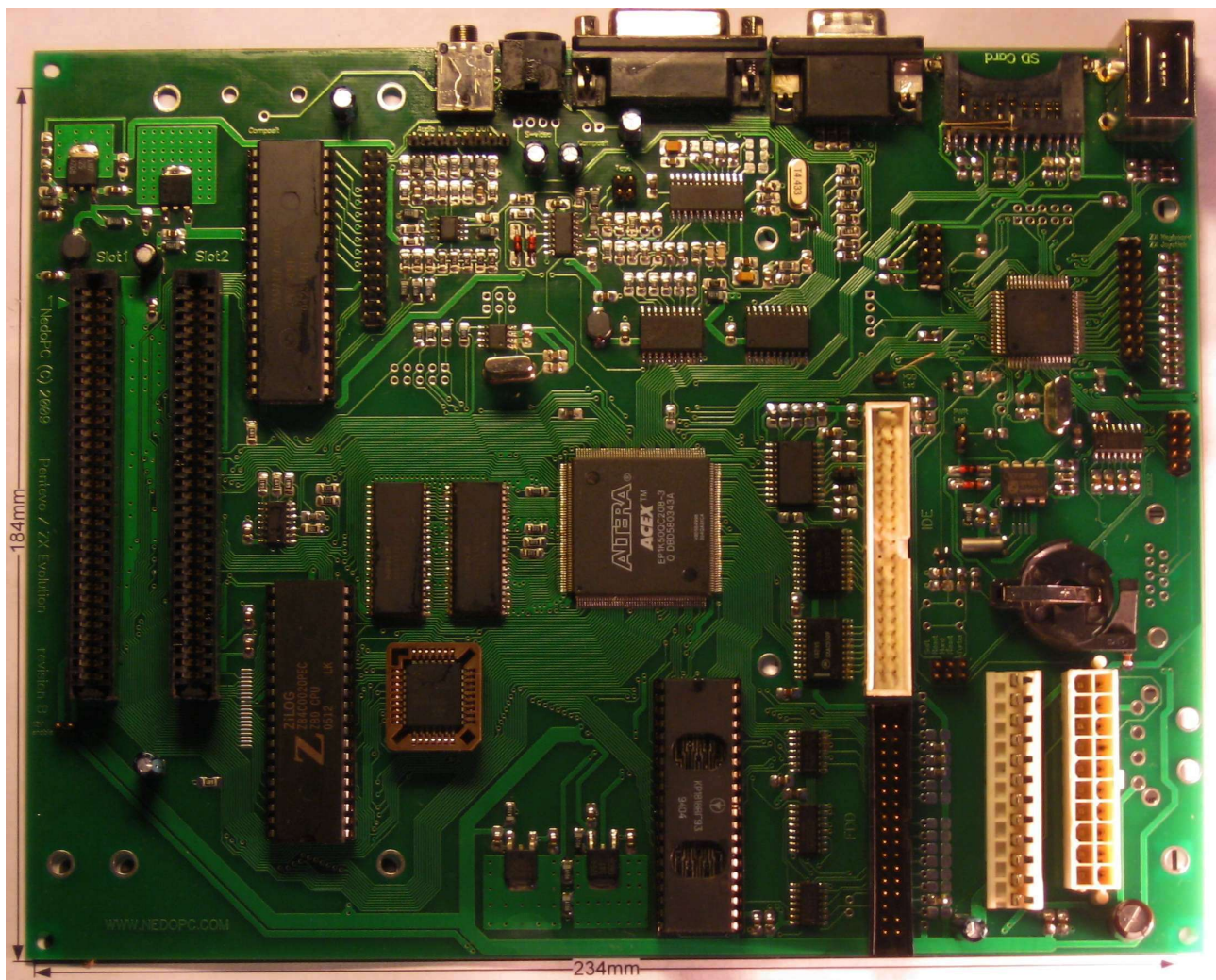


ZX Evolution. User manual.
(ZX Evolution revision B)



