



MIDI PAC manual

V0.31

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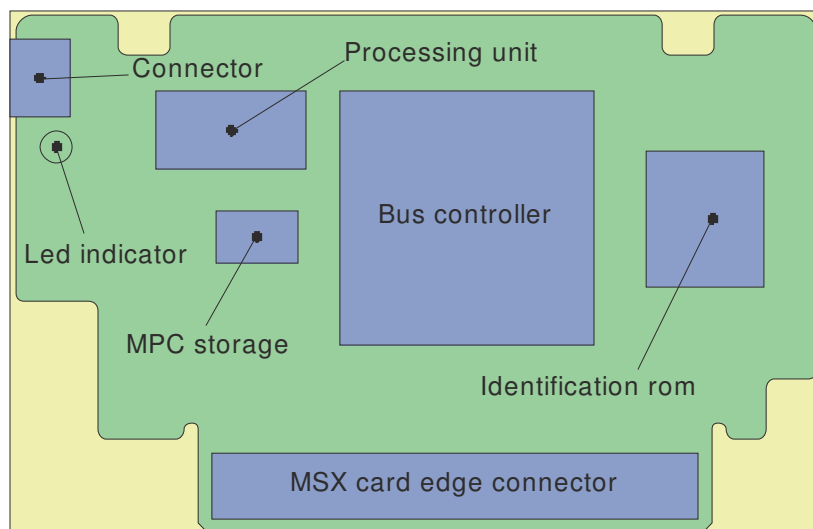
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Introduction

The MIDI-PAC is a neat little cartridge designed to be compatible with the MSX music standard, but instead of outputting audio directly, it will output MIDI data from its built-in connector instead.

When the MIDI-PAC is connected (using the supplied cable) to a MIDI synthesizer or sound module, all of the MSX music will play through the MIDI device. Playing MSX games will give you a whole new experience as the quality of the voices is no longer defined by the YM2413 but by the connected MIDI device. Use your old MSX music program as a high-end MIDI sequencer or connect the MIDI-PAC to a sequencer (or PC with sequencer software) and start recording/arranging all of your favorite game music.

This manual will not only give you the information needed to connect and configure your MIDI-PAC, it also has detailed information on how to program the MIDI-PAC and use the internal registers for use in your own applications.



Bus controller

The bus controller will handle the MSX bus signals so it will take in all data written to address 0x7C / 0x7D and present new data when the MSX is reading from address 0x7C. It also will handle the critical data path to the processing unit.

Processing unit

The main MIDI-PAC processing unit is an 8-bit risk based micro controller running at 8 MHz, as it executes the most instructions in a single clock cycle it almost hits a performance of 8 MIPS.

The main purpose of the processor is to convert the OPLL based register data that makes up your music, to MIDI data. Sub tasks handle the additional registers, MPC storage, serializing and outputting the MIDI data, etc.

Identification ROM

The main purpose of the identification ROM is to allow MSX applications to identify there is a MSX music compatible device present. Default this ROM is filled with nothing else then an identification string, so a basic extension as in the FM-PAC is not supported.

As the on-board ROM is a flash-device, it is possible to load your own 16KB ROM inside the MIDI-PAC using the MPFLASH.COM utility.

You can find more information on how to update your flash ROM in the **Changing identification ROM** section.

Connector

The connector on the side of the MIDI-PAC is used to output the MIDI data to a synthesizer or sound module. The connector is a mini USB type connector as a standard MIDI connector will not fit within a standard MSX cartridge. A special mini USB to standard MIDI connector is included with the MIDI-PAC package.

Led indicator

The led indicator is a simple way to give you real-time information on for example, start-up status, checksum errors, buffer overrun, etc. In the appendix you can find an detailed explanation on all of the possible led information patterns.

MPC storage

The **Midi Pac Configuration** storage area is a non volatile memory that holds all of the MIDI-PAC settings. The data inside the MPC storage area is fully redundant and is completely covered by a 16 bits CRC. With this the MIDI-PAC has ability to reconstruct the MPC storage area if for some reason some values have been corrupted. A fully functional general MIDI configuration will be created if the MPC storage area is corrupted and reconstructing isn't possible anymore.

The MPC storage area is split into two sections, namely real-time and part-time settings. The function of the two different storage sections is explained in the configuration section.

