The MIDI-Interface MVS-FP (Fully Polyphonic) in the Synthesizer

Yamaha SK-20

The MIDI for Vintage Synths FP interface in the Yamaha SK-20

1. Overview

The MIDI-for-Vintage-Synths-Interface is used to retrofit a MIDI-interface for remote control of synthesizers. The **MVS-FP-interface** processes the MIDI-commands *Note-On* and *Note-Off* via the MIDI-input (MIDI-In) and can be set to one of the 16 available MIDI-channels using the rotary-switch. The MIDI-Omni-Mode (i.e. all MIDI-channels are processed simultaneously) can also be enabled for special cases.

The electronics of the MVS-FP-interface are distributed over several different circuit-boards. In addition to the five octaver-boards responsible for the key contact control (below the keyboard), there is an MVS-FP-controller-board (next to the power supply). The latter contains the actual MIDI-interface and controls the octaver-boards connected via a ribbon cable.

Since the MVS-FP version has no digital-to-analog-converter, analog-functions (pitch-bend, filter-control, etc.) cannot be supported in principle. However, the external pitch-bend can be used to "keyboard-shift" with a range of +/- 2 semitones in order to enable at least a "digital pitchbend" in real time (see chapter 2.2 and chapter 3.1).

The MVS-FP-interface has no controls for normal operation. On the circuit-board of the MVS-FP-controller, some special options can be selected using a jumper, which are described in the appendix (chapter 3.1).

On the back of the Yamaha SK-20 there is a MIDI-Input-socket labeled as MIDI-In, a MIDI-loop-through-output (MIDI-Thru) or a MIDI-output (MIDI-Out) are not available.

The MIDI control of the Yamaha SK-20 is basically fully polyphonic. With regard to the load on the power supply unit due to the 61 low-power optocoupler-switches, there is a safety limitation: 12 keys pressed simultaneously are permitted at any time. If more optocouplers are activated, the MVS-FP-controller calculates the additional thermal load and - depending on the number of buttons and the duration - switches buttons off from the middle. The algorithm works so inconspicuously that 13 keys could be kept pressed for approx. 6 minutes, with 61 keys activated at the same time a partial switch-off takes place after approx.

The additional switching-output on the MVS-FP-controller-board is wired to the instrument's Sustain-socket in such a way that the Sustain-function of the Yamaha SK-20 can be activated using the MIDI command *Sustain-On/Off*. In special cases, another MIDI switch-command can also be configured. A separate manual is available on request (“hidden feature”).

2. Operation

2.1 The Setting of the MIDI-Channel or the Omni-Mode

There is a 16-position rotary-switch on the controller-circuit-board of the MVS-FP-interface, with which the MIDI-channel can be switched to one of the 16 possible channels. The controller-circuit-board is mounted next to the power supply after opening the instrument and is very easily accessible after loosening the cover screws and folding up.

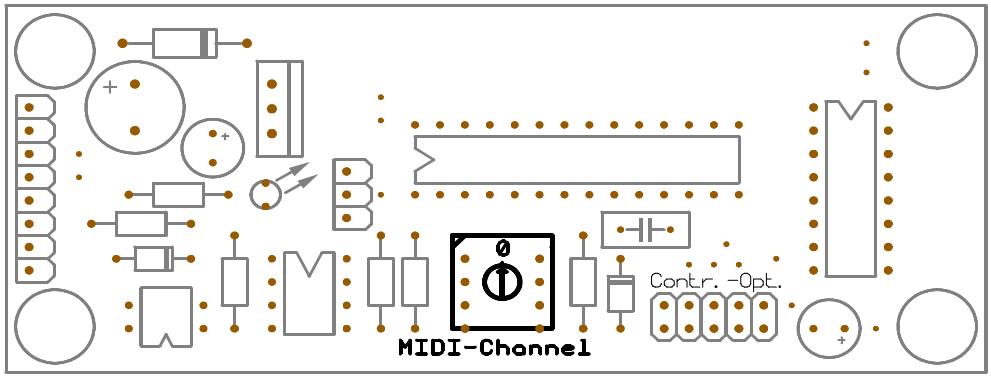
The 16-stage rotary-switch referred to below as the HEX-switch has an imprint in hexadecimal notation to indicate its switch position. The lowest position is 0 (and not 1) and the levels above 9 are marked A-F. At first glance, this may seem a bit strange, but so the switch position marker takes up minimal space.