(version 19. Sep. 2010)

www.nedopc.com

Table of contents

1 Introduction.....	3
2 Board layout.....	4
3 Connectors.....	5
3.1 X1. Floppy drive.....	5
3.2 X2. IDE.....	6
3.3 X3. IO port and audio.....	6
3.4 X4. JTAG for EP1K50Q208.....	7
3.5 X5. AVR ISP for ATMEGA128.....	7
3.6 X6. RS232 communication.....	8
3.7 X7. VGA.....	8
3.8 X8. S-Video out.....	8
3.9 X9. Composite video out.....	9
3.10 X10. 3.5 Audio out.....	9
3.11 X11. PS/2 keyboard and mouse.....	9
3.12 X12. Joystick and original ZX keyboard.....	9
3.13 X13. RGB video out.....	10
3.14 X14. AVR JTAG for ATMEGA128.....	10
3.15 X15. Tape in/out.....	11
3.16 X16. Audio out (duplicate X10).....	11
3.17 X17. Audio in.....	11
3.18 X18. Reserved.....	11
3.19 X19. RS232 communication (duplicate X6).....	11
3.20 X20. Composite video out (duplicate X9).....	12
3.21 X21. S-Video out (duplicate X8).....	12
3.22 PWR1. AT power.....	12
3.23 PWR2. ATX power.....	13
3.24 PWR3. Power.....	13
3.25 GB1. Battery holder.....	13
4 Jumpers and button.....	15
5 ZXBUS slots.....	17
6 Installation ZX Evolution to ATX/miniATX case.....	19
7 Installation ZX Evolution to AT case.....	20
8 Appendix 1. Ribbon cable for floppy drives.....	21

1 Introduction

ZX Evolution is Spectrum compatible computer. Computer based on programmable logic device Altera EP1K50Q208 and has flexible architecture, but board content original main chips (Z80, sound coprocessor, floppy controller).

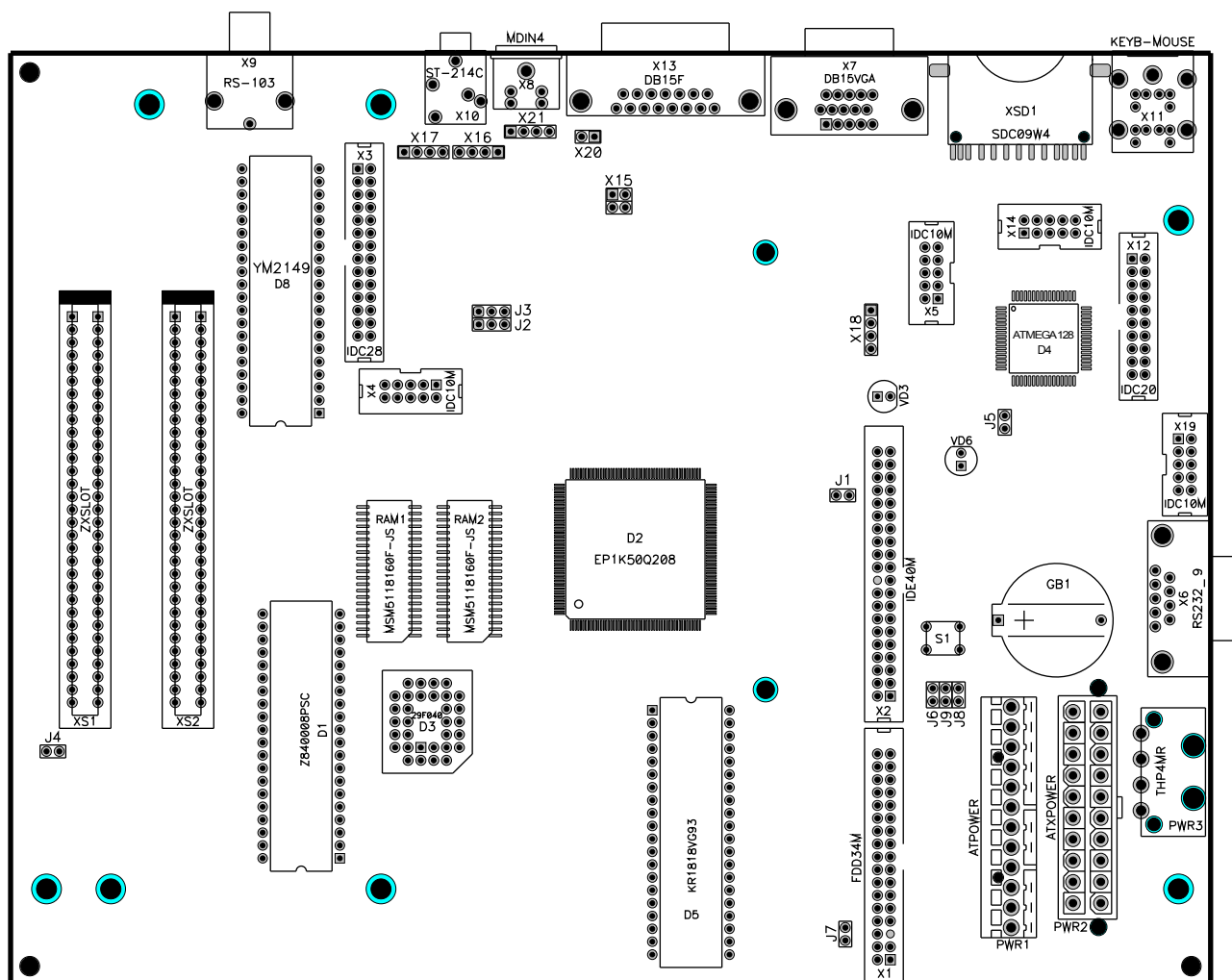
ZX Evolution board designed by miniATX standard for easy installation to miniATX or ATX case.

