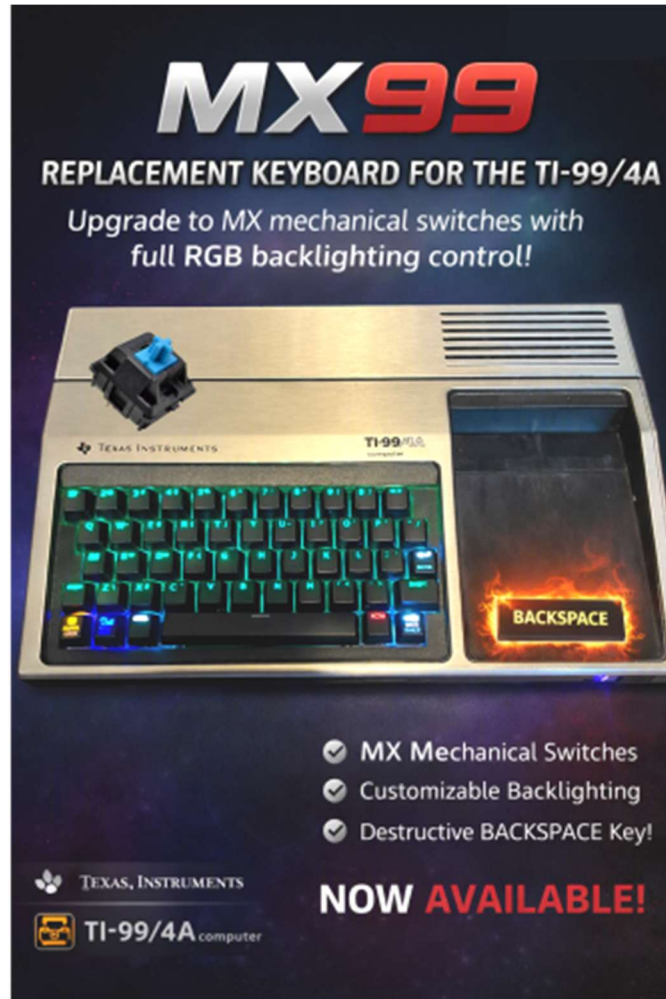


838-MX99 V1.0

Modern TI-99/4A Keyboard Replacement



Last Updated: October 14, 2026

Table of Contents

Disclaimer.....	4
Summary	4
Features	4
MX99 Operations	4
What is in the box?	5
What you must provide:	5
Requirements.....	5
Required Parts.....	6
Audio Hum Information:	6
Get to know the new MX99 Keyboard	7
6U Spacebar	7
Backlight Control Key	7
Alpha-Lock Key	7
Back side of Keyboard PCB.....	8
Micro-Controller Circuitry	8
Keyboard Connector Cable	9
Power & Ground Connections	9
Programming Port.....	9
Stabilizing Capacitor.....	9
TI-99 USB Keys Connection	9
Bracket Mounting Holes.....	9
Programming the MX99 Microcontroller.....	9
Requirements:.....	9
Installation	10
Powering the MX99 Up for the first time.....	13
Verify Power Readings	13
Programming.....	14
Known Issues.....	15
FAQs	15
Links	16
Support	17
Revision History.....	17

Disclaimer

SHIFT838 / 838 Designs is not responsible for any damage to equipment, property, or dwellings, nor for any injury or death resulting from the installation of the MX99 keyboard when performed by the end user. By choosing to install the MX99 keyboard themselves, the end consumer accepts full responsibility for all risks associated with the installation process and waives all claims against SHIFT838 / 838 Designs for any resulting loss, harm, or liability.

Summary

The MX-99 by SHIFT838 offers a modern-day replacement for the aging TI-99/4A keyboard.

Features

The MX99 keyboard sports the feature set below:

- 100% compatible with TI-99/4A computers
- Utilizes 100% MX type key-switches
- Backlight control offering OFF-Low-Medium-High
- Current backlight saved and applied at next power-up
- Destructive Backspace Key!
- Alpha-Lock Joystick Fix implementation

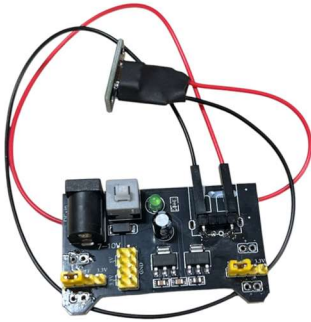
MX99 Operations

- Alpha-Lock – To engage or disengage the alpha-lock state simply press it one time. If the LED under the key is lit, then the alpha-lock is engaged, and typing will give you all capital letters. If the LED is off it will produce lower case letters. To go to the opposite setting of what it is, simply press the key again.
- Save Alpha-Lock State for next power up
 - If you want the alpha-lock key to be engaged at power-up, then enable the alpha-lock to ensure the LED under the key is lit. Press and hold the alpha-lock key for 3 seconds, when the alpha-lock LED starts to blink, release the key. Your alpha-lock state has now been saved.
 - Do the same but ensuring the LED under the key is off to save the power state as disabled state then hold the alpha-lock key down for 3 seconds to save.
- Destructive Backspace – This key does multiple functions with the microcontroller circuitry to do a FCTN 5 and FCTN 1 to become a destructive backspace key.
 - Single character backspace – Pressing the backspace key a single time will take the cursor to the left by one character and delete that character.

