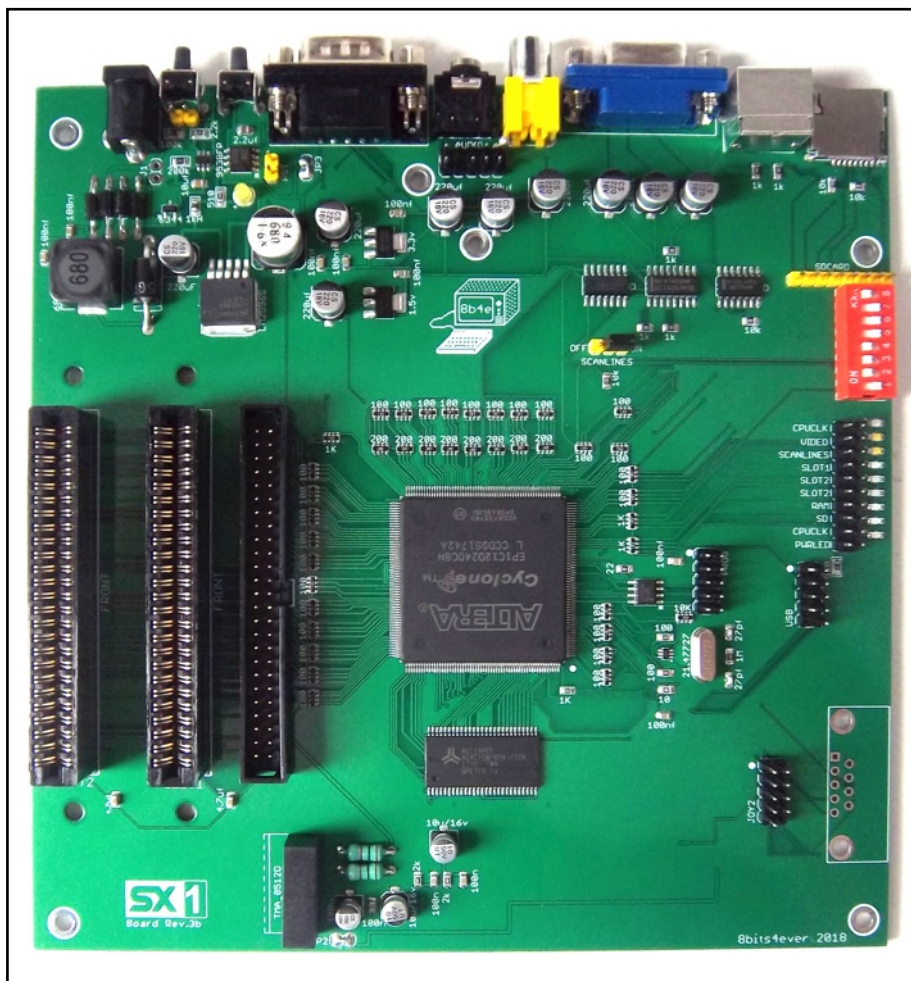


SX-1 MSX FPGA User Manual



This manual is based on the work by Bruno Nazareth



The SX-1 is a FPGA (field programmable gate array) computer board which implements a fully compatible MSX2+ machine. The ZX-1 design is based on the One Chip MSX. It features all the functions of the OCM and adds a hardware scanlines generator (for the VGA output). It also allows the connection of USB keyboards (only if they implement PS/2 protocol through USB).

Tech Specs

- Altera Cyclone EP1C12Q240C8N FPGA chip
- 32 MB SDRAM
- Compatible with KdL Firmwares
- MSX2+ Standard Compatible
- Turbo 5.37 or 8.06 MHz
- Switchable 2/4 Mb RAM Mapper
- MSX-MUSIC Compatible (FMPAC)
- 1 Mb ESE-MegaRAM
- 1 Mb ESE-RAM SCC+
- 2 External Cartridge Slots
- MicroSD Card Slot for Mass Storage (SD card **FAT16** formatted)
- RGB/VGA 15/31KHz Video Output (50/60Hz)
- Composite Video Output
- NTSC 60hz Composite and S-Video Output
- PS/2 and USB Keyboard Connection
- 2 DB9 Joystick Ports (MSX compatible)
- 3.5mm Jack Stereo Audio Output
- Selectable Tape Input Mode

Unit overview

(See Board_Overview.PDF for details)



