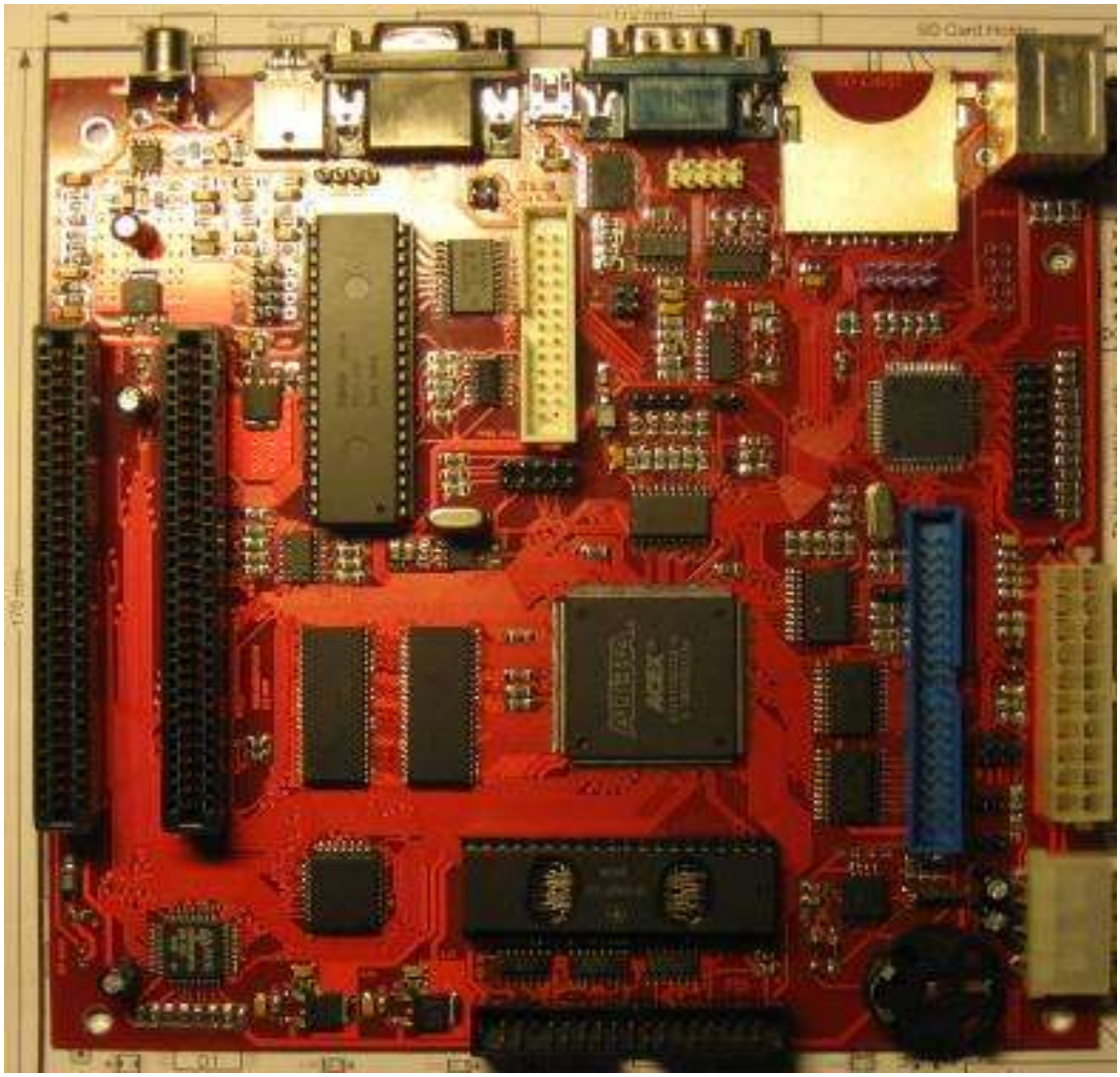
Solder and start up ZX Evolution

(ZX Evolution revision C)



(version 16. Feb. 2012)

www.nedopc.com

Table of content

1 Preface

You must to have skill to solder SMD parts and QFP chips.

Need hardware programmer for flashing bootloader into MCU ATMEGA128 (for example Altera ByteBlaterMV and compatible).

ZX Evolution based on programmable logic matrix ALTERA ACEX. Cause computer functionality depend to loaded configuration. NedoPC create own configuration (see “base configuration” document).

Please print montage scheme before soldering ZX Evolution. Refer to montage scheme for placing parts.

Recommended to read manual before soldering.