- Multiple Character backspace – Holding the backspace key down will continually repeat the process of moving the cursor back one character and deleting that character, repeatedly until the backspace key is no longer pressed.

What is in the box?

- MX99 Keyboard with options purchased
- 5V breadboard power supply



- USB C breakout adapter mounted to 3D printed panel mount housing
- 2x Two-position Dupont style header wires

What you must provide:

- USB Power Brick capable of handling 2 amps of current.
- USB Power Cable with power switch capable of delivering at least 2 amps of current.
- 3M Heavy-Duty or Gorilla double-stick tape to attach the bread-board power module if being used.
- Patience

Requirements

- TI-99/4A (any model)
- Newly designed drop-in replacement internal power supply
 - The MX99 was tested with a modern drop-in replacement power supply as it is of modern design and much quieter as well as a dedicated 5v power supply.
 - It will work on the older power supplies, but they are very noisy and you will hear it on the audio channel when engaging the backlight LEDs.
- If using the 5V breadboard power supply provided to power MX99 (ensures clean audio signal line)
 - 5v Bread Board Power supply
 - USB C panel mount bracket with USB C breakout board
 - 2 sets of 2 position jumper wires long enough to connect between USB C and 5v Breadboard power supply.
 - USB C power cable (2A or higher)

- USB Power Brick (2A or higher)
- Couple of screws to mount USB C panel mount adapter
- Basic Soldering Skills

Required Parts

The parts below are necessary to perform successful installation.

- 3D printed MX99 mounting Brackets
 - Standard MX brackets if using MX keycaps
 - If using with ALPS original keycaps:
 - ALPS MX99 mounting brackets
 - 47x MX to Alps keycap adapters
 - 3x MX Extension Brackets
 - 3x ALPS/MX spacers
 - Depending on whether brackets have brass inserts or not
 - 6x machine screws for brass inserts
 - If there is no brass insert, 4x hi-low screws for plastic
- Phillips head screwdriver to disassemble TI-99/4A and mount keyboard

Audio Hum Information:

If using the stock TI Internal power supply then expect to have a fair amount of hum when the backlight LEDs are engaged, depending on the level of brightness will make the hum louder. This is because the TI internal power supply is very noisy. To reduce the amount greatly use a modern replacement internal power supply that is sold on my store. To eliminate it almost completely use the provided 5v bread-board power supply.

Get to know the new MX99 Keyboard



Backlight Control

Destructive Backspace

6U Spacebar

The 6U spacebar replaced the original 8U size to accommodate for the two new keys, the backlight control key and the destructive backspace key.

