on pic. 2.4.2.2).

c) Solder wire Nr. 6 "KBD-IN" to lower lead of R73 resistor ([6] on pic. 2.4.2.3).

**Pic. 2.4.2.2**



**Pic. 2.4.2.3**



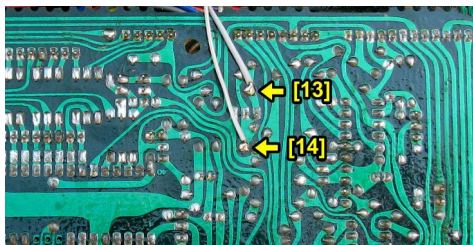
d) Solder wire Nr. 13 "CLK-LOCK" to right lead of R34 resistor ([13] on pic. 2.4.2.4).

e) Solder wire Nr. 14 "CLK-OUT" to upper lead of C15 capacitor ([14] on pic. 2.4.2.4).

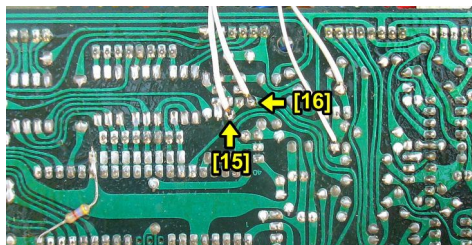
f) Solder wire Nr. 15 "GATE-LOCK" to upper lead of R49 resistor ([15] on pic. 2.4.2.5).

g) Solder wire Nr. 16 "GATE-OUT" to lower lead of R47 resistor ([16] on pic. 2.4.2.5).

**Pic. 2.4.2.4**



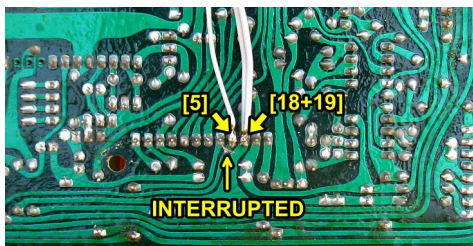
**Pic. 2.4.2.5**



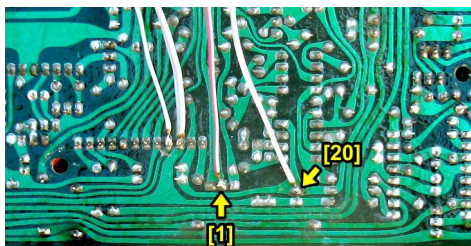


- h) On synth board, interrupt (e.g. using thick needle) connection between “96” pin of the “93~104” connector and lead of R73 resistor (pic. 2.4.2.6). This connection is marked by crossline on pic. 2.4.2.1.
- i) Solder wire Nr. 5 “KBD-OUT” to “96” pin of the “93~104” connector ([5] on pic. 2.4.2.6).
- j) Solder both wires Nr. 18 and Nr. 19 “GND” to “95” pin of the “93~104” connector ([18+19] on pic. 2.4.2.6).
- k) Solder wire Nr. 1 “+15V” to + pole of C12 capacitor ([1] on pic. 2.4.2.7).
- l) Solder wire Nr. 20 “+9V” to + pole of C11 capacitor ([20] on pic. 2.4.2.7).