MSX Card edge connector

The MIDI-PAC has a card edge connector compatible with the MSX system, the connector is equipped with beveled edges for easy entry inside a MSX slot. The contact surface is treated with a gold finish to ensure a good and durable connection.

! Do not touch the contacts as this will contaminate the surface and the risk of damaging the device due to ESD.

How to use your MIDI-PAC

Please observe the following rules before using your MIDI-PAC to keep it in a good working condition:

- Make sure your computer is turned off before inserting or removing the MIDI-PAC!
- Do not place your MIDI-PAC in direct sunlight!
- Keep your MIDI-PAC away from all kinds of liquid!
- Don't drop or stand on the MIDI-PAC!
- Do not open the MIDI-PAC!
- Don't touch the cart-edge connector with your skin!

In this chapter you can find all the information needed to get started and have lot's of fun with your new MIDI-PAC!

Getting started

Using the MIDI-PAC is really quite simple and it will just take the simple six steps described below :

1. Remove your MIDI-PAC from its packaging and place it in one of the MSX *slots.
*You can place the MIDI-PAC in one of the primary slots or in one of the expanded slots!
2. Remove the cable from the *packaging and insert the smaller connector into the MIDI-PAC.
*Cable is included within the packaging and can be found behind the top lid.
3. Place the larger MIDI connector inside your MIDI *equipment.
*Default the MIDI-PAC will support General MIDI or GM in short.
4. Turn on your MIDI equipment before you turn on your MSX as the MIDI-PAC will configure your equipment during power-up. Resetting the MSX will also trigger the reconfiguration of your MIDI equipment.
5. Turn on your MSX computer and start a game or application that support the MSX music standard.
6. Have fun !

Changing MIDI setup

As not all of the synthesizers or sound modules out there support General Midi, the MIDI-PAC support the possibility to change its internal settings. This means that you can for example select your own MIDI patches, change channels, panning or even handle your own controller value's. It's even possible to save the MIDI-PAC settings to disk so you can exchange it with other MIDI-PAC users.

The so called **Midi Pac Configuration** files or in short **MPC** files can be uploaded to your MIDI-PAC with the **MPCLOAD.COM** utility. Saving an existing MIDI-PAC configuration to disk can be done with the **MPCSAVE.COM** utility.

Both utilities will validate the configuration before loading or saving the configuration, if something is wrong with your configuration it will prompt you to repair or not. This option can be helpful if you like to change the file yourself with the help of (for example) a hex editor.

Below you can see an example on how to load and save your configuration :

- To load the GM.MPC configuration to your MIDI-PAC, you can enter the following command from the MSX-DOS command prompt: **MPCLOAD GM.MPC**
- To save the modified configuration of your MIDI-PAC, you can enter the following command from the MSX-DOS command prompt: **MPCSAVE GM.MPC**

You can find MPC files for all kind of synthesizers or sound modules on www.worp3.com.

Changing identification ROM

As explained within the introduction section, the MIDI-PAC has an integrated 16KB flash ROM that is used to enhance your MIDI-PAC. By default the ROM holds an identification string so games and applications will detect

the MIDI-PAC as a true MSX music extension. It is however possible to put in a different or even your own ROM-image inside the MIDI-PAC, this can enhance its possibilities even further.

You can use the MPFLASH.COM utility to re-flash your MIDI-PAC, see the example below :

- To re-flash your MIDI-PAC, you can enter the following command from the MSX-DOS command prompt:
MPFLASH MIDIPAC.ROM

Note: As there is no limitation on what kind of ROM you put inside the MIDI-PAC, it is possible to lock-up the MSX in such a way that you won't be able to start MSX-DOS anymore, for example if you put in some game. When this happens you got yourself a bricked MIDI-PAC, see the troubleshooting section for more information.

Updating the MIDI-PAC

The MIDI-PAC firmware is still evolving, newer firmware versions will be available in the near future. As the MIDI-PAC has a build-in bootloader, it is possible to update the MIDI-PAC with the use of your own MSX. You can use the MPUUPDATE.COM utility to update your MIDI-PAC, see the example below :

- To update your MIDI-PAC, you can enter the following command from the MSX-DOS command prompt:
MPUPDATE MPA_V050.BIN

Note: The firmware file does include some checksums that will be checked before the utility will update your MIDI-PAC, but if for some reason something has gone wrong (for example a power failure) the MIDI-PAC could brick itself. In such case the MIDI-PAC indication led will stay red and it will not work, see the troubleshooting section for more information on how to unlock your MIDI-PAC again.

