Assembly instructions and notes for the Z80-MBC3 kit computer

The Z80-MBC3 single board computer is intended to experience the vintage feel of the early days of personal computing. It is an evolution of a design made by Fabio Defabis (nickname Just4fun). My assessment of that design was that the Z80-MBC2 had some imperfections and could be improved in a number of ways.
With an upgrade, it was also possible to extend its input and output capabilities in order to make it more versatile. Design choices were made to simplify the hardware by making use of a more recent Atmega4809 controller chip which replaces the Atmega32A in the MBC2, and eliminate some of the components. Provisions have been made to allow the MBC3 to be used for a variety of applications. It is therefore wise to think about the intended purpose of the computer before you start with the assembly.
Questions that you should answer to yourself are:

Which of the available inputs and outputs am I going to use from the start?

Apart from the required plug modules, the MBC3 has several connections for general purpose digital I/O (GPIO) and an analogue input. If you won't require them then you can leave some locations on the printed circuit board unpopulated. In specific :

- The analogue input can be used with the onboard potentiometer or an external 0 – 5 Volt signal. If you wish to use the input for an external signal, then do not mount the potentiometer. The potentiometer is only needed in case you are going to use it.

- The pin headers for I2C and GPIO are only there for cases where you actually want to use them. You can postpone the mounting of these to a later time.

- Similarly, the UPDI connector is a provision to allow the initial programming of the ATmega4809 IOS controller. Since the kit is shipped with a preprogrammed Atmega4809, the UPDI header does not need to be fitted. It can however be used to wire +5 Volt and Ground to your application.

To assemble the PCB you need a soldering iron and a multimeter. Start with the resistors. Note that R6 and R7 are not present and not necessary because the DS3231 module has pull-up resistors on the SDA and SCK lines. Continue with the gradually higher profile components, i.e. IC sockets, capacitors, transistor, and LEDs, and round off with the 6-pin module sockets. Mind that many components (LEDS, electrolytic capacitor C5, and the beeper) have polarisation. Which means you must mount them in the right orientation. A demonstration video can be found on : Z80-MBC3 | Facebook
After the soldering is finished, you can apply the feet to the board. Rubber feet are included which can be sticked to the bottom at the four corners of the PCB. Finally plug the IC's into the sockets, the microSD card in the SD adapter module, and insert the modules. The SD adapter and RTC have the PCB pointing away from the main board, and the FTDI serial adapter has the module board vice versa.

Willem

Notes and limitations of the Z80-MBC3 :

➔ Battery on the DS3231 Real Time Clock

The Real Time Clock module is designed to work on a LIR2032 rechargeable battery. It will also work with a non-rechargeable after a simple modification. The resistor that is on the module to enable charging should be disconnected or removed when using a non-rechargeable battery.
You can look up many examples and online videos on how to accomplish that.

➔ disk emulation using the micro SD card

The Z80 target software that was created for the MBC2 can run on the MBC3 without the need for modification. The micro SD card shipped with the kit contains a verbatim copy of the image that was published for the MBC2. A copy of this archive is also available on the Z80-MBC3 Github file repository at :

https://github.com/eprive/Z80-MBC3/blob/main/s220718-r240620_sd_v1.zip

If you ever need to revert to this original collection, then you can copy it's contents to the micro-SD card which was included with the kit.

➔ IOS

The ATMEGA4809 was a logical replacement since it is available in a DIP package, and has extra features which are welcome for an upgrade of the Z80-MBC. The firmware maintains compatibility with the previous IOS version, and is expanded to support the added features.
In case the owner of a defective IOS controller IC wants to repair it himself or install an update the IOS firmware, the procedure for this is described in the respective archive:
https://github.com/eprive/Z80-MBC3/blob/main/IOS-S10425.zip
As of 2023 the kits are still shipped with the initial (2021) firmware and no newer versions have been released or planned.

➔ Terminal connection

The Z80-MBC3 was primarily designed to be used in conjunction with a PC or thin client running a terminal emulation program. The emulation settings for the FTDI adapter are :

Baudrate = 115200, 8 bits, 1 stopbit, No parity, XON+XOFF flow control

It is feasible to use a real terminal or an interface that provides a similar serial port interface. The uTerm board which was designed for the MBC2 can only be attached to the MBC3 using wires.

➔ USER button + LAMP LED usage in Z80 application programs

A quirck was discovered with boards that are populated with a blue coloured LED located on the LAMP position. When using the USER button in a Z80 application program, it will only work properly when the LAMP is not programmed (unlit). Z80 application programs that intend to use the LAMP _**and**_ the USER button concurrently, should replace the blue LED with a green coloured one.