**Pic. 2.4.2.6**

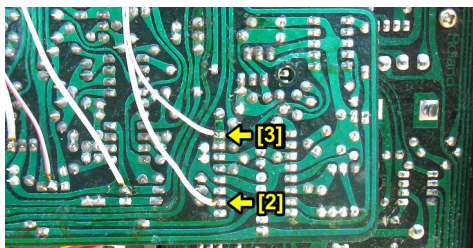


**Pic. 2.4.2.7**

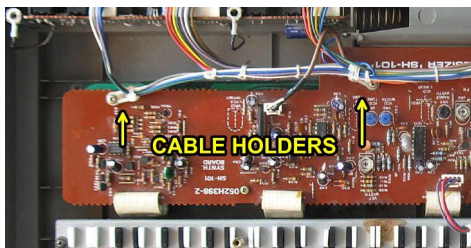


- m) Solder wire Nr. 2 “-5V” to pin Nr. 7 of IC2 integrated circuit ([2] on pic. 2.4.2.8).
- n) Solder wire Nr. 3 “5Vref” to pin Nr. 1 of IC2 integrated circuit ([3] on pic. 2.4.2.8).
- o) The synth board (OPH177-2) can be now placed to its original position. Turn it back and fix it to the instrument body with original seven self-tapping screws (pic. 2.4.1.1). Be sure that no wire of the flat control signal cable is pinched between the board and support etc. Do not forget to fix two cable holders to the board (pic. 2.4.2.9). Plug “93~104” and “109~111” connectors back to the synth board.

**Pic. 2.4.2.8**



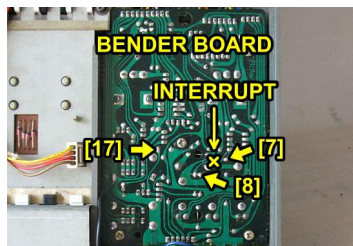
**Pic. 2.4.2.9**



## 2.4.3 BENDER BOARD

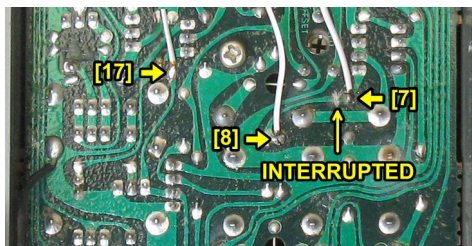
- a) Wires Nr. 7, 8 and 17 of the control signal cable will be connected to bender board (OPH178-1, pic. 2.4.3.1).
- b) On the bender board - interrupt (e.g. using thick needle) connection between lead of R6 resistor and C8 capacitor (pic. 2.4.3.2). This connection is marked by crossline on pic. 2.4.3.1.
- c) Solder wire Nr. 7 “BEND-OUT” to upper lead of C8 capacitor ([7] on pic. 2.4.3.2).

**Pic. 2.4.3.1**

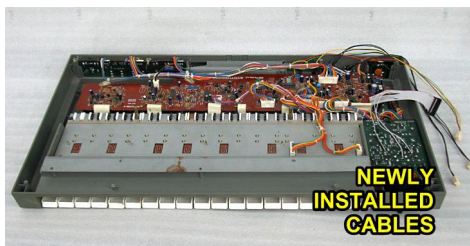


- d) Solder wire Nr. 8 "BEND-IN" to upper lead of R6 resistor ([8] on pic. 2.4.3.2).
- e) Solder wire Nr. 17 "MOD-OUT" to lower lead of R21 resistor([17] on pic. 2.4.3.2).
- f) Having all these done, the instrument should look like on the pic. 2.4.3.3.

Pic. 2.4.3.2



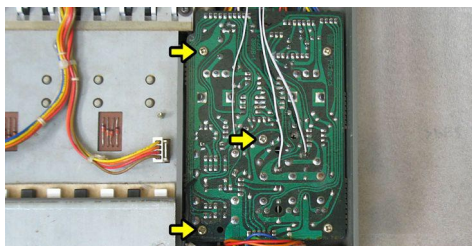
Pic. 2.4.3.3



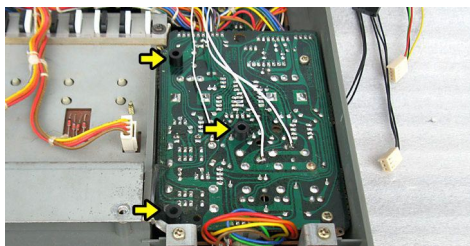
## 2.5 THE INTERFACE BOARD MOUNTING

- a) The interface board will be placed over the bender board (OPH178-1). Unscrew three self-tapping screws from the bender board (pic. 2.5.1).
- b) Put plastic supports from the interface accessory to the bender board where the removed screws were placed originally (pic. 2.5.2).