Configuration

As described before, the MIDI-PAC is fully configurable. U can use the MPCONFIG.COM utility to change the configuration of your MIDI-PAC. Just start MPCONFIG.COM from your MSX-DOS prompt to start the utility and start the configuration. All of the configuration options will be described within this section.



The configurator is divided into two main type of settings, real-time and part-time. The main difference is that all real-time settings will be used during the real-time conversion between OPLL and MIDI. All of the part-time setting will be used to initialize the connected MIDI device during power-up or a reset of the MSX computer.

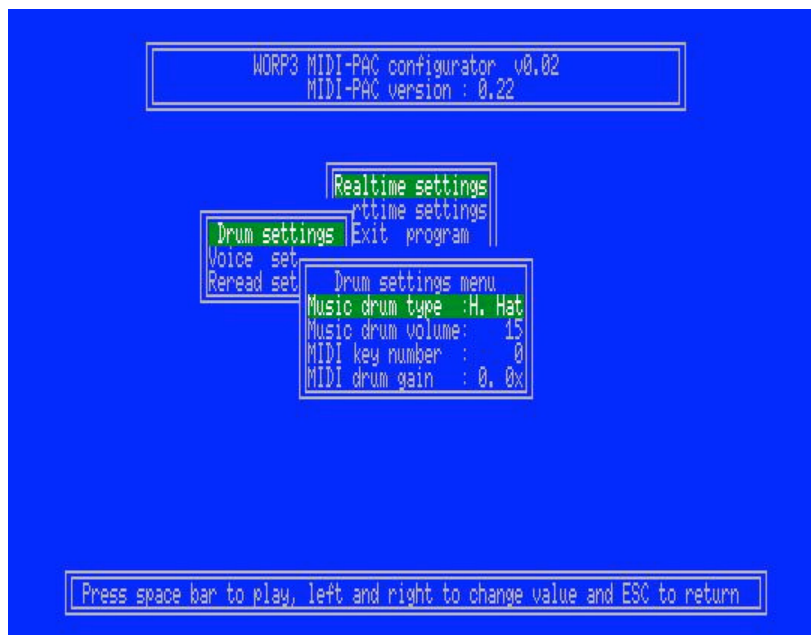
Real-time settings

The real-time drum and voice settings are separated from each other as the method of conversion is different. So to prevent confusion between the different settings, each of the drum or voice settings are inside their own menu.



Real-time drum settings

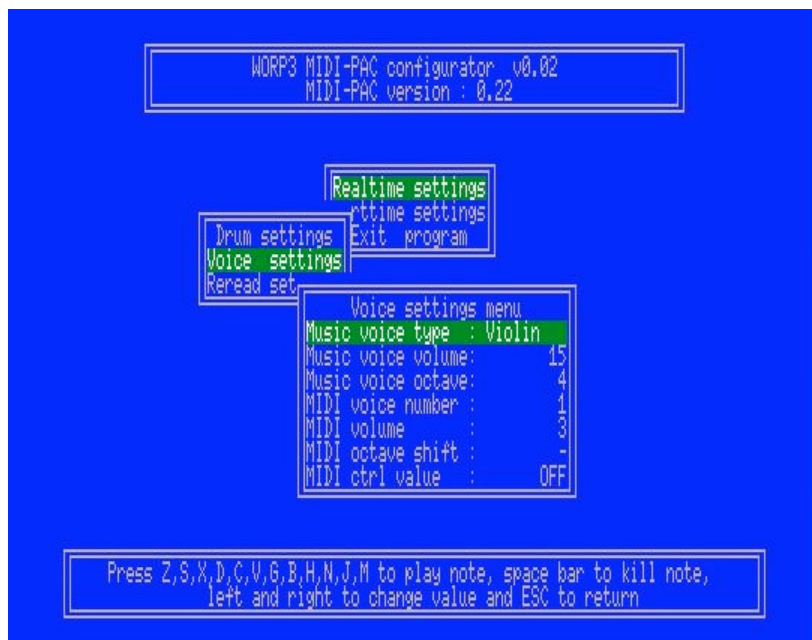
All of the real-time drum related settings can be made from the drum settings menu. All of the possible drum settings will be explained in this section. In general you can change the setting type with the up and down key, change the setting with the left and right key and play the specific drum type with the space bar. You can leave the menu with the ESC key.