Main features:

- Z80 on 3.5MHz (standard)/7 MHz (turbo mode) without wait circles;
- 4 MBytes RAM, 512KBytes ROM (flash ROM);
- MiniATX form factor, support ATX or AT power supply;
- 2 ZXBUS slots;
- Peripheral controller ATMEGA128;
- PS/2 keyboard/mouse interface;
- IDE interface [parallel ATA] (one channel, up to 2 devices on master/slave mode);
- SD(HC) memory card interface;
- Floppy disk interface based on WDC1793 (support up to 4 drives);
- RS232 interface;
- Realtime/Calendar (RTC);
- Sound interfaces: AY38910/YM2149F, beeper, pwm;
- Joystick and mechanical (original) keyboard interface;
- Tape interface (input/output);
- RGB video out (SCART compatible);
- Integrated PAL coder on CXA1645M/CXA2075M (composite and S-Video output);
- VGA (scan doubler).

2 Board layout

Layout of components and connectors on board:



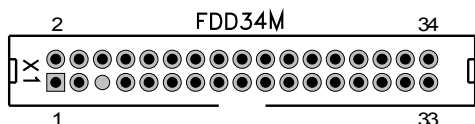
Most usable connectors place to ATX cases “window”.

Board use standard ATX or AT power supply.

Warning: Only ZXBUS compatible devices may installed to slot (for example NeoGS sound card: <http://www.nedopc.com/gs/ngs.php>).

3 Connectors

3.1 X1. Floppy drive



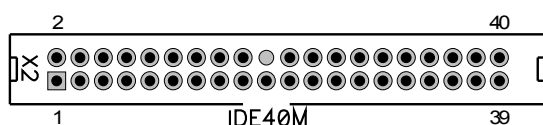
Connector for floppy drive[s] (3.5' or 5.25'). Supported up to four devices.

First pin have square pad.

Pins description:

№	Name	Description	№	Name	Description
1	GND	Ground	2		Not used
3	GND	Ground	4		Not used
5	KEY	key (no contact)	6	DS3	Select 3 drive (D)
7	GND	Ground	8	IDX	Index
9	GND	Ground	10	DS0	Select 0 drive (A)
11	GND	Ground	12	DS1	Select 1 drive (B)
13	GND	Ground	14	DS2	Select 2 drive (C)
15	GND	Ground	16	MOTON	Motor on
17	GND	Ground	18	DIRC	Direction
19	GND	Ground	20	STEP	Step
21	GND	Ground	22	WD	Write data
23	GND	Ground	24	WG	Write enable
25	GND	Ground	26	TR00	Track 0
27	GND	Ground	28	WP	Write protect
29	GND	Ground	30	RDDATA	Read data
31	GND	Ground	32	SIDE1	Side select
33	GND	Ground	34		Not used

3.2 X2. IDE



Connector for IDE (parallel ATA) drives. Supported up to two drives on master/slave mode.

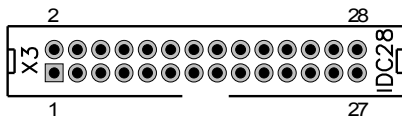
First pin have square pad.