Before you turn on your SX-1

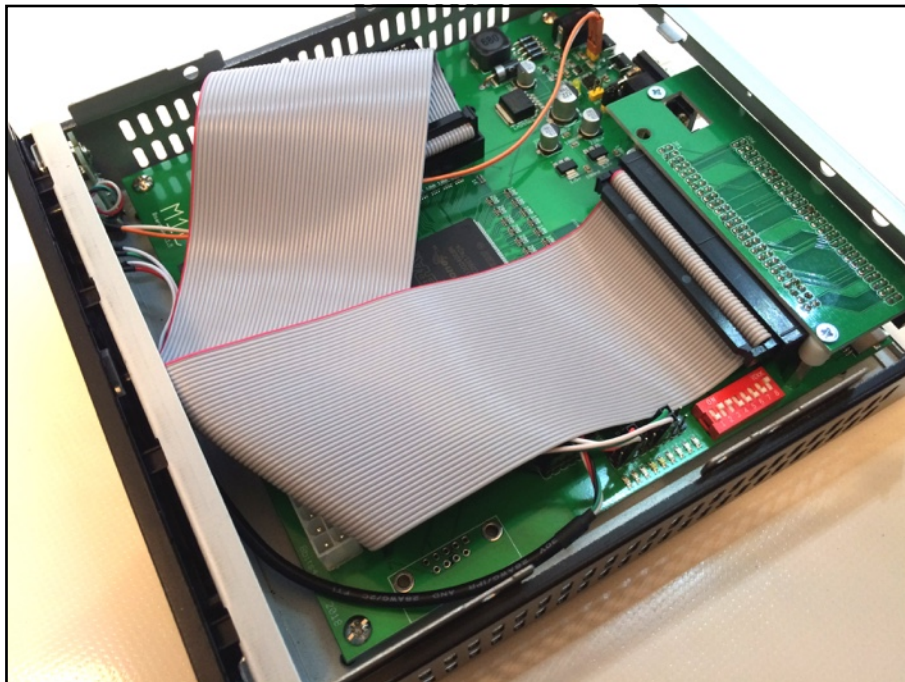
-Make sure you are using the right power supply. A **9 volts 2A** is recommended (although the unit can take up to 12v DC). **Using a different PSU could damage the unit permanently!**

-Select a desired video output (See **DIP Switch Settings** section). For best quality choose VGA/RGB video output. Remember the Composite/S-Video output is NTSC 60hz standard. If you connect it to a PAL screen you will get a B/W image.

-Connect a PS/2 Keyboard to be able to input commands. You can also use USB keyboards connected through the USB port 1, as long as the USB keyboard supports PS/2 protocol.

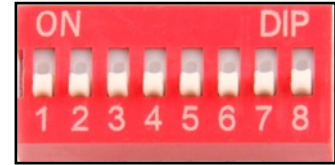
-Optionally, you can insert a FAT16 formatted SD card with MSXDOS2 boot files (See **DIP Switch Settings** section to enable the SD slot) and also you can insert any MSX compatible cartridge (game cartridges, Floppy/IDE controllers, FlashROM carts, etc are supported)

WARNING!!! Do not plug/unplug any cartridge/device when the unit is powered. It will very likely damage the unit permanently.



DIP Switch Settings

The DIP switch is accessible from the bottom of the unit and can be used to select/configure the various features the SX-1 offers.



Switch	Function	Setting	
SW1	CPU Speed	OFF	CPU 3.58Mhz
		ON	CPU 8.06Mhz -TurboPANA 5.37Mhz -Turbo Mega SD enabled
SW2/SW3	Video Output	OFF/OFF	Composite Video/S-Video (NTSC, 60hz)
		OFF/ON	RGB (through VGA connector).
		ON/OFF	VGA 31khz/60Hz
		ON/ON	VGA w/ scanlines, 31Khz/60Hz
SW4	SLOT 1 Config	OFF	External slot 1 enabled
		ON	internal MEGASCC+ (1Mb) enabled External slot 1 disabled
SW5/SW6	SLOT 2 Config	OFF/OFF	External slot 2 enabled
		OFF/ON	internal ESE MegaRAM 1Mb (ASCII 8Kb BANK). External slot 2 disable
		ON/OFF	internal ESE MegaSCC+ 1Mb. External slot 2 disable
		ON/ON	internal ESE MegaRAM 1Mb (ASCII 16Kb BANK). External slot 2 disable
SW7	RAM Mapper	OFF	2Mb internal RAM mapper
		ON	4Mb internal RAM mapper
SW8	SD Card Slot	OFF	Disabled
		ON	Enabled

Warning!! Do not alter DIP switches settings while the unit is powered on!! DOING SO MIGHT DAMAGE THE UNIT

Keyboard

The SX-1 supports standard PC PS/2 keyboards and USB keyboards implementing PS/2 protocol through USB.