- Music drum type**
 With this setting you can choose which of the five drum types (High Hat, Cymbal, tom-tom, snare drum or Base drum) you want to change/hear.
Note: This is a temporary MSX music setting, therefore it will not be stored within the MIDI-PAC.
- Music drum volume**
 This setting will change the volume level on which a specific drum will be played. It can be useful to compare the different volume levels while played between the music and a MIDI device.
Note: This is a temporary MSX music setting, therefore it will not be stored within the MIDI-PAC.
- MIDI key number**
 This is the actual key that will be played on your MIDI device when the specific drum type is requested to play. The MIDI key number corresponds with a specific drum on your MIDI device which can be found inside your device manual.
- MIDI drum gain**
 With this setting you can give each specific MIDI drum an additional gain level. So if one of the MIDI drum voices is too loud, you can lower the gain value, normally it will set to 1.

Real-time voice settings

All of the real-time voice related settings can be made from the voice settings menu. All of the possible voice settings will be explained in this section. In general you can change the setting type with the up and down key, change the setting with the left and right key and play the specific voice with one of the following keys "ZSXDCVGBHJNM" or silence the voice with the space bar. You can leave the menu with the ESC key.



- **Music voice type**

With this setting you can choose which of the 32 voices you want to change/hear. Within the table below, you can see the relation between the voices type, MSX music voice, groups and example voices.

Voice type	MSX music	Group	Example/description
Silence	Original	Yes	Used when an original is used but all settings are zero.
Violin	Preset	No	
Guitar	Preset	No	
Piano	Preset	No	
Flute	Preset	No	
Clarinet	Preset	No	
Oboe	Preset	No	
Trumpet	Preset	No	
Organ	Preset	No	
Horn	Preset	No	
Synth	Preset	No	
Harp	Preset	No	
Vibraphon	Preset	No	
S.Bass	Preset	No	
A.Bass	Preset	No	
E.Guitar	Preset	No	
G-Default	Original	Yes	Used for all unknown original settings.
G-Piano	Original	Yes	Example voices: Acoustic piano, Grand piano, Bright piano, Honky tonk piano, Electric piano, Harpsichord, Clavinet, Clavicorde, etc.
G-Chromat	Original	Yes	Example voices: Celesta, Glockenspiel, Music box, Vibraphone, Marimba, Xylophone, Bells, harp, chimes, etc.
G-Organs	Original	Yes	Example voices: Rock organ, Reed organ, Accordion, Harmonica, wanderer, etc.
G-Guitar	Original	Yes	Example voices: Nylon guitar, Steel guitar, Jazz guitar, Electric Guitar, Overdrive Guitar, etc.
G-Basses	Original	Yes	Example voices: Acoustic base, Electric bass, Fretless bass, Slap bass, Synth Bass, etc.
G-Strings	Original	Yes	Example voices: Violin, Cello, Tremolo strings, Pizzicato strings, Timpani, etc.
G-Ensembl	Original	Yes	Example voices: String ensemble, Synth strings, Choir aahs, Voice Oohs, Synth Choir, etc.
G-Brasses	Original	Yes	Example voices: Trumpet, Trombone, Tuba, Muted trumpet, French Horn, Brass Section, Synth Brass, etc.
G-Reeds	Original	Yes	Example voices: Soprano Sax, Alto Sax, Tenor Sax, Baritone Sax, Oboe, English Horn, Bassoon, Clarinet, etc.
G-Pipe	Original	Yes	Example voices: Piccolo, Flute, Recorder, Pan flute, Blown Bottle, Shakuhachi, Whistle, Ocarina, etc.
G-Synth	Original	Yes	Example voices: Square, Sawtooth, Polysynth, Metallic, etc.
G-Etnics	Original	Yes	Example voices: Sitar, Banjo, Shamisen, Koto, Kalimba, Fiddle, Shanai, Plucked, Santool, Chord, Santool, etc.
G-Snares	Original	Yes	Snare drum like voices.

G-Base-dr	Original	Yes	Example voices: Base drum, taiko.
G-Special	Original	Yes	Used to overcome fast repeating effects, use voices with slow attack.