Pins description:

№	Name	Description	№	Name	Description
1	RESET	Reset	2	GND	Ground
3	D07	Data7	4	D08	Data8
5	D06	Data6	6	D09	Data9
7	D05	Data5	8	D10	Data10

9	D04	Data4	10	D11	Data11
11	D03	Data3	12	D12	Data12
13	D02	Data2	14	D13	Data13
15	D01	Data1	16	D14	Data14
17	D00	Data0	18	D15	Data15
19	GND	Ground	20	KEY	KEY (no contact)
21		Not used	22	GND	Ground
23	DIOW		24	GND	Ground
25	DIOR		26	GND	Ground
27	IORDY		28		Not used
29		Not used	30	GND	Ground
31		Not used	32		Not used
33	DA1	Address1	34		Not used
35	DA0	Address0	36	DA2	Address1
37	CS0	Select0	38	CS1	Select
39	DASP	Indicator	40	GND	Ground

3.3 X3. IO port and audio

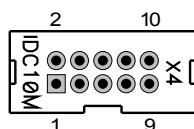


Connector for connect external devices (AY/YM coprocessor port interface) and audio output.
First pin have square pad.

Pins description:

№	Name	Description	№	Name	Description
1	LOUT	Left audio output	2	ROUT	Right audio output
3	GND	Ground	4	GND	Ground
5	AYA0	Data0 port A	6	AYB0	Data0 port B
7	AYA1	Data1 port A	8	AYB1	Data1 port B
9	AYA2	Data2 port A	10	AYB2	Data2 port B
11	AYA3	Data3 port A	12	AYB3	Data3 port B
13	AYA4	Data4 port A	14	AYB4	Data4 port B
15	AYA5	Data5 port A	16	AYB5	Data5 port B
17	AYA6	Data6 port A	18	AYB6	Data6 port B
19	AYA7	Data7 port A	20	AYB7	Data7 port B
21	+5V	Power +5V	22	+5V	Power +5V
23	RESZ	Reset (Z80 reset line)	24	AY_CLK	AY/YM clock frequency (1.75MHz)
25	GND	Ground	26	GND	Ground
27	GND	Ground	28	GND	Ground

3.4 X4. JTAG for EP1K50Q208

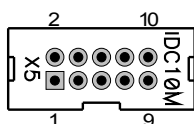


Connector for programming FPGA EP1K50Q208 via JTAG interface (with ByteBlasterMV or other programming device).
First pin have square pad.

Pins description:

№	Name	Description	№	Name	Description
1	TCK	Clock	2	GND	Ground
3	TDO	Data output	4	3V3	Power +3.3V
5	TMS	Mode select	6		Not used
7		Not used	8		Not used
9	TDI	Data input	10	GND	Ground

3.5 X5. AVR ISP for ATMEGA128

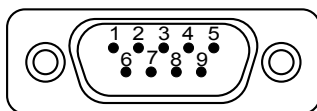


Connector for programming ATMEGA128 via ISP (with ByteBlasterMV or other programming device).
First pin have square pad.

Pins description:

№	Name	Description	№	Name	Description
1	CK	Clock	2	GND	Ground
3	DO	Data output	4	VCC5	Power +5V
5	RST	Reset	6		Not used
7		Not used	8	EXCLOCK	External clock
9	DI	Data input	10	GND	Ground

3.6 X6. RS232 communication

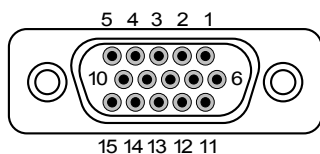


Communication port used for connection with other computer or communicating devices (for example modem). Up to 115200BOD transfer speed.

Pins description:

№	Name	Description	№	Name	Description
1		Not used	6		Not used
2	RXD	Receive data	7	RTS	Request to send
3	TXD	Transmit date	8	CTS	Clear to send
4		Not used	9		Not used
5	GND	Ground	Shield		Connected to ground

3.7 X7. VGA



Connector for monitor or TV.

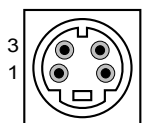
Warning: Monitor or TV must support 50Hz, 31KHz video rate. Please refer to monitor manual or compatible monitors list:

http://www.nedopc.com/zxevo/zxevo_supported_monitors.pdf.

Pins description:

№	Name	Description	№	Name	Description
1	R	Red	9		Not used
2	G	Green	10	GND	Ground
3	B	Blue	11	GND	Ground
4		Not used	12		Not used
5		Not used	13	HS	Horizontal synchronization
6	GND	Ground	14	VS	Vertical synchronization
7	GND	Ground	15		Not used
8	GND	Ground	Shield		Shield connect to ground

3.8 X8. S-Video out



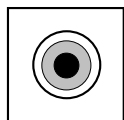
Connector for TV or monitor.

Quality of s-video signal is higher than composite video signal.