Some useful hints:

- Please solder parts in order like in manual. Some parts hard to solder than it not in order.
- Please refer any part to montage scheme before soldering. Remove soldered parts is too hard.
- Please refer to polarity and pins order of parts. False polarity may cause to malfunction any other parts.
- Punctuality soldering give easy start up.
- Please not mix different parts. Some parts not marked (for example SMD capacitors) and hard to find.
- If you can check part before soldering then please do it.

Marking of some parts declare in appendix of manual.

2 Soldering order

1. SMD resistors and capacitors. Tantalum capacitors has polarity (positive pin of tantalum capacitor marked by lines).
   WARNING: *Place SMD capacitor pins far from GND field of board. Pins placed near board may cause to short. (Protection mask not complete close GND field on some boards).*
2. QFP chips корпусах (D1, D2 and D4).
   WARNING:
   - Please refer to first pin orientation of chip;
   - Please set pins of chip precisely to it places on board before soldering;
   - If you short some pins by solder than clear it only by soldering iron. Other mechanical devices (like needle) can destroy pins of chip.
3. SOIC, SOJ (RAM1, RAM2) and PLCC (D3) chip.
   - Please refer to first pin orientation of chip;
   - Please set pins of chip precisely to it places on board before soldering;
4. Non SMD parts (diodes, capacitors, ferrites, quarts).
   WARNING:
   - If you plan to use ITX or ATX case for board then recommend not solder VD3,VD6 (replace it to two-pins connector). Cause You can to use leds on front of case.
5. DIP panels (for D5,D8 chips).
   WARNING:
   - Refer to side key in panel via inserting chip.
   - D5 (KR1818VG93) has 2.5mm pins step. Not recommend use panels with through hole contact termination type.
6. Insulation-displacement connectors (IDC).
   WARNING:
   - If you not plan to develop ZX Evolution configurations then you not need X4 and X14 connector.
7. Other connectors.
   WARNING:
   - Solder power connector only whose be used.

After soldering:

- Clear board from flux by proper solvent. Recommend to clear board after soldering SMD parts or before soldering connectors. Remove flux from working surfaces of connectors.
- Check power circuits to ground shorting by ohmmeter or other proper testers. Please check power circuits after voltage regulators too. If you found shorting then must remove it before start up.
- Recommend to check connectors and panels pins to ground shorting (whose must not connect to ground.

3 Start up

Computer not require some tunes and must start correctly if used good working conditions parts. Boards was to check by electronic test on PCB manufacture (true only for ordering from NedoPC boards).

Start up board and check it steps:

- Flash bootloader to ATMEGA128 MCU via ByteBlasterMV hardware programmer (see Appendix) or other.
- Flash working configuration via bootloader (use USB, RS232 connector or SD card). You can to flash TEST&SERVICE configuration for checking some blocks of ZXEvo (all test of this configuration write log to USB, RS232 of master computer).
- Check loading configuration to programmable logic matrix EP1K50Q208.
- Check other blocks of ZX Evolution.

ZX Evolution need next flashing images for start up:

- bootloader (used for start ATMEGA128 MCU and for updating configurations);
- working configuration (used by ATMEGA128 MCU and include code for programmable logic matrix EP1K50Q208). NedoPC supply “base configuration”, but exist configurations from other developers.
- ZXEVO.ROM (flashed to M29F040 and used by Z80 CPU).

3.1 Flashing bootloader to ATMEGA128 MCU.

Bootloader used for change or update configurations of ZXEvo. Bootloader run in first and start current working configuration or try to flush new configuration if some rules gone.

Board has two connectors for connect hardware programmer: ISP [X5] and JTAG [X14].

You can to flash bootloader to ATMEGA128 MCU by two ways:

- Use ByteBlasterMV (Altera specification) via ISP [X4] (soft AVReal http://real.kiev.ua/avreal/download/)
- Use JTAG [X14] (AVR JTAG ICE).

Fuses of ATMEGA128:

Fuse	Value	Description
CKOPT	0	Ext. Crystal/Resonator High Freq.; Start-up time: 16K CK + 64 ms
CKSEL3..1	111	
CKSEL0	1	
SUT1..0	11	
BODEN	0	Brown-out Detector level at 4.0 V
BODLEVEL	0	

BOOTRST	0	boot-block start on reset
BOOTSZ10	00	Size of boot-block is 8Kb
EESAVE	1	Clear EEPROM on ChipErase
SPIEN	0	Allowed flashing via ISP
JTAGEN	0	Allowed JTAG
OCDEN	1	On-chip Debug prohibited
M103C	1	ATMEGA103 not compatible
WDTON	1	Watchdog Timer not used
BLB1	10	boot-block modifying by SPM command prohibited

Command line for AVREAL (flashing via ByteBlasterMV):

```
avreal32.exe -ab -p1 +ATMEGA128 -e -w zxevo_bl.hex -f_low=3F,_high=88,_ext=FF,_lock=EF -v
```

3.2 Flashing working configuration

Working configuration content code for logic matrix EP1K50Q208 and interact with peripheral devices like keyboard, mouse, RTC, joystick and other. Working configuration flashed to ATMEGA128 MCU.