Note: This is a temporary MSX music setting, therefore it will not be stored within the MIDI-PAC.

- **Music voice volume**

This setting will change the volume level on which a specific voice will be played. It can be useful to compare the different volume levels while played between the music and a MIDI device. The volume of a specific music channel will effect the volume of a complete MIDI channel, not only a single voice.

Note: This is a temporary MSX music setting, therefore it will not be stored within the MIDI-PAC.

- **Music voice octave**

This setting will change the octave of the voice which you will hear during playback on one of the following MSX keys “ZSXDCVGBHNJM”.

Note: This is a temporary MSX music setting, therefore it will not be stored within the MIDI-PAC.

- **MIDI voice number**

This is the actual voice that will be played on your MIDI device when specific voice type is requested to play. The voice number (1 up to 128) corresponds with a specific voice on your MIDI device which can be found inside your device manual.

- **MIDI volume**

With this setting you can give each MIDI voice a specific volume that will be added to the channel volume. So if one of the MIDI voices is too loud, you can lower this volume value.

- **MIDI octave shift**

With this setting you can shift a specific MIDI voice by one or more octaves. So you can lower or increase the pitch of a specific voice if (for example) you like a specific voice but find it to high or low in pitch. It will increase the use of your voices as you could (for example) even use a piano as a bass!

- **MIDI ctrl (controller) value**

With this setting you can connect a specific MIDI controller to your voice and give each voice a personal touch. This setting holds only the controller value, the controller number and default value can and must be set within the additional settings menu, this menu can be found inside the part-time menu.

Keep in mind that using this option will give a drastic increase in the amount of MIDI data, so be careful using this setting while playing games which change instruments very often!

Note: The ‘controller value change’ will be send through the MIDI interface before the ‘select voice’ command!

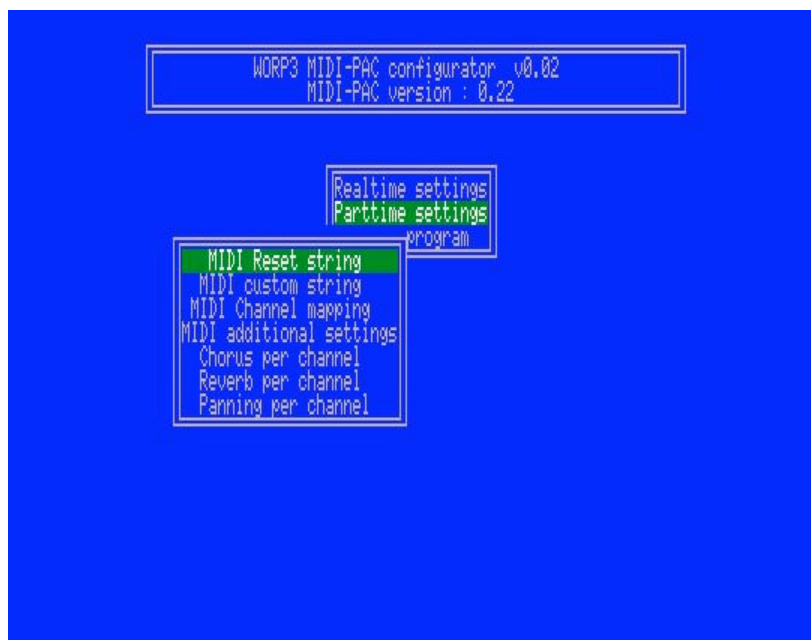
Real-time re-read settings

All of the settings made in the drum or voice settings section are stored inside the volatile section of the MIDI-PAC, so if by accident you have changed the wrong setting or you are not happy with the changes, it’s possible to re-read the settings from the MPC storage area.

After executing a re-read, all of the settings are restored to the power-up or the last time you loaded a new MPC file inside the MIDI-PAC!

Part-time settings

In the part-time settings you can find all of the settings that will be handled during power-up or reset.



- **MIDI Reset string**

In this setting menu you can define a string of hex codes which will be send to your MIDI device directly after power-up or a reset of your MSX computer.

Reset length will define the number of hex codes the MIDI-PAC must send to your MIDI device, a zero value will disable the MIDI reset string.

The 'Wait after reset' is used to give your MIDI device the time to initialize all of its internal settings, This value can be found inside the manual of your MIDI device.