The position of the HEX-switch is only read once after switching on the instrument and is then saved until it is switched off. This fact does not really matter in practice, because the instrument should not be operated in the open state anyway ...

A device opening is necessary to change the MIDI-channel, which is why this is reserved for the experienced technician.

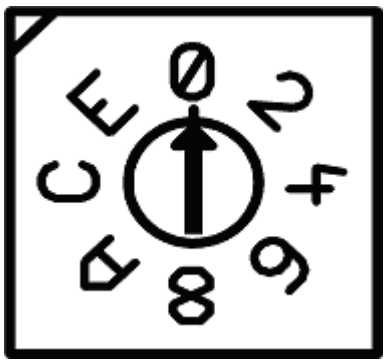
Since there are also open mains voltage components in the device, there is a risk of lethal electric shock: the mains plug must be pulled!

The setting is made with a small screwdriver with a suitable blade width ("phase tester"), the selected switch position is indicated by a small arrow.



The overview of the MVS-FP-controller with the location of the HEX-switch

The assignment between the HEX-switch position and the MIDI-channel is described in detail on the following page.



The HEX-switch with the 16 positions 0-9 and A-F

HEX-Switch-Position	MIDI-Channel (dezimal)
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10
A	11
B	12
C	13
D	14
E	15
F	16

The assignment of the HEX-switch position to the selected MIDI-channel

The lowest MIDI-channel 1 (HEX-switch position 0) is preset on delivery.

In the rare case that the MVS-FP-interface should not react to a specific MIDI-channel but to all MIDI-channels at the same time, the MIDI-Omni-Mode can also be enabled. This can be done via one of the jumpers and is described in the appendix (chapter 3.1). If the MIDI-Omni-Mode is enabled, the HEX-switch position is of course no longer important.

2.2 The Pitchbend-Function

Using pitchbend on a master keyboard, it is possible to "keyboard-shift" in real time with a range of +/- 2 semitones. Since the MVS-FP version does not have a digi-

tal-to-analog-converter, pitchbend can of course not be infinitely variable, but takes place by digitally moving the keyboard position.

The switching-stages are selected so that they are symmetrical to the semitone-steps of a synthesizer with a stepless pitchbend. This results in a good compromise between the resulting effects with slow pitchbending (little deflection) and the musical expression possibilities with fast pitchbending (large or full deflection).

At the upper and lower limits of the keyboard it should be noted that of course a note cannot be moved to a key that does not exist, so it is “cut off”. It should also be noted that every semitone-jump creates (internally) a new attack.

If absolutely necessary, the pitchbend-function can be disabled using a jumper on the MVS-FP-controller (see Chapter 3.1).

2.3 The Setting of the Sustain-Invert-Function

If the "Switch-Output to Sustain-Slider" option is installed, the polarity of the MIDI-Sustain-signal (also known as damper or hold) can be switched using the Sustain-Invert-function. Although the polarity should normally be set on the MIDI-transmitter (depending on the sustain-pedal used), it may be necessary to additionally invert the signal on the MIDI receiver.

If necessary, the Sustain-Invert-function can be disabled using a jumper on the MIDI-controller (see Appendix, Chapter 3.1).

On delivery, the Sustain-Invert-function is disabled.

2.4 The Auto-Local-Function

If a sequencer-track uses pitchbend-data or a continuous-controller (damper, sustain or hold pedal), it depends on the sequencer program whether it ends or when the sequence is stopped sends the control commands for zeroing the values or not. In the worst case, the signals would get stuck at the last used values and there is no possibility (except to switch off the synthesizer) to set them manually to zero.

The Auto-Local-function resets all control-signals influenced by the MVS-FP-interface to the starting position if "no depressed key" is detected over a period of 30 seconds.