Backlight Control Key

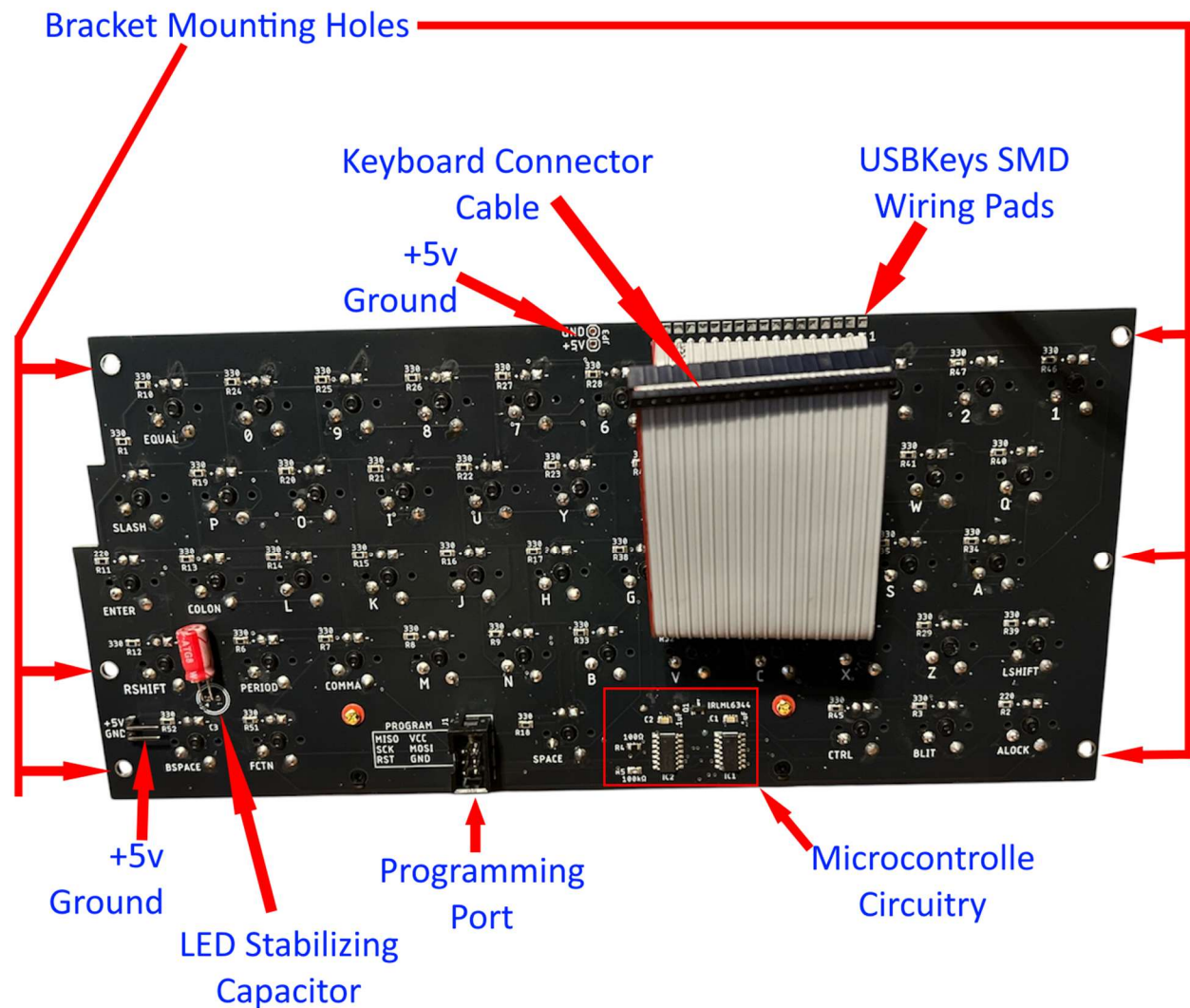
Backlight control key – This controls the backlight, off-low-medium-high.

Destructive backspace key – This key does what should have been included. This key will perform a FCTN-S then immediately after a FCTN-1 to do a backspace then delete. Holding the key down will cause it to repeat.

Alpha-Lock Key

Alpha Lock key – This key works the same as the original, but it is not latching. The alpha-lock state is controlled by a microcontroller with custom code. This is not a latching key, however if you currently have the Alpha Lock engaged and you want to save its current state so that when you power up it will implement that state, you simply hold the key down for roughly 3 seconds and it will flash and save the setting to the EEPROM.

Back side of Keyboard PCB



Micro-Controller Circuitry

This is where all the magic happens, the circuitry controls the backlight, alpha-lock state and destructive backspace features. All within a custom-coded ATTINY84.

Keyboard Connector Cable

This is the cable that hooks up to the TI-99/4A main board. Please note that keyboards may come with a 15-position cable just like the TI-99/4A or a 18 Position. The 18-position cable can be used on the TI-99/4A, only hook up pins 1-15.

Power & Ground Connections

Simply a spot to provide power or pull power from the board for +5v DC and Ground.

Programming Port

This port can be used to program the ATTINY84 micro-controller with updated firmware. When programming the ATTINY84 be sure to disconnect the power to the keyboard. Obtain the 838-AVR program from <https://www.shift838.com>

Stabilizing Capacitor

This capacitor was put in to help stabilize the power going to the backlight LEDs.

TI-99 USB Keys Connection

Behind the keyboard ribbon cable there are surface mount pads that can be used to hook up the TI-99 USB-Keys keyboard adapter.

Bracket Mounting Holes

These are simply the holes to be used when mounting the MX99 3D printed brackets. Mount the brackets on the bottom of the board and attach the screws from the top.

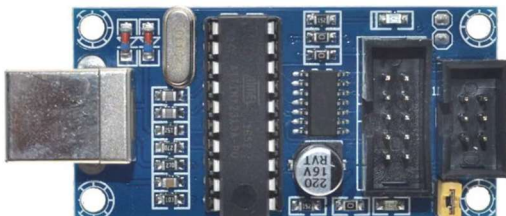
Programming the MX99 Microcontroller

The MX99 Microcontroller is easy to program when updates come out or if you want to revert to a previous firmware version.