For example, if you want to send a GM reset, you must set the following values:

- Wait after reset: **150 ms**
- Reset length: **6**
- String: **F0 7E 7F 09 01 F7**

- **MIDI custom string**

The purpose of the MIDI Custom string function is almost the same as the MIDI Reset string, the only difference is that its primary use is to support user configuration strings and that it will be handled after the MIDI reset string has been handled.

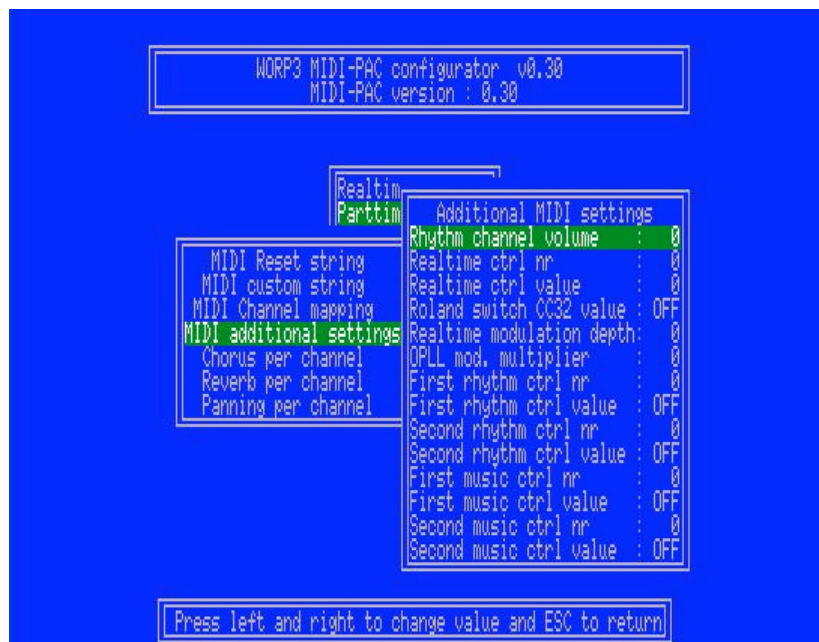
Note: As it will be handled directly after the MIDI Reset string, you could even use this custom string function as an extender for your MIDI reset string function. Don't forget that the 'wait after reset' must be zero in that case!

- **MIDI Channel mapping**

In this setting menu you can setup the channel mapping between the MSX music channels and the MIDI channels. Some MIDI devices (mostly old ones) don't support all of the MIDI channels, if this is the case then you can re-map all or a specific MSX music channel to one of the other 16 MIDI channels.

- **MIDI additional settings**

The additional settings are a collection of settings, all with a different kind of function. They are combined in a single menu as the amount of settings per function is limited.



- Rhythm channel volume**
 With this setting you can set the volume of the rhythm channel. As it's a channel volume, all of the drum voices will be affected by this setting. Individual drum voice gain can be set from the real-time setting menu.
- Realtime ctrl nr / value**
 These two settings are the needed addition to the real-time 'controller value' setting, as without those two settings you won't know which MIDI controller you are changing when a voice is changing.
 With the 'Realtime ctrl nr' you can select the MIDI controller you want you change during real-time voice changing and with the 'Realtime ctrl value' you can enter the default value for the selected controller as not controllers have the same default value, for example: the lower bank controller has (mostly) a default value of 0, but the panning controller has a default value of 64. So keep in mind that you always set the correct default value for a specific controller number!

Note: The 'controller number' and the 'controller value' will only be effective after a valid 'controller value' within the real-time menu has been entered!
- Roland switch CC32 value**
 The most Roland modules require both the CC00 (MSB) and the CC32 (LSB) values before a program change may be send. With this option you can tell the MIDI-PAC that it must send an additional CC32 value between the realtime controller and a program change command.
 For most Roland modules this value will be 0 but in some cases it can be used to select some different banks or compatibility modes, see your module manual (bank switching) for more information.
- Realtime modulation depth**
 The MIDI-PAC has a MSX music modulation detection that will send this modulation depth to your MIDI device when a modulation is detected. The modulation depth is fixed to this value as the modulation depth detection is not yet supported by the MIDI-PAC.
- Opll mod. multiplier**
 The MIDI-PAC will extract a modulation level out of the OPLL setting when original voices are used. As the extracted value will have a maximum value of 15 it will hardly noticeable. The opll mod. multiplier will boost the modulation level to a more noticeable level.
- First rhythm ctrl nr / value**

With these two settings you can select any MIDI controller on the rhythm channel you like and give it a default value. So this function will give you the ability to, for example, set a special panning, effects, bank select, modulation, etc.