In addition, the function can be influenced by the corresponding MIDI-commands *Local-On/Off*. If the MIDI-command *Local-Off* is sent, the MVS-FP-interface completely switches off the Auto-Local-function. If the MIDI command *Local-On* is sent, the MVS-FP-interface switches on the Auto-Local-function and at the same time sets the previously received values for pitchbend and modulation to the output-values.

The Auto-Local-function is always enabled, but can be delayed by a pending MIDI sustain-signal, even if no Note-On command is activated.

2.5 The Active-Sensing-Function

The adaptive Active-Sensing-function constantly monitors the MIDI connection and can trigger an internal MIDI reset when the connection is disconnected (e.g. switching off the master-keyboard). For sound generators (synthesizers or similar), this function should be used to reliably avoid the “crash” or “hang-on” of the sequencer. The whole thing only works, however, if the MIDI-transmitter also sends corresponding active-sensing commands.

Provided that the MIDI-transmitter sends the MIDI-command *Active-Sensing* for at least 6 seconds, the Active-Sensing-function is automatically armed. If at some point later no more MIDI data is received, an internal MIDI-reset is carried out after approx. 2 seconds and the Active-Sensing-function is therefore enabled again. With this algorithm, the MVS-FP-interface adapts to the existing MIDI setup, depending on whether active sensing is used or not.

If absolutely necessary, the Active-Sensing-function can be disabled via a jumper on the MIDI-controller (see Appendix, Chapter 3.1).

On delivery, the adaptive Active-Sensing-function is enabled.

3. Appendix

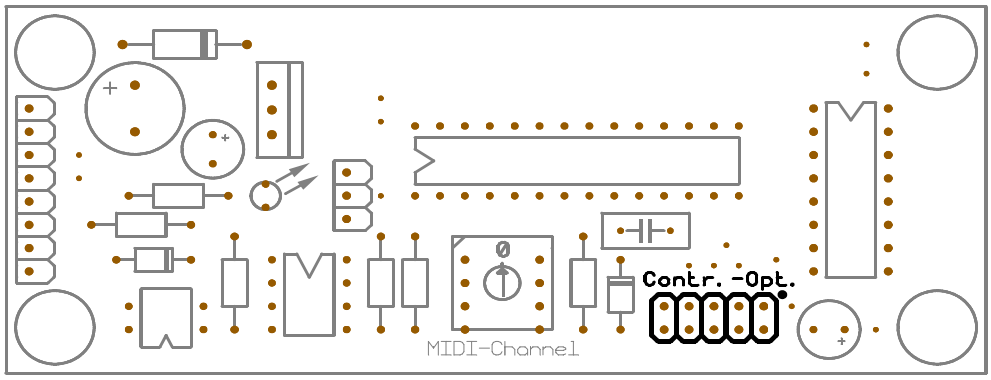
3.1 Jumper

There is a jumper field on the controller-circuit-board of the MVS-FP-interface, via which some options can be set. Normally, however, no changes should be necessary here, unless they are made after prior agreement with the manufacturer or at your own risk.

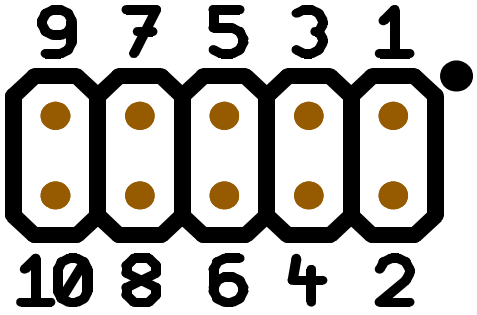
A device opening is necessary to set the special-options, which is why this is reserved for the experienced technician.

Since there are also open mains voltage components in the device, there is a risk of lethal electric shock: the mains plug must be pulled!

The 10-pin jumper field for the controller-options is actually the ISP connector that is used for the programming phase of the microprocessor with a special programming device. In normal operation, some of the pins are used as additional inputs to query jumpers.



The overview of the MVS-FP-controller with the location of the jumper field



The ISP connector, which also serves as a jumper field

Only the three jumpers described below are permissible, otherwise a short circuit could damage the MVS-FP-interface or the synthesizer.

