# The Retro Hacker - TRHMSX – Quick User Guide – Rev 1.5

**THANK YOU FOR YOUR PURCHASE!**

Just like you, I love MSX, and this computer was carefully built in my laboratory for you. I don't make a living by selling these things on the Internet, it's my hobby, and all profits go towards building new projects and keeping the MSX alive.

Please, if you have any issues with the computer, let me know immediately. I want you to have the same experience I desire as a buyer.

This FPGA-based MSX2+ hardware represents a straightforward implementation, drawing inspiration from the original 1chipMSX circuit but featuring several enhancements and a new PCB design for improved functionality.

TRHMSX features:

* **MSX2+ Compatibility**: Reproducing the MSX2+ architecture, ensuring compatibility with a wide range of software and games.
* **Expanded Memory Options**: Choose between 2MB or 4MB of mapped RAM, providing flexibility for diverse computing needs and applications.
* **9958 Video Display Processor (VDP)**: Incorporating the 9958 VDP for sharp graphics and improved visual performance, delivering an authentic MSX experience.
* **FM and SCC Sound Capabilities**: Featuring FM synthesis and SCC sound to reproduce the iconic audio characteristics of MSX systems, enhancing the overall gaming and multimedia experience.
* **Programmable Sound Generator (PSG)**: Including the original PSG for standard MSX audio output.
* **Keyboard Compatibility**: Supporting USB or PS/2 keyboards, providing users with a choice for their preferred input device.
* **MicroSD Card Support**: Integrating a microSD card slot for convenient storage and easy access to files, games, and software.
* **MSX Cartridge Slots**: Equipped with two MSX cartridge slots, allowing users to explore a vast library of MSX cartridges for an extended range of applications and games.
* **Dual Joystick Ports**: Featuring two joystick ports for multiplayer gaming and compatibility with classic MSX peripherals.
* **Wireless Network Support**: Incorporating wireless network support through the ESP8266, enabling online connectivity and expanding the possibilities for networked applications.
* **12V Cartridge Lines**: Providing dedicated 12V lines for cartridges, ensuring compatibility with a variety of peripherals and accessories.
* **MIDI Output**: Generates MIDI output over the Joystick Port 2 (needs a custom cable and a MIDI player).

This guide was created to help you get started with setting up and using your new computer. It comes already set up with 2MB of RAM, and with a pre-built microSD card that has MSXDOS 2 and the newest version of SofaRUN ready to go. I've even tossed in some ROM files from my own collection so you can dive right into enjoying your MSX experience from the get-go.

## Power Source

Your computer is equipped with a 5V 2A power source (center positive), which is connected via a 2.1mm jack. It's essential to be cautious if you consider using a different power source, as connecting power sources with higher voltages can potentially harm the computer, leading to the need for repairs. Always stick to using the provided power source or an equivalent one (5V 2A) to ensure the safety and proper functioning of your computer.

## Configuration (Dipswitch)

On the side of your computer, you'll notice an eight-position dipswitch (in red). This handy feature allows you to customize various settings for your TRHMSX. Refer to the table below for a detailed description of each available configuration.

|  |  |  |  |
| --- | --- | --- | --- |
| DIP-SW | FUNCTION | OPTION | DESCRIPTION |
| 1 | CPU Clock | OFF | Standard mode 3.58MHz |
| ON | Custom Speed mode 4.10MHz to 8.06MHz (10.74MHz on system bus)  • Press [F12] key to change clock type (3.58MHz >> 5.37MHz >> Custom Speed)  • The external clock is set on [Sync to CPU] by default  • [Turbo Pana] is 5.37MHz like the original specification  • A special hybrid clock [Turbo MegaSD] is enabled by default |
| 2/3 | Video Output | OFF/OFF | S-Video  • NTSC, 50Hz+60Hz, interlaced video signal |
| OFF/ON | RGB w/ Audio Out (a mono signal inside the video cable)  • 15kHz, 50Hz+60Hz, interlaced video signal, requires a VGA to SCART cable |
| ON/OFF | VGA Mode for LED TV or LED Display  • Progressive video signal 31kHz / 50Hz+60Hz with the ability to set the pixel ratio 1:1 at 60Hz |
| ON/ON | VGA+ Mode for CRT Monitor (legacy output)  • Progressive video signal 31kHz / 50Hz+60Hz / SETSMART -D0 must be executed to force 60Hz |
| 4 | Cartridge Slot-1 | OFF | External Slot-1  • Recommended default |
| ON | Internal ESE-MegaSCC+ 1024kB (shared w/ the 2nd half of ESE-MegaSCC+ Slot-2)  • External Slot-1 is disabled  • Memo: the CMT toggle is [Scroll Lock] key (disabled by default) |
| 5/6 | Cartridge Slot-2 | OFF/OFF | External Slot-2  • Recommended default |
| OFF/ON | Internal ESE-MegaRAM ASCII-8K 1024kB  • External Slot-2 is disabled |
| ON/OFF | Internal ESE-MegaSCC+ 2048kB  • External Slot-2 is disabled |
| ON/ON | Internal ESE-MegaRAM ASCII-16K 2048kB  • External Slot-2 is disabled |
| 7 | Internal Mapper | OFF | Internal 2048kB RAM  • Recommended default |
| ON | Internal 4096kB RAM |
| 8 | Internal microSD | OFF | Disabled |
| ON | Enabled  • Recommended like default |