- **Second rhythm ctrl nr / value**

These two settings are exactly the same as the above described 'First rhythm ctrl nr / value'. It will only give you the ability to set two different MIDI controllers.

- **First music ctrl nr / value**

With these two settings you can select any MIDI controller on the music channels you like and give it a default value. So this function will give you the ability to, for example, set a special panning, effects, bank select, modulation, etc.

Note: The controller setting will be changed on all nine music channels !

- **Second music ctrl nr / value**

These two settings are exactly the same as the above described 'First music ctrl nr / value'. It will only give you the ability to set two different MIDI controllers.

- **Chorus per channel**

In this setting menu you can setup the default chorus for each music channel. The currently effective value inside your MIDI device will not be changed if the selected value is set to 'OFF', as this will just skip this individual value.

- **Reverb per channel**

In this setting menu you can setup the default reverb for each music channel. The currently effective value inside your MIDI device will not be changed if the selected value is set to 'OFF', as this will just skip this individual value.

- **Panning per channel**

In this setting menu you can setup the default panning for each music channel. The currently effective value inside your MIDI device will not be changed if the selected value is set to 'OFF', as this will just skip this individual value.

Troubleshooting

Bricked mode

When for some reason your MIDI-PAC has been bricked, you must press and hold your MSX reset button while turning on your MSX computer. After turning on wait until the LED indicator will go RED.
After the LED has gone to RED you have two options:

Updating your MIDI-PAC: Start MPUPDATE without resetting the MSX computer and follow the instructions on the screen.

Reprogramming the ROM: Reset the MSX computer and start MPFLASH to reprogram your identification ROM.

Error running MIDI-PAC applications

When none of the MIDI-PAC applications seems to be working or generating strange error's on a Turbo-r, you probably are using the old versions. The older applications can't run in the R800 mode so you have to switch off the turbo mode and run them with the turbo mode switched off or you can download the latest versions from the WORP3 website.

Appendix

Led indicator table

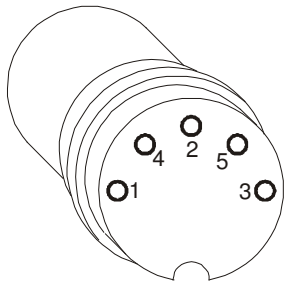
LED Color	During	Remark
None (off)	-	MIDI-PAC isn't getting any power.
RED	After power-up	No MIDI-PAC application program or in anti brick mode.
RED (blinking)	Playing music	MIDI buffer overrun, this is an indication that there are more events transmitted to the YM2413/MIDI-PAC then midi can process.
GREEN	During operation	Normal operation

Synth compatibility list

Manufacturer	Type	Supports	Working ?	Remark
Roland	SC-50	GS	Good	Voices are somewhat shrill
Roland	SC-55	GS	Good	Voices are somewhat shrill
Roland	SC-88	GS	Very Good	
Yamaha	DB-50	XG	Very Good	
Yamaha	MU-15	XG	Very Good	
Yamaha	MU-55	XG	Very Good	
Yamaha	MU-80	XG	Very Good	
Roland	JV1010	GM	Slow	Synth has very nice voices but is somewhat slow during the switching of voices which causes delay's within the music.
Roland	MT-32	Custom	Reasonable	The MT-32 is only 8 channel polyphony which isn't perfect when all 9 music channels are played.

Mini USB to standard MIDI connector

The following schematic illustrate the standard MIDI to MIDI-PAC cable that is included in the MIDI-PAC package. The USB connector used for the MIDI-PAC is a standard mini B male type. The MIDI connector is a 5 pins 180 degree DIN male type. All of the necessary connections can be found within the schematic below.



Viewed from soldercup's
Male DIN-5-180 connector

- 1-Not connected
- 2-GND (Black-mini-usb-pin-5)
- 3-Not connected
- 4-MIDI +5V (Green-mini-usb-pin-3)
- 5-MIDI out (White-mini-usb-pin-2)
- Shield-Cable shield