Requirements:

- MX99 keyboard
- Programmer

The programmer that is the best and most reliable I have found is a USBTiny as seen below:



- Firmware File (.hex)

- 838-AVR Program – Can be downloaded from <https://www.shift838.com> and used to program the MX99 keyboard. This program is cross-platform compatible, it has been tested on Windows and Linux, it should also run on MAC. It does require Python 3 and other python modules to be installed, please refer to the 838-AVR documentation.

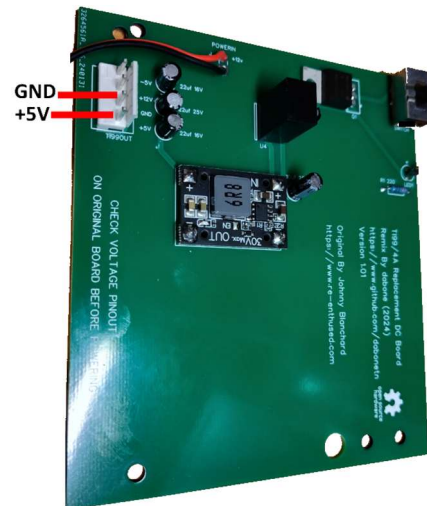
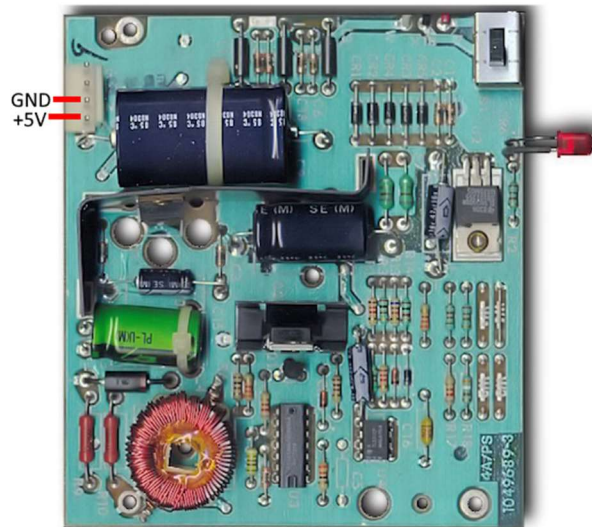
Installation

Below is a short guide to how to install the MX99 keyboard into a TI-99/4A:

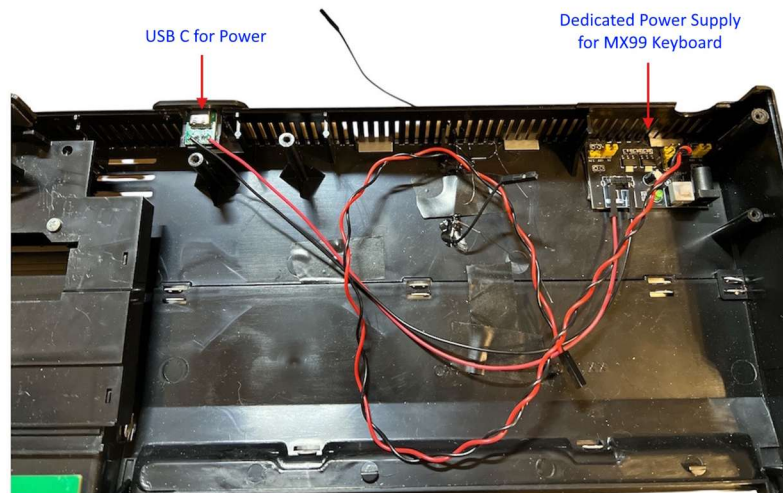
1. Disassemble the TI-99/4A, refer to the link if you need help:
 - a. http://www.mainbyte.com/ti99/console/console_dis.html

Note: It is recommended to use a dedicated power supply for the MX99 keyboard to eliminate audio hum.

2. If using a dedicated power supply for the MX99 and not tapping into the internal power supply, then jump to step 4.
3. If you are not using a dedicated power supply and want to tap into the 5v and Ground of an original TI-99/4A power supply or a modern drop-in replacement power supply, refer to the images below:



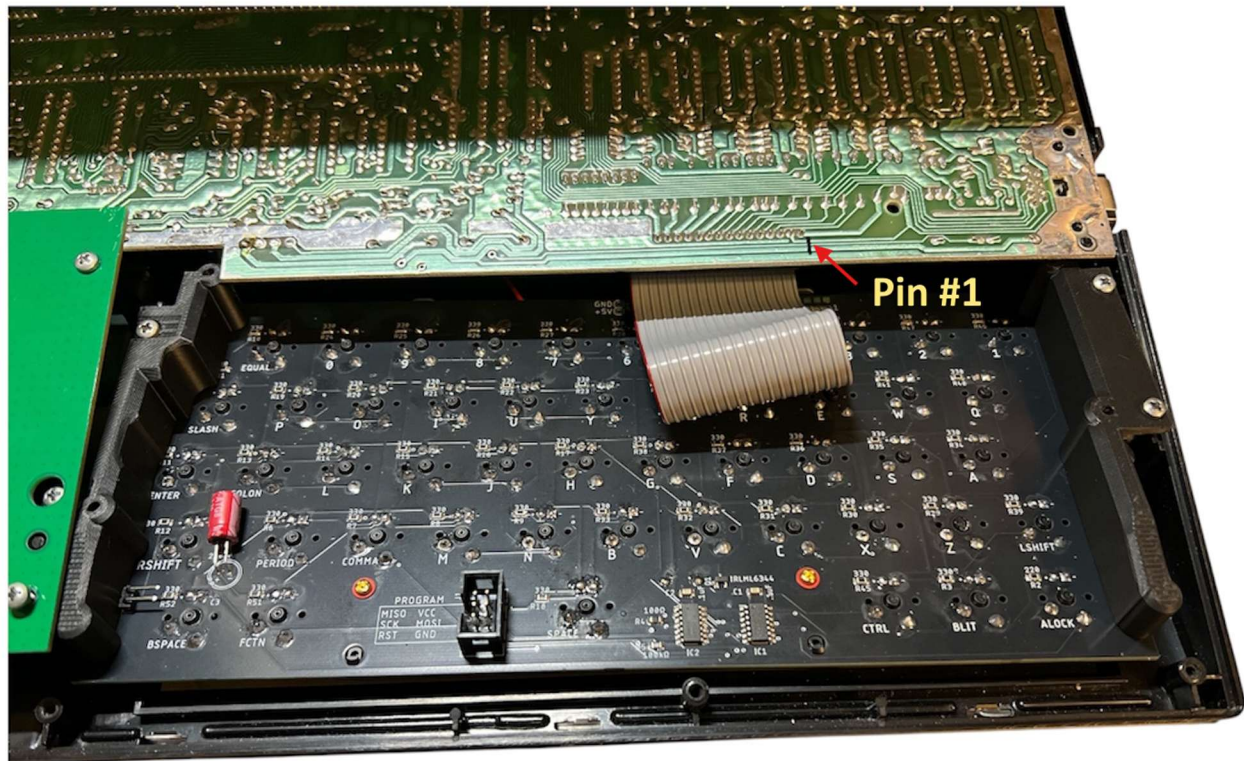
4. Depending on which power supply you are using to provide power to the MX99 keyboard, please ensure you have connected the correct wires to ground and +5v DC. Failure to do so will result in damaging the internal components of the power supply and possibly the TI-99/4A itself.
5. If using the bread-board power supply:
 - a. Find a suitable location to mount the unit using the double-stick tape method ensuring there is adequate wire length to connect from the USB C breakout to the bread-board power supply (BBPS) and from the BBPS to the MX99 keyboard power and ground headers.