Bootloader flash working configuration via miniUSB-USB or RS232 null-modem cable, or from SD card. See documentation of bootloader.

3.3 Flashing ZXEVO.ROM to M29F040

ZXEVO.ROM content programs for Z80 cpu like BASIC or OS. NedoPC supply ready-to-use M29F040 , but You can to flash it from TEST&SERVICE configuration (see TEST&SERVICE documentation).

4 Appendix 1. Parts marking

4.1 SMD resistors

Recommend to use 1206 or 0805 size of SMD resistors.

SMD resistors marked by next rules:

XYZ where XY – value, Z — number of zeros, like on formula XY*10^Z Ohm.

For example:
102 = 10*10^2 = 1000 Ohm (or 1 KOhm);
510 = 51*10^0 = 51 Ohm.

SMD resistors whose value smaller then 10 Ohm marked by next rules:

XR**Y** where X — Ohm value, Y — 0,1 Ohm value.

For example:
1R0 = 1,0 = 1 Ohm;
2R2 = 2,2 = 2,2 Ohm.

4.2 SMD capacitors

Recommend to use 1206 or 0805 size of SMD capacitors.

SMD capacitors not marked.

4.3 Tantalum SMD capacitors

Tantalum capacitors has size Type A, Type B, Type C, Type D. Please use capacitors whose size equal to size wrote in bill of material.

Tantalum capacitors marked by next rules:

- Positive pin marked by line;
- Capacity calculate like XYZ rule for resistors, but in pF.

For example:
105 = 10*10^5 = 1000000pF = 1 mkF
476 = 47*10^6 = 47000000pF = 47 mkF

4.4 Aluminum capacitors

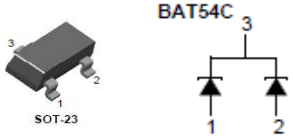
Capacity and maximum voltage of aluminum capacitor printed on it body — for example 100mkF x 16V.

Negative pin marked by line on capacitor side.

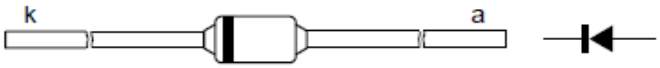
4.5 Diodes

- VD1,VD2 content two schottky-diodes in one SOT23 case. Diodes orientation in case depend to name (use BAT54C). Fairchild diodes has L43 on case, Philips diodes - WW1

(Refer to datasheet for other manufacturers).

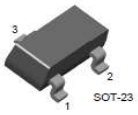


- VD4,VD5,VD7,VD8 diodes can like in smd SOD80 case or in SOD27 (DO-35) non-smd case. It named LL4148 (smd) or 1N4148 (non-smd).



4.6 Transistors

VT2-VT4 can any BC846-BC850 series in SOT23 case.



1. Base
2. Emitter
3. Collector

Fairchild transistors marked by string on case like in table:

Type	BC846			BC847			BC848			BC849			BC850		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Mark	8AA	8AB	8AC	8BA	8BB	8BC	8CA	8CB	8CC	8DA	8DB	8DC	8EA	8EB	8EC

Philips transistors marked by string on case like in table:

Type	BC846			BC847			BC848			BC849			BC850		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Mark	1A*	1B*	1D*	1E*	1F*	1G*	1J*	1K*	1L*		2B*	2C*		2F*	2G*

Where * depend to country: 'p' (made in HK), 'm' (made in Malaysia), 'W' (made in China).

Refer to datasheet for other manufacturers.

4.7 Voltage regulators

Voltage regulator DA5 can any 7805 compatible in TO252 (DPACK) case. Maximum current is 500mA.

1. Voltage In
2. Ground
3. Voltage Out

Voltage regulators DA2-DA4 can any LM1117 compatible in TO252 (DPACK) case.

1. Ground
2. Voltage Out
3. Voltage In

Marking depend to manufacturer (refer to datasheet). Marking for some manufacturer in table:

Part	Uout	LM1117	K1254	IL1117	SPX1117
DA2	ADJ	LM1117DT-ADJ	K1254EP1T	IL1117-1.25D0T	SPX1117R
DA3	3.3V	LM1117DT-3.3V	K1254EH3AT	IL1117-3.3D0T	SPX1117R-3.3
DA4	2.5V	LM1117DT-2.5V	K1254EH2AT	IL1117-2.5D0T	SPX1117R-2.5

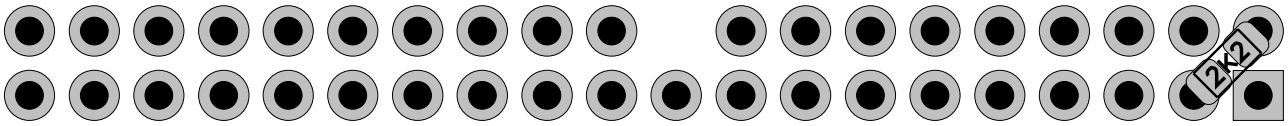
5 Appendix 2. Hardware fixes

We found some fixes for ZX Evolution hardware. Boards from NedoPC has fixes, but You can make fixes youself.

5.1 Fix long time searching IDE device

Searching IDE devices is long time if no devices plugged to IDE.

IDE connector [X2] (bottom side of board).
ID7 line pull-down to GND via resistor.



Use 1K5 .. 4K7 resistor.

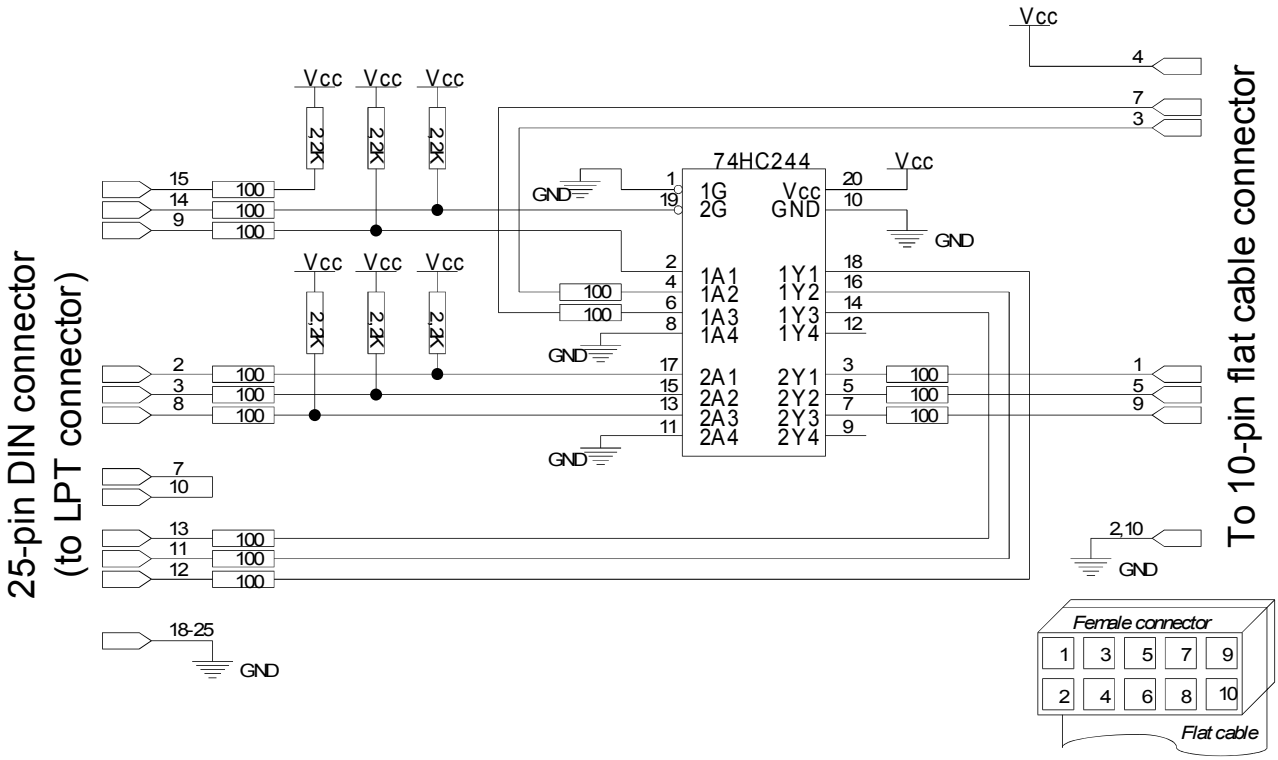
6 Appendix 3. Parts set

Parts set from NedoPC is enough to solder ZX Evolution, but scheme content unnecessary parts. List of parts not supplied by NedoPC in table:

Name	Value	Description
VD3,VD6	LED5	Leds replaced by two-pins connector for using leds on front side of ATX or ITX case: • VD3 – HDD LED; • VD6 – PWR LED.

7 Appendix 4. ByteBlasterMV scheme

Original scheme from Altera “ByteBlasterMV Parallel Port Download Cable Data Sheet”.



WARNING:

- Connection to master computer via printer LPT connector (Some modern computers not has LPT connector).
- Length of cable from 10-pin connector to ZX Evolution connector must be maximum 10..15 centimeters (4-6 inches).