Pins description:

№	Name	Description	№	Name	Description
1	GND	Ground	2	GND	Ground
3	C	Chrominance	4	Y	Luminance

3.9 X9. Composite video out



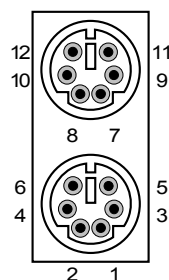
Connector for TV or monitor. Shield connect to ground.

3.10 X10. 3.5 Audio out

Connector for headphone or speaker.

Shield connect to ground.

3.11 X11. PS/2 keyboard and mouse

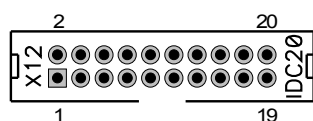


Connector for PS/2 keyboard and mouse. Keyboard connect into near from board (bottom) socket. Mouse connect into far from board (top) socket. Shield connect to ground.

Pins description:

№	Name	Description	№	Name	Description
1	DATA	Keyboard data	7	DATA	Mouse data
2		Not used	8		Not used
3	GND	Ground	9	GND	Ground
4	+5V	Power +5V	10	+5V	Power +5V
5	CLK	Keyboard clock	11	CLK	Mouse clock
6		Not used	12		Not used

3.12 X12. Joystick and original ZX keyboard

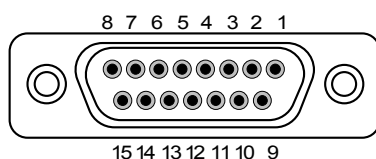


Connector for original ZX keyboard or joystick. First pin have square pad.

Pins description:

№	Name	Description	№	Name	Description
1	ZXROW0	0 row of original keyboard	2	ZXROW1	1 row of original keyboard
3	ZXROW2	2 row of original keyboard	4	ZXROW3	3 row of original keyboard
5	ZXROW4	4 row of original keyboard	6	ZXROW5	5 row of original keyboard
7	ZXROW6	6 row of original keyboard	8	ZXROW7	7 row of original keyboard
9	RST	Reset	10	ZXCOL4	4 column of original keyboard
11	ZXCOL3	3 column of original keyboard	12	ZXCOL2	2 column of original keyboard
13	ZXCOL1	1 column of original keyboard	14	ZXCOL0	0 column of original keyboard
15	GND	Ground	16	JOYL	Left of joystick
17	JOYR	Right of joystick	18	JOYU	Up of joystick
19	JOYD	Down of joystick	20	JOYF	Fire of joystick

3.13 X13. RGB video out



Connector for monitors or TV (via SCART).

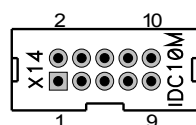
Shield connect to ground.

Warning: Some TV not content RGB video inputs on SCART connector. Please refer to TV user manual.

Pins description:

№	Name	Description	№	Name	Description
1	GND	Ground	9	R	Red
2	GND	Ground	10	G	Green
3	GND	Ground	11	B	Blue
4	CPAL	Composite video out	12	VS	Vertical synchronization
5	GND	Ground	13	CS	Composite synchronization
6	LOUT	Left audio out	14	GND	Ground
7	ROUT	Right audio out	15	VCC	Power +5V
8	HS	Horizontal synchronization	Shield		Shield connect to ground

3.14 X14. AVR JTAG for ATMEGA128



Connector for programming ATMEGA128 via JTAG ICT.

First pin have square pad.

Pins description:

№	Name	Description	№	Name	Description
1	TCK	Clock	2	GND	Ground
3	TDO	Data output	4	VCC	Power +5V
5	TMS	Mode select	6	PRGRST	Reset
7	VCC	Power +5V	8		Not used
9	TDI	Data input	10	GND	Ground

3.15 X15. Tape in/out



Connector for tape device.

First pin have square pad.

Pins description:

№	Name	Description	№	Name	Description
1	IN	Tape input	2	GND	Ground
3	OUT	Tape output	4	GND	Ground

3.16 X16. Audio out (duplicate X10)

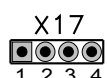


Connector for headphone or speaker.
First pin have square pad.

Pins description:

№	Name	Description	№	Name	Description
1	LOUT	Left	2	GND	Ground
3	GND	Ground	4	ROUT	Right

3.17 X17. Audio in

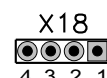


Connector for external audio sources (for example CDROM).
First pin have square pad.

Pins description:

№	Name	Description	№	Name	Description
1	LIN	Left	2	GND	Ground
3	GND	Ground	4	RIN	Right

3.18 X18. Reserved

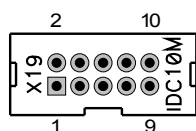


Connector with reserved pins of ATMEGA128. Reserved for future use.
First pin have square pad.