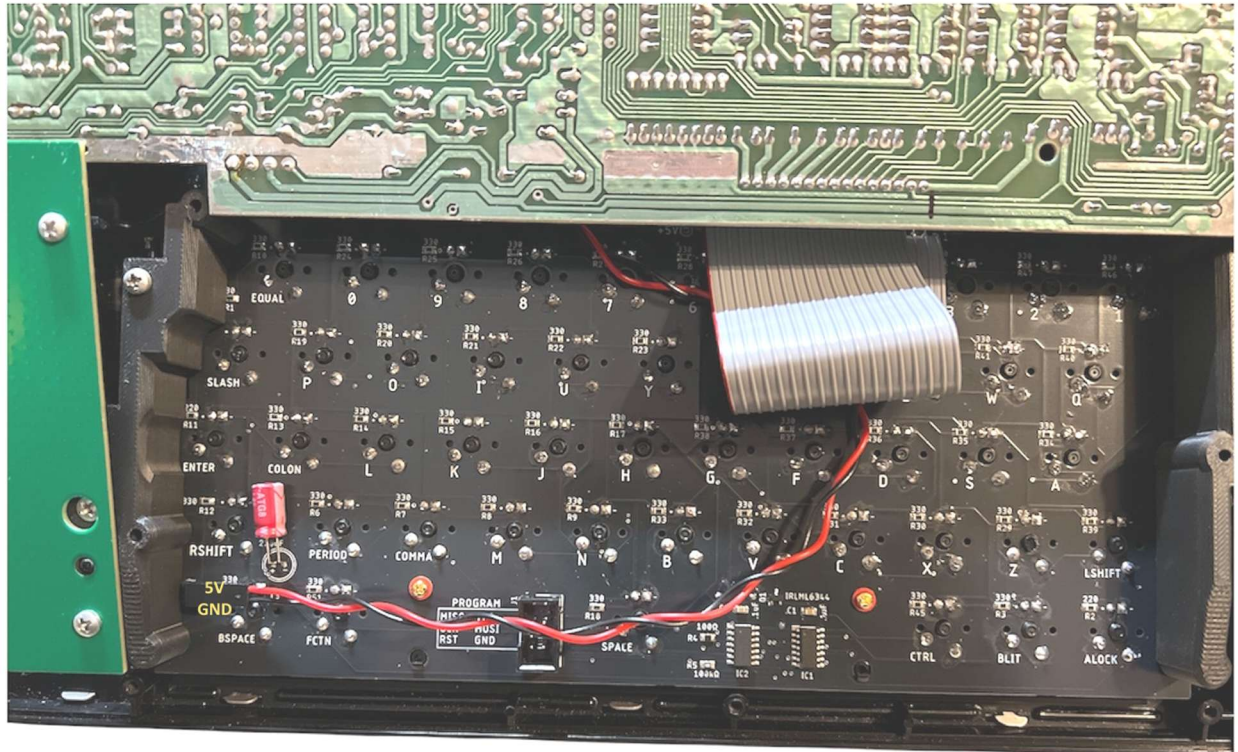
- b. Ensure the power switch on the BBPS is engaged so that it will always provide power (this is just for the USB with power switch cable so the end user can turn the MX99 on/off from the cable).
 - c. Do not hook the header wires to the keyboard yet. Test the power first with a multimeter set to DC voltage.
 - d. While the BBPS is turned on with power (look for the green LED on the BBPS PCB)
 - e. Using the multimeter test between power and ground that there is ~5VDC as an output.
 - f. Pick a spot on the TI-99/4A to mount the panel mount for the USB C breakout, measure and cut and mount it.
 - g. Run wires to their locations
 - h. Install the TI99/4A mainboard and internal power supply back in the unit and secure them.
 - i. Connect the power supply wires back up to the main board.
6. Mount the required 3D printed Brackets to the Keyboard. The keyboard brackets mount on the bottom and the screws go through the top of the keyboard into the brackets.



7. Drop the MX99 keyboard in place and plug in the ribbon cable as required to the TI-99/4A main board. Remember, the red line on the cable is for pin #1 of the keyboard. There is a white dot on the TI-99/4A main board, that is pin 15! The red wire on the cable should be furthest away from the white dot on the 99/4A main board, pin #15.



8. Loosely secure the MX99 keyboard and flip the 99/4A over for final alignment.
 - a. Make any adjustments needed to ensure all the keys can be pressed without rubbing on the 99/4A console shell.
9. Tighten the mount screws for the MX99
10. Plug in the 5VDC and Ground to the power ground header of the MX99



11. Put the bottom of the console shell back on the unit and insert all the power switch slide pieces to control the power to the unit. Don't worry about securing the bottom shell with screws yet.
12. Turn the unit back over
13. Plug in the USB power cable to the USB C panel jack that was mounted in step 5F.
14. Plug the main TI-99/4A console power to the back of the unit.
15. Now you are ready for the test!