By default, your computer is set to 3.58Mhz, generate VGA video with 31Khz, enable the microSD card, and have 2 MB of RAM. If you wish to modify these configurations, simply adjust the positions of the corresponding dip switches accordingly. The default position of each dip switch is shown in gray.

Video Output

By default, your computer is configured for VGA video output at 31Khz (dip switches 2/3 in ON/OFF), which provides the best video quality for the TRHMSX. This configuration is strongly recommended. The VGA standard is supported by most LED/LCD displays with a DH15 connector. For screens that only support HDMI, you can use an inexpensive VGA-to-HDMI converter to achieve optimal results.

## The S-Video output also offers excellent quality and can be activated by changing the dip switches 2 and 3 to off.

## Keyboard

The TRHMSX is compatible with most USB and PS/2 keyboards available on the market. By default, your TRHMSX is configured from the factory with the USB port enabled for use with USB keyboards. If you wish to utilize the PS/2 port, you must boot the computer while pressing the button located near the USB port. This action will disable the USB port for keyboards and activate the PS/2 port.

For those who prefer to consistently use the PS/2 port, it is necessary to erase the firmware currently running on the WCH 559T chip. This can be accomplished by using the WCH ISP Tool and following the specific instructions for firmware erasure.

You can download the WCH ISP Tool from <https://www.wch-ic.com/downloads/WCHISPTool_Setup_exe.html>

Although multiple USB keyboards have been successfully tested with the computer without issues, it is not possible to guarantee compatibility with all USB keyboards. It is advisable to avoid gaming keyboards or those that do not adhere to USB standards, such as those requiring special drivers to operate on Windows, as they are likely incompatible with the TRHMSX.

Note: PS/2 keyboards WILL NOT WORK if you turn the computer on without the pushing the button that is located close to the USB port, unless you erase the firmware of the CH559 chip.

There are some keyboard shortcuts that can be used with the TRHMSX, the following table document those:

|  |  |
| --- | --- |
| Key or Key Combination | Function |
| END | MSX STOP key |
| ALT | MSX GRAPH key |
| Windows | Space (when playing games, it is recommended to use the Windows Key to shoot instead of the space to avoid issues with moving object in diagonal) |
| F6 | MSX GRAPH key |
| F7 | MSX KANA key |
| F8 | MSX SELECT key |
| F9 | Increases PSG volume |
| SHIFT + F9 | Decreases PSG volume |
| F10 | Increases SCC volume |
| SHIFT + F10 | Decreases SCC volume |
| F11 | Increases OPL volume |
| SHIFT + F11 | Decreases OPL volume |
| PAGE UP | Increases overall volume |
| PAGE DOWN | Decreases overall volume |
| F12 | Alternates CPU clock in turbo mode:  3.58 Mhz ->5.37 Mhz -> Custom |
| PRINT SCREEN | Alternates video output mode:  VGA 31Khz -> RGB 15Khz -> CVBS |
| SCROLL LOCK | Activates/Deactivates cassette mode |
| SHIFT + F12 | Alternates the Slot 1 mode:  External -> MegaSCC+ 1024kB |
| SHIFT + SCROLL LOCK | Alternates the Slot 2 mode:  External -> MegaRAM ASCII-8K -> MegaSCC+ 2048kB -> MegaRAM ASCII-16K |

## Status Leds

On the printed circuit board, you'll find a bank of LEDs that serve as diagnostic indicators, allowing you to track the performance of your computer and identify potential issues. The table below provides a detailed description of each LED, enabling you to gain a comprehensive understanding of their respective meanings.