1. A set jumper at **position 9-10** enables the MIDI-Omni-Mode. The position of the HEX-switch is then no longer important.
2. A jumper at **position 7-8** inverts the polarity of the received MIDI-command *Sustain-On/Off*.
3. A jumper in **position 3-4** disables all of the following special functions:
   - Reset after missing MIDI-command *Active-Sensing*
   - Digital pitchbend-function (all MIDI-pitch-bend data is ignored)

   So far there is no need to disable these special functions, but you never know...

3.2 MIDI-Activity-LED

The controller-circuit-board of the MVS-FP-interface has a yellow LED, which normally indicates the processing of MIDI-commands (MIDI-Activity). When the synthesizer is switched on (system-check) and in the event of certain errors, other states are also signaled.

3.3 MIDI-Implementation

MIDI-Command	**Data / Processing**		**Remarks**
Basic-Channel	1-16		The setting is made using a HEX-switch rotary switch (0..9, A..F).
Program-Change	No		Program change commands are ignored.
Note-Number	36 – 97		Other note numbers are ignored, the MIDI activity LED only lights up for editable notes.
Velocity	Note On Note Off	Yes No	Velocity 1-127 strikes the key, Velocity 0 (or Note-Off) releases the key.
Pitch-Bender	Yes		The pitch-bender command causes the keyboard position to be shifted by +/- 2 semitones in real time.
Aftertouch	Poly Channel	No No	Aftertouch commands are ignored.

Continued on the next page...

Continued from previous page...

MIDI-Command	**Data / Processing**		**Remarks**
Continuous-Controller	Modulation Breath-Controller Foot-Pedal Data Entry Volume	No No No No No	Continuous-controller-commands are ignored.
Switches	Sustain / Hold Portamento Sostenuto Soft-Pedal	Yes No No No	The switching-output acts on the Sustain-Pedal-socket. The polarity of the MIDI-Sustain-command can be inverted using a jumper. Through a special configuration, one of the three other switches can also be parameterized (→ special manual).
Channel-Mode	Reset-All-Contr. Local On/Off All Notes Off Omni Off Omni On Mono On Poly On	Yes Yes Yes Yes Yes No Yes	In Omni-Mode all MIDI-channels (1..16) are processed simultaneously. The local-commands influence the behavior of the auto-local-function (see chapter 2.4).
System-Real-Time	Timing-Clock System-Reset Start Stop Continue Active-Sensing	No Yes No No No Yes	If active-sensing-commands are received for approx. 6 seconds, a subsequent interruption of the MIDI data stream causes a MIDI system reset (All-Notes-Off etc.).
System-Common	Song Position Song Select Tune Request	No No No	System-common-commands are ignored.

3.4 Technical Data and Design

Power supply:	Due to the low power consumption, the supply comes directly from the synthesizer (+ 15V).
Connections:	1 x MIDI-in, 1 x optocoupler output for sustain/damper, ribbon-cable-connector for up to 8 octaver-circuit-boards.
MIDI-Modes:	Poly-Mode (MIDI-channel adjustable via HEX-switch), Omni-Mode (MIDI-channel is independent of the HEX-switch).
MIDI-Commands:	Note-On/Off, All-Notes-Off, Omni-On/Off, Sustain (or Damper, Hold), Active-Sensing, Reset.
Reaction-time:	Less than 1 millisecond (practically real time).
Special-functions:	Invertierungsfunktion für Damper/Sustain/Hold-Polarität, Auto-Local-Funktion für Pitchbend-Reset, LED für MIDI-Activity, MIDI-Error/Overflow, HW-Failure etc.
Design:	Invert-function for damper/sustain/hold-polarity, Auto-Local-function for pitchbend reset, LED for MIDI-activity, MIDI-error/overflow, Hardware-failure, etc.
Dimensions:	Controller: 100 x 40 x 25 mm (LxWxH) Octaver: 160 x 35 x 10 mm (LxWxH)
Weight:	< 500 g

4. Notes

RED-Robatum
Wir können,
was wir tun!