Pic. 2.5.1

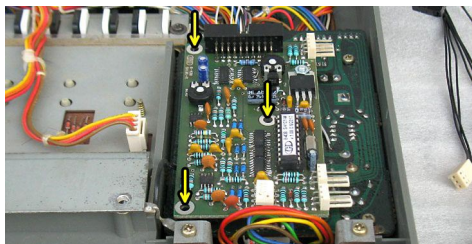


Pic. 2.5.2

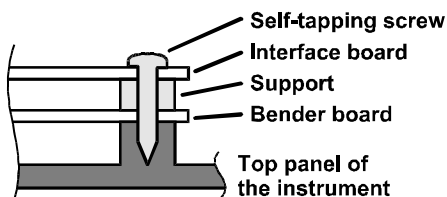


- c) Place the interface board to the plastic supports. Be carefully so that the supports stay on its positions (pic. 2.5.3).
- d) Fix the interface board to the instrument using three self tapping screws from the interface accessory (pics. 2.5.3, 2.5.4). These screws are longer than the original screws. Be sure that no wire of the flat control signal cable is pinched between the board and support etc.

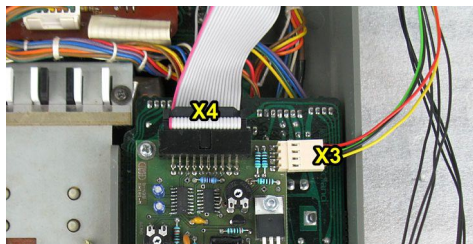
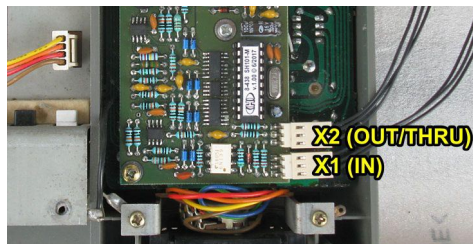
Pic. 2.5.3



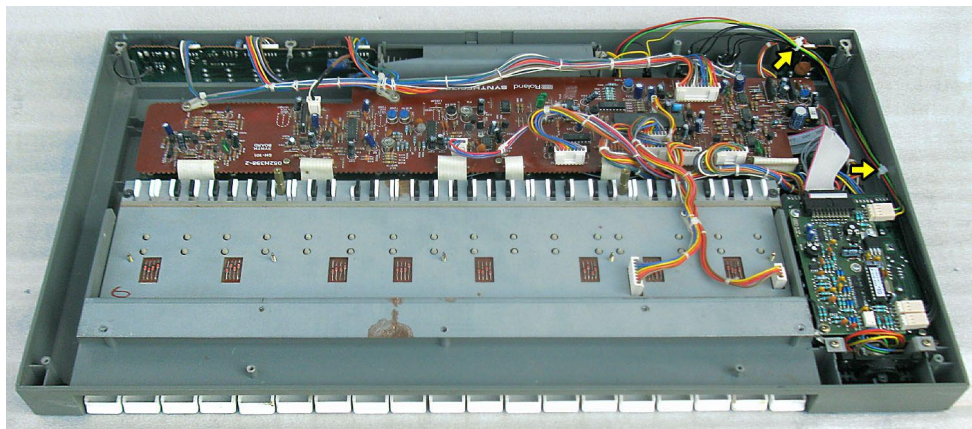
Pic. 2.5.4



- e) Plug 20-pin connector of the control signal cable to X4 plug head on the interface board. Orientation of the connector is given by the connector lock and it can't be plugged incorrectly (pic. 2.5.5).
- f) Plug the 4-pin connector of bunched cables with button and LED to X3 plug head on the interface board. Orientation of the connector is by the connector lock again (pic. 2.5.5).
- g) Plug two 3-pin connectors of MIDI cables to X1 and X2 plug heads on the interface board. Orientation of the connectors is given by the connector lock again but be sure that the connectors are not exchanged: MIDI input must be plugged to X1 head and MIDI output to X2 head (pic. 2.5.6).