All the SX-1 functions and settings are accessible through key strokes and shortcuts. Special MSX keys (STOP, GRAPH, etc) are mapped to PC keyboard as well:

PC Key/ Combo	Function
END	MSX STOP Key
ALT	MSX GRAPH Key
WIN	MSX SPACE Key
F6	MSX GRAPH Key
F7	MSX KANA Key
F8	MSX SELECT Key
F9	Increase PSG volume
SHIFT + F9	Decrease PSG volume
F10	Increase SCC volume
SHIFT + F10	Decrease SCC volume
F11	Increase FM volume
SHIFT + F11	Decrease FM volume
PAGE UP	Increase overall volume
PAGE DOWN	Decrease overall volume
F12	Changes CPU speed between 3.58MHz, 5.37MHz and 8.06MHz
PRINTSCREEN/ SHIFT + PRINTSCREEN	Changes video output CVBS/S-Video, SCART, VGA 31KHz, VGA+ 31KHz
SCROLL LOCK	Enable/disable tape input mode
SHIFT + F12	Toggles SLOT 1 configuration external/SCC+
SHIFT + SCROLL LOCK	Toggles SLOT 2 configuration external/ASCII8/SCC+/ASCII16

Status LEDs

There are 9 LEDs on board to show the status of different SX-1 configurations. LEDs will turn ON/OFF depending on a setting being enabled or disabled. Also, while adjusting volume the LEDs will show the level (from 1 to 9) of the volume.

LED	Status	
1	Flashing	SD activity. Flash memory activity
2	ON	4Mb RAM Mapper
	OFF	2Mb RAM Mapper
3/4	OFF/OFF	External SLOT 2 Enabled
	OFF/ON	ESE-MegaRAM ASCII 8K
	ON/OFF	ESE-MegaSCC+
	ON/ON	ESE-MegaRAM ASCII 16K
5	OFF	External SLOT 1 Enabled
	ON	ESE-SCC+
6/7	OFF/OFF	Composite Video/S-Video output
	OFF/ON	15khz RGB+Audio through VGA connector
	ON/OFF	VGA
	ON/ON	VGA with scanlines
8/9	OFF/OFF	Standard 3.58Mhz Clock
	OFF/ON	Turbo 5.37Mhz Clock
	ON/OFF	Turbo 8.06Mhz Clock

Keyboard LEDs are also used to show configuration status:

SCROLL LOCK LED: Tape input ON/OFF

NUM LOCK LED: Kana mode ON/OFF

Attention! DIP switch, keys and LED functions can change if a different firmware is loaded onto the board.

Cartridges

Both external slots on the SX-1 can be used to run MSX cartridges. These can be ROM (software) cartridges or any hardware add-on cart like FDD/IDE interfaces, FlashROM cartridges, etc. Any cart that works on a original MSX machine should work with the SX-1.

ATTENTION!! DO NOT INSERT/EXTRACT CARTRIDGES WHILE THE UNIT IS POWERED ON.

To use the external slots make sure the DIP switches are set properly: Switch 4 OFF to activate slot 1, Switches 5 and 6 OFF to activate slot 2.

External Mass Storage

To use any external storage devices such as floppy disk controllers or IDE controller cartridges you might need to disable the SX-1 SD slot to avoid hardware conflicts. To turn off the SD slot set the DIP switch 8 to OFF.

Tape Player

It is possible to use a tape player with original MSX cassette tapes to load software into the SX-1 through the right audio channel input. This channel can be configured either as an audio output or input by pushing the SCROLL LOCK key on the keyboard.

For tape loading make sure the SX-1 SD slot is disabled and the SCROLL LOCK LED on the keyboard is lit. Then you can issue the BASIC loading command (see the instructions for the particular tape you want to load) and play the tape.

SX-1 SD Card Slot

To activate the SX-1 internal SD card slot set the DIP switch 8 to ON. You can use SD cards formatted as FAT16, max partition size 4GB. With the latest KdL firmware release the SX-1 will support SDHC, but the max partition size remains 4GB.

You can use the card directly with the regular MSX BASIC commands (FILES, SAVE, LOAD, etc). The card will be recognized as drive "A". If there is an external storage interface plugged onto one of the cartridge slots the internal SD will be recognized as drive "C".

It is also possible to use MSXDOS (NEXTOR is also available with KdL firmware 3.5). In this case you need to copy MSXDOS2.SYS and COMMAND2.COM to the SD card.

Running MSXDOS will allow the use of various tools and utilities as for example ROMLOAD.COM/MGLOCM.COM to load ROM files, SofaRUN to browse and launch files and programs, many SX-1 configuration utilities, C compilers, etc. Notice you need to individually download and copy these utilities into the card. We strongly recommend to read the MSXDOS2 user manual to get familiar with all its functions and features.

Firmware Update

The MSX user/developer KdL is actively updating the OCM/Zemmix firmware. You can find the latest version at his site: <http://gnogni.altervista.org>

The firmware can be updated either with the PLDFLASH.COM utility (provided in KdL's the "OCM-EXTRA" package) or using the Altera USB-Blaster programmer. Please follow the instructions enclosed in KdL's "OCM-PLD" package ("howto.txt" file).

ATTENTION!! From firmware version 3.6.2 there is an specific version for the SX-1 board. Is recommended to use this firmware.