Powering the MX99 Up for the first time

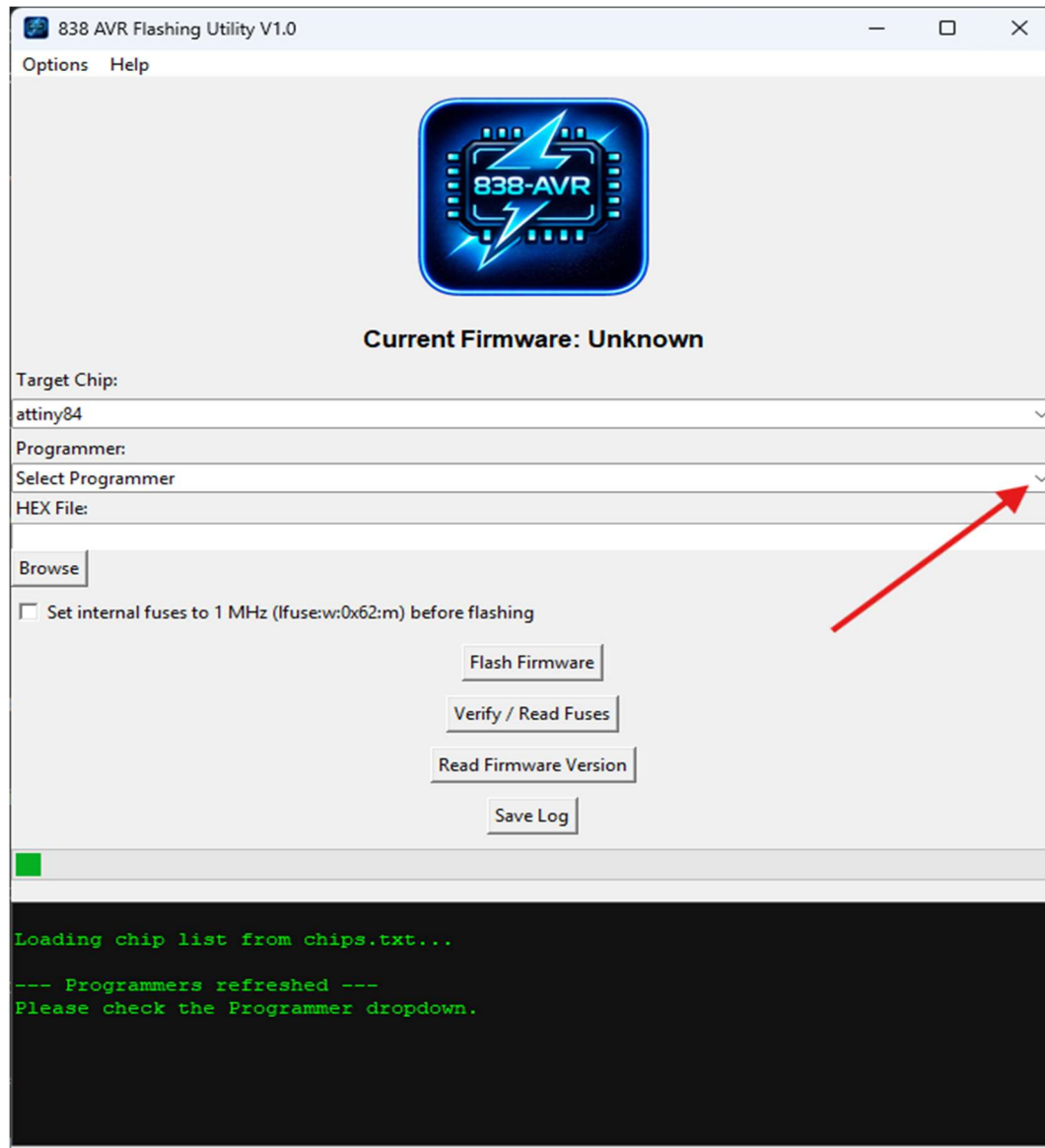
Verify Power Readings

1. Engage the power on the USB power switch.
 - a. By default, the MX99 ships to have the alpha lock key disengaged and the backlight brightness set to 'Medium'.
 - b. You should see the backlights engage almost immediately. Press the alpha lock key and verify the alpha-lock led turns on and off when pressed.
2. If all looks good for step 1 above, then power up the 99/4A console
3. Go into TI Basic and test your keyboard.
4. Secure bottom console shell with screws
5. Enjoy your new MX99 Keyboard!

Programming

The procedure is the same for Linux and Windows

1. Execute the MX99Update program
2. Plug in the programmer's cable to the MX99 programming header
3. Unplug the power wires from the MX99 keyboard
4. Once the programmer has been plugged in the MX99Update program will refresh the 'Select Programmers' and list all the programmers you have mounted on your system. Pull down the selection and select the programmer to be used.



5. Now click 'Browse' to select the firmware hex file to program.
6. Ensure you select 'Set internal fuses to 1MHz) before flashing
7. Click 'Flash Firmware'

8. When successful the status window will show:

```
Processing -U lfuse:w:0x62:m
Reading 1 byte for lfuse from input file 0x62
Writing 1 byte (0x62) to lfuse, 1 byte written, 1 verified

Processing -U flash:w:C:/Users/shift/OneDrive/Documents/MX99/838-MX99.ino.hex:i
Reading 2084 bytes for flash from input file 838-MX99.ino.hex
Writing 2084 bytes to flash
Writing | ##### | 100% 3.26s
Reading | ##### | 100% 2.70s
2084 bytes of flash verified

Avrdude.EXE done. Thank you.

✓ SUCCESS
```

9. Unplug the programmer first
10. Disconnect the programmer from the MX99 programming port
11. Reapply power to the MX99 keyboard ensuring VCC and Ground are correctly oriented.
12. Reassemble the TI-99/4A if needed.

Known Issues

There can be a hum on the audio line when the backlight LEDs are engaged. This depends on how clean the TI's internal power supply is. I have not run across any that are completely quiet, the hum is louder depending on the level of brightness from the backlight LEDs. The only real solution is to replace the power supply with a modern drop-in replacement sold on <https://www.shift838.com/store> or to use a dedicated clean 5v power supply that delivers at least 1.5 amps of current.