**Pic. 2.5.5**

**Pic. 2.5.6**


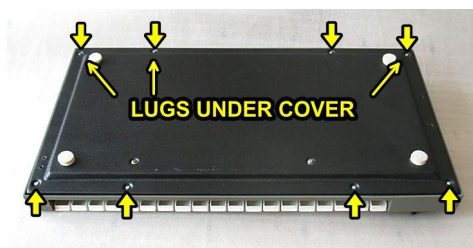
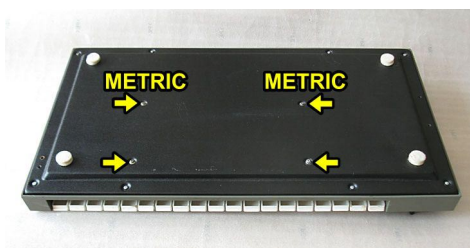
- h) Align cables of MIDI sockets, LED and button and fix them with two plastic stripes from the interface accessory (pic. 2.5.7).

**Pic. 2.5.7**


## 2.6 FINISHING OF THE INSTALLATION

- a) Place the metal bottom cover back to the instrument. Be sure that the three grounding lugs are correctly placed under holes in the cover (pic. 2.6.1).
- b) Fix the metal cover with original eight self-tapping screws to plastic cover (pic. 2.6.1) and two self-tapping and two metric screws to keyboard (pic. 2.6.2). This is the reverse procedure of the steps described in the chapter 2.1.



**Pic. 2.6.1****Pic. 2.6.2**

c) The installation of the MIDI interface kit is now finished and the SH-101 instrument is prepared for MIDI communication. Please read carefully user manual of the interface before usage of modified instrument.

### 3 CALIBRATION OF CONTROL VOLTAGE

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. Note: **The calibration procedure is not necessary if the keyboard's CV of the SH-101 is adjusted exactly as described in service manual of the instrument.**

The calibration range is approx.  $\pm 90$  cents, calibration step is 1,465 cent (see table 2). 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 ( $\pm 0$  cent, no shift) ex-factory.

**Table 2 – CV calibration Constant**

Const.	Cent	Const.	Cent	Const.	Cent	Const.	Cent	Const.	Cent	Const.	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		



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.

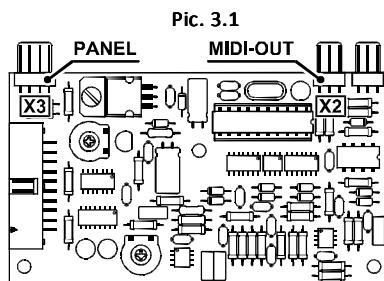
The calibration procedure is following:

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.

## 4 INSTALLATION TIPS

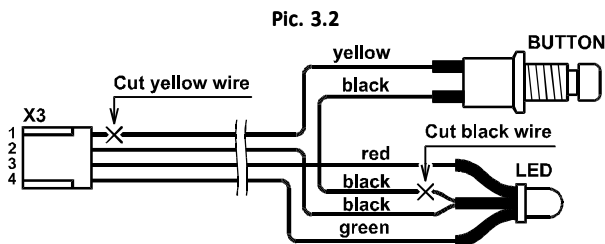
### 4.1 OUTPUT MIDI – THRU/OUT

SH-101 interface has both MIDI input and output. However, only MIDI input is necessary for basic operation of the interface (i.e controlling the instrument by MIDI commands). MIDI THRU/OUT output connector need not to be installed at all. If you don't require transfer of MIDI data to another MIDI devices (THRU function ) or reverse communication of the interface with host system (OUT function). In such case, X2 connector (MIDI-OUT) on the interface board will remain unused (see pic. 3.1).



### 4.2 RESET BUTTON AND INDICATION LED

Installation of whole bunched cables with reset button and indication LED isn't necessary as well. You don't need to install this bunched cables if you don't want to damage the instrument's panel by drilling. In such case, X3 connector (PANEL) will remain unused (see pic. 3.1).



It is also possible to install only the indication LED on instrument's panel. In such case, remove button from bunched cables (cut-off yellow and black wires as shown on pic. 3.2).

If the button is not installed, the interface operation is unaffected. The only limitation is that the reset of the interface can be done only by turning the instrument off and on or by MIDI commands sent to the interface (see user manual of the interface).