Pins description:

№	Name	Description	№	Name	Description
1	PE2	PE2 pin on ATMEGA128	2	GND	Ground
3	GND	Ground	4	PE3	PE3 pin on ATMEGA128

3.19 X19. RS232 communication (duplicate X6)

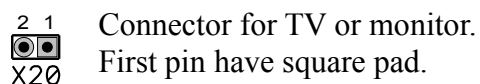


Communication port used for connection with other computer or communicating devices (for example modem). Up to 115200BOD transfer speed.
First pin have square pad.

Pins description:

№	Name	Description	№	Name	Description
1		Not used	2	RXD	Receive data
3	TXD	Transmit data	4		Not used
5	GND	Ground	6		Not used
7	RTS	Request to send	8	CTS	Clear to send
9		Not used	10		Not used

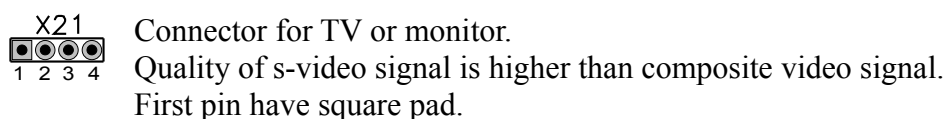
3.20 X20. Composite video out (duplicate X9)



Pins description:

№	Name	Description	№	Name	Description
1	CPAL	Composite video	2	GND	Ground

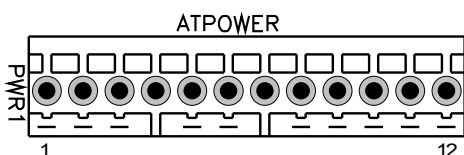
3.21 X21. S-Video out (duplicate X8)



Pins description:

№	Name	Description	№	Name	Description
1	Y	Luminance	2	GND	Ground
3	GND	Ground	4	C	Chrominance

3.22 PWR1. AT power



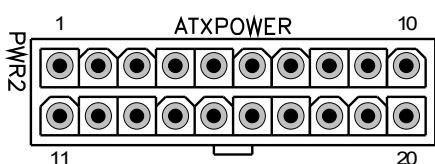
Connector for AT power supply.

Warning: Wires marked black (on P8 and P9) must be together in center of boards connector.

Pins:

№	Name	Description	№	Name	Description
1	PWRGOOD	Power is good	7	GND	Ground
2	VCC5	Power +5V	8	GND	Ground
3	VCC12	Power +12V	9		Not used
4		Not used	10	VCC5	Power +5V
5	GND	Ground	11	VCC5	Power +5V
6	GND	Ground	12	VCC5	Power +5V

3.23 PWR2. ATX power

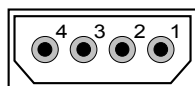


Connector for ATX power supply.

Pins description:

№	Name	Description	№	Name	Description
1		Not used	11		Not used
2		Not used	12		Not used
3	GND	Ground	13	GND	Ground
4	VCC5	Power +5V	14	PS_ON	Power on
5	GND	Ground	15	GND	Ground
6	VCC5	Power +5V	16	GND	Ground
7	GND	Ground	17	GND	Ground
8	PWRGOOD	Power is good	18		Not used
9	VCC5STBY	Standby +5V	19	VCC5	Power +5V
10	VCC12	Power +12V	20	VCC5	Power +5V

3.24 PWR3. Power

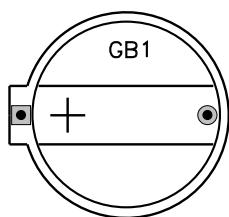


Connector for non-standard power supply (+12V, +5V, GND).

Pins description:

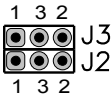
№	Name	Description	№	Name	Description
1	VCC5	Power +5V	3	GND	Ground
2	GND	Ground	4	VCC12	Power +12V

3.25 GB1. Battery holder



Holder for RTC battery.
Please use CR2032 batteries (3Volt).