FAQs

Does it matter the order of powering up the TI and MX99 keyboard if using a dedicated power supply?

Answer: No

Trying to update the firmware on the MX99 and I have received an error that there is no programmer found/attached.

Answer: Programmers are quirky, unplug the programmer from USB and wait 10 seconds and plug it back in. The 838-AVR program should see it now, if you still experience the issue then it is an OS issue and may need you to reboot your PC.

I accidentally reversed 5v DC and Ground, now the keyboard does not work for the backlight or destructive backspace.

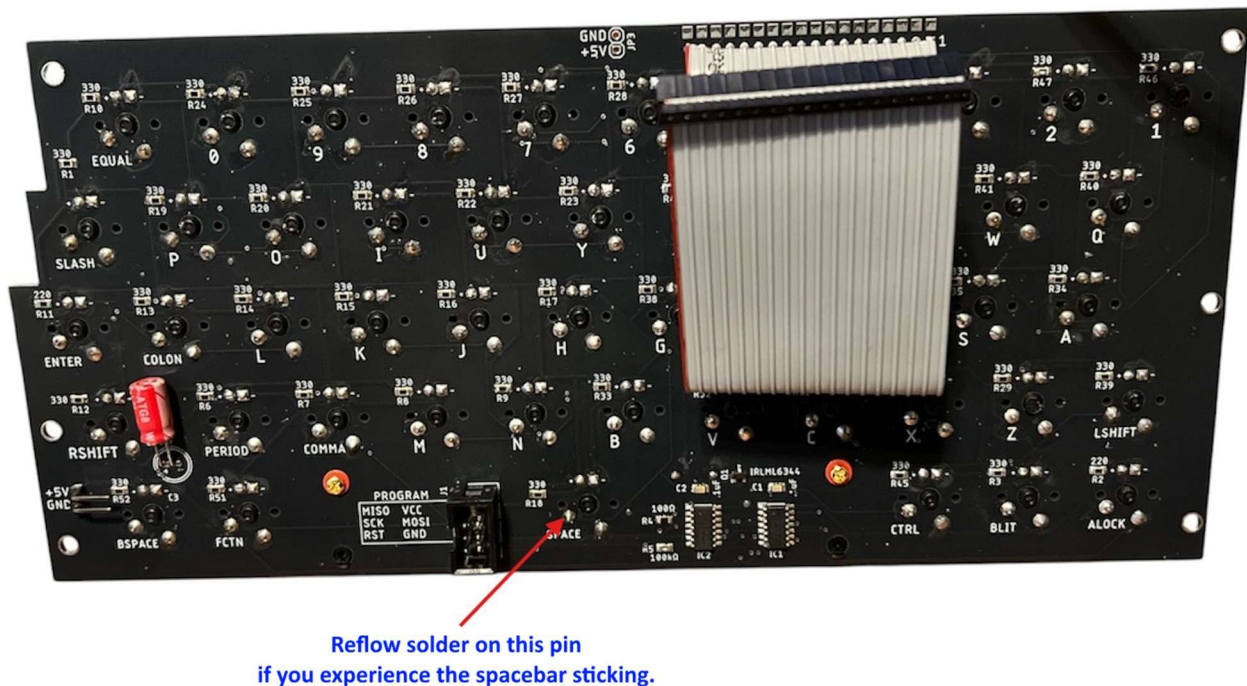
Answer: unplug the power to the keyboard fully and wait 30 seconds. Plug everything back in correctly, if the MX99 still behaves this way then you have fried the circuitry and it will need to be replaced. Send an email to support@shift838.com

When engaging the LEDs of the backlight there is a hum coming through my speakers.

Answer: This was mentioned before, this is because the stock internal power supply is a very dirty power supply. The MX99 was tested with the modern drop-in replacement, which still has a small hum. The corrective action is to use a dedicated modern power supply that provides at least 1.5 amps of power.

I built my keyboard myself and the spacebar seems to stick when the stabilizers are connected to the space bar.

Answer: The quickest course of action to resolve this is to desolder the LED of the spacebar completely and make sure you can remove the LED. Next while the spacebar is installed and mounted to the stabilizers and MX switch is to heat up and reflow the solder of the top pin closest to the Z-key row. This will force it to move ever so slightly to remove the bind. This has been corrected in the next revision.



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Links

- SHIFT838 Web Site: <https://www.shift838.com>
- SHIFT838 Web Store: <https://www.shift838.com/store>
- SHIFT838 YouTube Channel: <https://www.youtube.com/@shift838>

Support

If you need support feel free to drop an email to support@shift838.com

Telnet to heatwave.ddns.net port 9640

Revision History

Date	Author	Notes
September 1, 2026	Chris Schneider	Original Release
October 14, 2026	Chris Schneider	Added installation images