|  |  |  |
| --- | --- | --- |
| LED | Status | Description |
| 10 | Blinking | Activity with the USB keyboard (active by default) |
| 9 | Blinking | Activity with the microSD card |
| 8 | OFF | 2MB Memory Mapper |
| ON | 4MB Memory Mapper |
| 7/6 | OFF/OFF | External Slot 2 Enabled |
| OFF/ON | MegaRAM ASCII 8K Enabled |
| ON/OFF | MegaSCC+ Enabled |
| ON/ON | MegaRAM ASCII 16K Enabled |
| 5 | OFF | External Slot 1 Enabled |
| ON | SCC+ Enabled |
| 4/3 | OFF/OFF | Composite video enabled |
| OFF/ON | RGB w/ Audio Out (a mono signal inside the video cable) enabled |
| ON/OFF | VGA Mode for LED TV or LED Display enabled |
| ON/ON | VGA+ Mode for CRT Monitor (legacy output) enabled |
| 2/1 | OFF/OFF | Standard mode 3.58MHz enabled |
| OFF/ON | [Turbo Pana] mode 5.37MHz enabled |
| ON/OFF | Custom clock enabled |

## MicroSD Card

Your microSD card comes pre-configured with dynamic BIOS and all the necessary files to boot into MSXDOS2. When you power up your TRHMSX with dipswitch 8 enabled, the dynamic BIOS kicks in, seamlessly leading you into the MSXDOS2 environment, where you'll be greeted by the MSXDOS prompt.

Additionally, the card includes SofaRun 8 along with a curated collection of ROM files, providing you with everything you need to start using your computer right away. Simply execute SR8\SR to launch SofaRun and begin exploring the wealth of content at your fingertips.

## Network

By default, your computer comes with Wi-Fi capability enabled, albeit without the necessary network configuration to establish a connection. To initiate the setup process and connect your computer to your local wireless network, you'll need to perform the initial configuration.

To configure your network settings, power on the computer and press F1 during the boot sequence. You'll observe a message confirming the start of the network configuration process. From there, navigate to the appropriate option to configure wireless access. You'll be prompted to select the name of your network (SSID) and its corresponding password to establish a connection.

Following the initial setup, subsequent boot-ups will automatically connect your computer to the designated wireless network.

The jumper that is located close to the ESP8266 enables or disables the network card. You can choose to disable that feature by removing the jumper from the board.

The microSD card had a collection of network tools available on the NETWORK folder. Please explore those programs as they offer you a way to download and use programs obtained from the Internet.

## Tips and Tricks

* If you are going to use disk interfaces, make sure that you enable the external cartridge slots and disable the microSD card as that configuration can interfere with the external disk controller.
* If you want to connect a cassette device, you need to disable the internal microSD drive by changing the dipswitch 8 to OFF. Then turn your computer on and push SCROLL LOCK once. Connect your cassette unit into the audio jack and use the appropriate commands from the basic.
* Do you want to explore advanced topics and have fun with your MSX computer? Check the following references:
  + [Home · cayce-msx/msxpp-quick-ref Wiki](https://github.com/cayce-msx/msxpp-quick-ref/wiki)

## Solving Basic Issues

### Issue: The TRHMSX doesn't power on.

Is the power cable correctly connected? Is the power source compatible? The TRHMSX needs a power supply of 5V/2A center positive. Do not attempt to power the unit using the USB connector, you may damage the computer.

### Issue: The TRHMSX is powered on but doesn't display anything on the screen.

Is it properly connected to the monitor? Is the connector/cable faulty? Does the appropriate status led light up correctly?

If you cannot get video from a specific connector, try to switch the configuration and connect to another monitor using a different cable/connector. Through combinations of dip switches 2 and 3, you can change the display modes. If the screen doesn't display anything and no hardware issue is detected, check the dip switch settings.

### Issue: The keyboard doesn't work.

Is the keyboard connected to the PS/2 port or the right USB port? Only keyboards compatible with the PS/2 protocol can be used with the TRHMSX. Try another keyboard.

### Issue: The ROM cartridge doesn't work.

Is the cartridge dirty? Clean the cartridge and the slot if the cartridge doesn't work. Some cartridges need to be started with the shift key pressed.

### Issue: The microSD Card is not working.

Is dipswitch 8 turned off? Is the card formatted with FAT16?

### Issue: Joysticks are not working

Is the joystick (gamepad) compatible with MSX?