4 Jumpers and button

№	Name	Default value	Description	
J1	enable IDERES	opened	Enable IDE reset signal to IDE drives if shorted. It need to some old drives (for example Samsung 10Gb drives).	
J2,J3	set frequency	opened  1 - GND 2 - VCC5 J2:3 - S0 J3:3 - S1	Set frequency multiplier of PLL ICS501M (input frequency 14MHz).	
			State	Frequency
			J3:1-3 2 (S1=0) J2:1-3 2 (S0=0)	56MHz (4X input)
			J3:1-3 2 (S1=0) J2:1 3 2 (S0=M)	74.375MHz (5.3125X input)
			J3:1-3 2 (S1=0) J2:1 3-2 (S0=1)	70MHz (5X input)
			J3:1 3 2 (S1=M) J2:1-3 2 (S0=0)	91MHz (6.25X input)
			J3:1 3 2 (S1=M) J2:1 3 2 (S0=M)	28MHz (2X input) [default value]
			J3:1 3 2 (S1=M) J2:1 3-2 (S0=1)	43.75MHz (3.125X input)
			J3:1 3-2 (S1=1) J2:1-3 2 (S0=0)	84MHz (6X input)
			J3:1 3-2 (S1=1) J2:1 3 2 (S0=M)	42MHz (3X input)
			J3:1 3-2 (S1=1) J2:1 3-2 (S0=1)	112MHz (8X input)
J4	12v enable	opened	Enable +12V power supply to slots if shorted.	
J5	external clock	opened	Enable external clock to ATMEGA128 from AVR ISP connector (X5).	
J6	soft reset key	opened	Soft reset or power switching: - connect «PWR SW» button from ATX case; - soft reset (without restart ATMEGA128) if shorted few time.	
J7	HRDY->IP	opened	HRDY controlled IP pull-down to GND if closed.	
J8	turbo key	opened	Set turbo mode if shorted. Connect «Turbo» button from AT case.	
J9	hard reset key	opened	Hard reset (with restart ATMEGA128) if shorted. Connect «Reset» button of AT or ATX case.	

VD3 ¹	HDD Led		Connect «HDD LED» from AT or ATX case.
VD6 ²	PWR Led		Connect «PWR LED» from AT or ATX case.
S1 ³	hard reset button		Hard reset (with restart ATMEGA128).

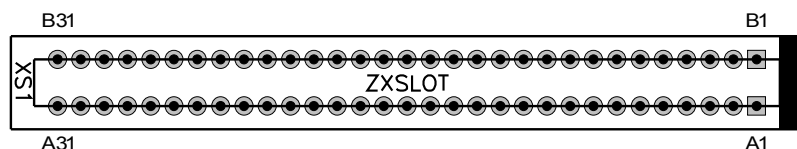
1 If set contacts instead VD3 led on board (for example boards from NedoPC).

2 If set contacts instead VD6 led on board (for example boards from NedoPC).

3 Not installed on boards from NedoPC.

5 ZXBUS slots

ZX Evolution have two slots compatible to ZXBUS standard.



ZXBUS pin step is 2.54mm.

First pin have square pad. First pin is near to rear side of ATX case.

Warning: ZXBUS cards key must placed to first pins side of slot. If ZXBUS card not have key, please refer to ZXBUS card user manual. If you install ZXBUS card incorrectly than ZXEvolution board may be malfunction.

Warning: ZX Evolution developer not guaranteed correct working ZXBUS cards from other developers. ZX Evolution developer not test ZXBUS cards from other developers. Testing must be organized by ZXBUS cards developer.

Warning: If ZXBUS card need +12V power on slot than J4 jumper on ZX Evolution board must be shorted.

Slot pins description:

№	Name	Description	№	Name	Description
A1	A14	14 address line of CPU	B1	A15	15 address line of CPU
A2	A12	12 address line of CPU	B2	A13	13 address line of CPU
A3	+5V	Power +5V	B3	D7	7 data line of CPU
A4	DCDOS	TRDOS enabled	B4		Not used
A5		Not used	B5		Not used
A6	GND	Ground	B6	D0	0 data line of CPU
A7	GND	Ground	B7	D1	1 data line of CPU
A8		Not used	B8	D2	2 data line of CPU
A9	A0	0 address line of CPU	B9	D6	6 data line of CPU
A10	A1	1 address line of CPU	B10	D5	5 data line of CPU
A11	A2	2 address line of CPU	B11	D3	3 data line of CPU
A12	A3	3 address line of CPU	B12	D4	4 data line of CPU
A13	IORQGE	Disable other devices (io catch)	B13	INT	Interrupt
A14	GND	Ground	B14	NMI	Non masked interrupt
A15	CSROMCE	Enable ROM selection	B15	HALT	CPU halt
A16	RS	Switch ROM pages	B16	MREQ	CPU memory request
A17		Not used	B17	IORQ	CPU io request
A18		Not used	B18	RD	CPU read data
A19	BUSRQ	CPU bus request	B19	WR	CPU write data
A20	RES	Reset	B20		Not used

ZX Evolution. User manual

A21	A7	7 address line of CPU	B21	WAIT	CPU wait
A22	A6	6 address line of CPU	B22		Not used
A23	A5	5 address line of CPU	B23		Not used
A24	A4	4 address line of CPU	B24	M1	M1 state of CPU
A25	CSROM	ROM selected	B25	RFSH	Refresh
A26	BUSAK	CPU bus acknowledge	B26	A8	8 address line of CPU
A27	A9	9 address line of CPU	B27	A10	10 address line of CPU
A28	A11	11 address line of CPU	B28	+5V	Power +5V
A29	+5V	Power +5V	B29	+12V	Power +12V
A30	GND	Ground	B30	GND	Ground
A31		Not used	B31		Not used

6 Installation ZX Evolution to ATX/miniATX case

ZX Evolution board designed for easy installing to ATX or miniATX case.

Warning: ZX Evolution not complected with brackets and fixates.

Steps:

1. Set CR2032 battery or compatible to GB1 holder on board.
2. Set board to cases frame. Set frame into case. Connectors (X10, X8, X13, X7, XSD1, X11) must placed to “window” on rear side of case.
3. Connect cases power supply to PWR2.
4. Connect RES SW (from «Reset» button on case) to J9 (hard reset) on board.
5. Connect PWR SW (from «Power» button on case) to J6 (soft reset) on board.
6. Connect IDE LED (from «Ide» led on case) to VD3⁴ on board (positive contact have square pad).
7. Connect PWR LED (from «Power» led on case) to VD6⁵ on board (positive contact have square pad).
8. Set floppy drive(s)⁶ into case, connect power supply to drive(s) and connect to X1 via ribbon cable.
Warning: Ribbon cable of floppy drive not compatible with standard PC ribbon cable. Scheme of ribbon cable see in appendix.
9. Set IDE drive(s)⁷ into case, connect power supply to drive(s) connect to X2 via ribbon cable.
Warning: Installing two IDE drives may be only in master/slave mode.

⁴ If set contacts instead VD3 led on board (for example boards from NedoPC).

⁵ If set contacts instead VD6 led on board (for example boards from NedoPC).

⁶ Floppy drive is not mandatory, ZX Evolution work normally without it.

⁷ IDE drive is not mandatory, ZX Evolution work normally without it.

7 Installation ZX Evolution to AT case

AT case necessary to prepare:

- create «window» on rear side of case for ZX Evolution boards connectors;
- create mounting holes on cases frame accord ZX Evolution board holes.

Warning: ZX Evolution not complected with brackets and fixates.

Steps:

1. Set CR2032 battery or compatible to GB1 holder on board.
2. Set board to cases frame. Set frame into case. Connectors (X10, X8, X13, X7, XSD1, X11) must placed to “window” on rear side of case.
3. Connect cases power supply to PWR1.
4. Connect RES SW (from «Reset» button on case) to J9 (hard reset) on board.
5. Connect TURBO SW (from «Turbo» button on case) to J8 (turbo key) on board.
6. Connect IDE LED (from «Ide» led on case) to VD3⁸ on board (positive contact have square pad).
7. Connect PWR LED (from «Power» led on case) to VD6⁹ on board (positive contact have square pad).
8. Set floppy drive(s)¹⁰ into case, connect power supply to drive(s) and connect to X1 via ribbon cable.
Warning: Ribbon cable of floppy drive not compatible with standard PC ribbon cable. Scheme of ribbon cable see in appendix.
9. Set IDE drive(s)¹¹ into case, connect power supply to drive(s) connect to X2 via ribbon cable.

Warning: Installing two IDE drives may be only in master/slave mode.

⁸ If set contacts instead VD3 led on board (for example boards from NedoPC).

⁹ If set contacts instead VD6 led on board (for example boards from NedoPC).

¹⁰ Floppy drive is not mandatory, ZX Evolution work normally without it.

¹¹ IDE drive is not mandatory, ZX Evolution work normally without it.

8 Appendix 1. Ribbon cable for floppy drives

Floppy controller on ZX Evolution distinguish from PC controller in selecting drives method. Floppy controller based on WDC1793 support up to four floppy drives.

PC floppy drives is selected like “B” drive on ZX Evolution by default. For connecting two drives to ZX Evolution use special ribbon cable:

