PC Engines

ALIX.1C system board

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Table of contents

Federal Communications Commission Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio energy. If this equipment is not installed and used in accordance with the manufacturer's instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

This board is designed for installation in a shielded enclosure (metal or plastic with conductive coating). Shielded cables are required on LAN and serial ports to assure compliance with FCC regulations.

A copy of the test report will be provided on request.

CE Declaration of Conformity

We, PC Engines GmbH, declare that ALIX1.C, when installed in the mini-box M200 metal enclosure, is in conformance with:

- EN 61000-6-3 (2005)   (emissions, residential and industrial)

- EN 61000-6-2   (ESD, susceptibility, residential and industrial)

The unit under test is in conformity with the standards mentioned above.

A copy of the test report will be provided on request.

Compliance information

For FCC, ALIX has been tested as a CPU board, installed in an enclosure, with the top cover removed. No further testing should be required if the board is used with other FCC tested modular components. Please see http://www.fcc.gov/oet/ for more details. The responsible party for FCC is the importer.

Testing for CE mark must be done at the level of the complete product, possibly including the wireless cards. Please contact PC Engines for assistance and documentation.

For satisfactory resistance to electrostatic discharge events (ESD), the ALIX board should be grounded (e.g. through the mounting holes, or the serial port connector).

Recycling / disposal
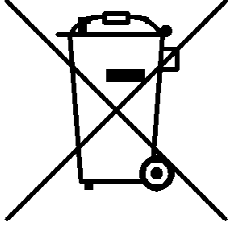
Do not discard electronic products in household trash ! All waste electronics equipment should be recycled properly. Actual procedures depend on your country.

Information for the recycler:

Remove lithium battery from the socket for separate recycling.

Introduction / features

ALIX is a miniITX form factor system board optimized for thin clients and embedded applications.

- AMD Geode LX CPU, 500 MHz (LX800) 5x86 CPU,
- 256 KB cache (64K data + 64K instruction + 128K L2)
- 1 Ethernet channel (Via VT6105M)
- 1 miniPCI + 1 PCI socket (3.3V) for 802.11 wireless cards and other expansion
- 256 MB DDR SDRAM, 64 bit wide for high memory bandwidth
- 512 KB flash for Award system BIOS.
- CompactFlash + 44 pin IDE header for user's operating system and application
- 12V DC supply through DC jack
- 2 serial port (DB9 male + 10 pin header)
- 1 parallel port (26 pin header)
- Combined PS/2 keyboard + mouse port
- VGA port
- 4 USB 2.0 ports (2 on rear panel connector + 2 on 10 pin header)
- AC97 audio codec (line in / line out on board, headphone + mic on 10 pin header)
- Header for LPC bus (use for flash recovery or I/O expansion)
- GPIO header for user expansion
- Optional header for TFT LCD interface, I2C bus
- Front panel header for power switch, reset, hard disk and power LED
- Buzzer for "beeps"
- Socketed RTC battery

OEM options

The following options can be configured for larger orders:

- DRAM size (128 MB, 256 MB)
- CPU speed (LX700 / LX800 / LX900)
- Delete I/O not required by customer
- CMOS level serial port (RXD / TXD only)
- Power LED
- PC Engines tinyBIOS

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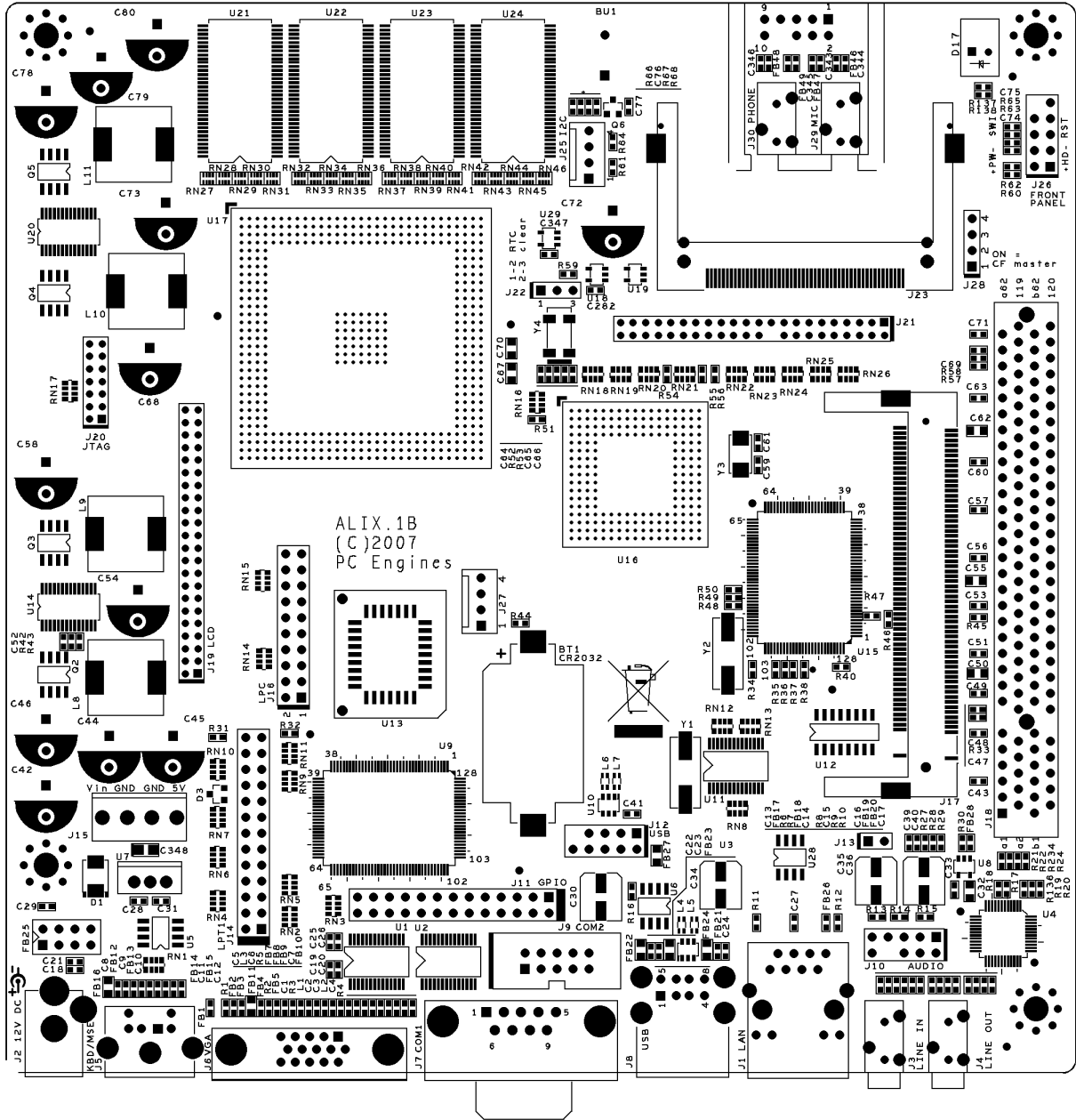
Technical data

Power supply   +12V DC, ~ 0.007A off state, typical about 0.4A active
                      Peak power can be higher, suggest a 15W supply.
                      Center pin = positive, sleeve = ground, 2.5 mm diameter.

Temperature range   0 to 50°C.

Dimensions   ALIX.1C = 6.7 x 6.7" (170 x 170 mm)

Known issues / warnings

The PCI slot supports 3.3V cards and riser cards ONLY. Do not attempt to insert a 5V adapter or riser card "the wrong way" – you may damage ALIX or your adapter card.

If using header J15 to feed power into the board, use the 12V and GND pins only, do NOT feed 5V into the board.

Commell MP-541D miniPCI dual Ethernet card will not work. This card quietly uses another ID select line for the second Ethernet channel, which the BIOS does not know about.

Linux boot may hang if no monitor is attached. According to customer reports this issue can be avoided by grounding pin 12 (DDCDAT) of the VGA connector. This seems to be caused by a VGA BIOS issue, FS and GS segment registers not restored when no monitor present. This can be worked around by adding push fs / push gs / pop gs / pop fs instructions around the int 10h call that tries to get the video settings (ah = 0fh).

Sandisk Extreme III CF cards don't work as master, change jumper J28 to run it as slave.

Getting started…

- Connect a 12V DC power supply to the DC jack J2. 2.5 mm center pin = positive, sleeve = ground. Power supply should be able to supply at least 12W for some margin. To avoid arcing, please plug in the DC jack first, then plug the adapter into mains.

- Connect VGA, keyboard and mouse as needed. To connect a PS/2 mouse, use an off-the-shelf PS/2 keyboard / mouse splitter. Some splitters may cause the BIOS to hang, test without or swap keyboard and mouse connections if this happens.

- Insert a bootable CF card. Hot swap of CF cards is not supported !

- Power on. If a jumper is installed on the SWI pins of front panel header J26, the board will start up immediately. Connect a pushbutton switch to these pins for manual control and software controlled power off.

You should see BIOS startup messages etc.

Setup options

ALIX uses Award BIOS for more features and operating system compatibility. Press Delete during startup to enter setup. Press Escape to get a boot menu. (BIOS 8/21/07 and later).

Connecting a CD-ROM or DVD drive

While not intended for normal operation, this can be useful to install operating systems etc. I use a AT (not ATX) power supply. Create a special cable to go from 12V and GND to the DC jack (snip up a drive power Y or extension cable). Connect the optical drive using a 44 pin to 40 pin IDE cable, jumper as slave device. This works best with the jumper installed across the SWI pins of the front panel header J26 (see above).

Support

Please email pdornier@pcengines.ch.

Damn Small Linux – Not (DSL-N)

Tested ok booting from CD (version RC4). Installation to CF card was not successful.

Debian Linux (Etch)

Works ok.

Boot may hang when no monitor is present (see known bugs).

FreeBSD

Beta test: 6.1 working if USB 2.0 is disabled in the BIOS setup. Kernel panic otherwise.

USB 2.0 requires a patch for correct recognition of the CS5536 USB controller.

iMedia Linux

(see www.imedialinux.com)

Installation from CD (version 5.0.1, 5.0.2) to CF card works fine. Recommend Fluxbox window manager. Fits on a 512 MB CF card with room to spare. Includes native drivers for the Geode LX CPU.

FreeDOS, MS-DOS 5.0

Tested ok, booting from CF card.

NetBSD

Not yet tested.

OpenBSD

For X11 and audio support, please use OpenBSD 4.3-current or later versions.

Ubuntu Linux

Recommend using "light" versions such as Xubuntu (XFCE window manager).

Note https://bugs.launchpad.net/ubuntu/+bug/156042 about setting the AMD video driver, and https://bugs.launchpad.net/ubuntu/+source/xserver-xorg-video-amd/+bug/140051 about AMD video auto detection.

Old version of Fluxbuntu looked interesting, but the current 7.10RC seems broken.

Windows XP Home

Installation from CD to a 2 GB CF card worked ok.

Drivers can be obtained from the AMD embedded support site, register at http://wwwd.amd.com/amd/developer.nsf/ or guess how the author of this document logs in…

Via network driver ->

 http://www.viaarena.com/default.aspx?PageID=420&OSID=1&CatID=1190&SubCatID=128

ALIX connector pinouts - from left to right, rear to front

J2   DC power jack

This is a generic DC jack connector with a 2.1mm center pin (will be 2.5 mm on ALIX.1B). Recommended input voltage is +12V. Supply current is about 0.4A at 12V, without any miniPCI adapters or USB devices installed. Absolute maximum rating for the FAN5026 switching regulator is 16V, be careful when connecting to unregulated sources such as solar batteries etc.

center	VIN	Positive input voltage
sleeve	GND	Ground

J15   DC power header

This is a 0.156" pitch header for feeding or tapping power.

1	VIN	+12V in or out (not switched)
2	GND	Ground
3	GND	Ground
4	VCC	+5V supply (output only, DO NOT feed power into this pin !)

J5   PS/2 keyboard / mouse

Keyboard and mouse are combined on one connector to save space and avoid a tall stacked connector. Use an off-the-shelf splitter if both keyboard and mouse are needed. Please note that not all splitters use the same pinout… If the BIOS hangs, swap keyboard and mouse.

1	KBDAT	keyboard data
2	MSDAT	mouse data
3	GND	ground
4	VCC	+5V supply
5	KBCLK	keyboard clock
6	MSCLK	mouse clock

J6   VGA

1	VGAR	VGA red
2	VGAG	VGA green
3	VGAB	VGA blue
4	nc	no connect
5	GND	ground
6	GND	ground
7	GND	ground
8	GND	ground
9	KBVCC	+5V supply
10	GND	ground
11	nc	no connect
12	DDCDAT	DDC data
13	HS	horizontal sync
14	VS	vertical sync
15	DDCCLK	DDC clock

J7   COM1 serial port

The standard PC pinout is used. To connect to a PC, use a null modem or "Laplink" cable.

1	DCD	data carrier detect (input)
2	RXD#	receive data (input)
3	TXD#	transmit data (output)
4	DTR	data terminal ready (output)
5	GND	ground
6	DSR	data set ready (input)
7	RTS	ready to send (output)
8	CTS	clear to send (input)
9	RI	ring indicator (input)

J9   COM2 serial port

10 pin header. (DB9 pin numbers in parantheses). Use an off-the-shelf 10 pin to DB9 cable. Please note that there are two different configurations for these cables…

1 (1)	DCD	data carrier detect (input)
3 (2)	RXD#	receive data (input)
5 (3)	TXD#	transmit data (output)
7 (4)	DTR	data terminal ready (output)
9 (5)	GND	ground
2 (6)	DSR	data set ready (input)
4 (7)	RTS	ready to send (output)
6 (8)	CTS	clear to send (input)
8 (9)	RI	ring indicator (input)
10	nc	no connect

J8   USB jack

Dual USB 2.0 connections:

1	VCC	switched +5V supply
2	DATA4-	negative data
3	DATA4+	positive data
4	GND	ground
5	VCC	switched +5V supply
6	DATA3-	negative data
7	DATA3+	positive data
8	GND	ground

J12   USB header

Dual USB 2.0 connections:

1	VCC	switched +5V supply
2	VCC	"
3	DATA1-	negative data
4	DATA2-	negative data
5	DATA1+	positive data
6	DATA2+	positive data
7	GND	ground
8	GND	ground
9	key	key pin (missing)

10	GND	ground

J1   Ethernet port 1

A RJ45 connector with integrated magnetics is used. ALIX does *not* support power over Ethernet.

1	TX+	transmit positive
2	TX-	transmit negative
3	RX+	receive positive
4	-	unused pair, 75 ohm terminated
5	-	unused pair, 75 ohm terminated
6	RX-	receive negative
7	-	unused pair, 75 ohm terminated
8	-	unused pair, 75 ohm terminated

J3   Audio line in

J4   Audio line out

J30   Headphone out   (connector on piggy-back board)

J29   Microphone in   (connector on piggy-back board)

J10   Audio expansion   (normally used for piggy-back board)

Additional audio signals can be accessed on this header.

1	MIC1	microphone, with phantom power
2	AUGND	ground
3	AUVCC	audio supply for microphone through 10K resistor
4	AUVCC	audio supply
5	HP_R	headphone right
6	nc	no connect
7	nc	no connect
8	key	key pin (missing)
9	HP_L	headphone left
10	nc	no connect

J13   SPDIF in

Optional, not tested.

1	SPDIF	SP/DIF digital input
2	GND	ground

J16   LPC expansion

The LPC port can be used to connect an additional super I/O device, or for an alternate flash EPROM to start the board when on board flash is corrupted or blank. Unlike earlier SC1100 based WRAP boards, this port cannot be used as GPIO pins. The on-board super I/O is configured at I/O address 2Eh, please select a different configuration address for expansion devices…

1	LCLK0	LPC clock (33 MHz)
2	GND	ground
3	LAD0	LPC data 0
4	GND	ground
5	LAD1	LPC data 1
6	GND	ground

7	LAD2	LPC data 2
8	GND	ground
9	LAD3	LPC data 3
10	GND	ground
11	LFRAME#	LPC frame
12	GND	ground
13	PCIRST#	reset (active low)
14	NC	reserved
15	ISP	high to use LPC flash, low to use on-board flash, pulled low by resistor
16	VCC	+5V supply
17	GND	ground
18	V3	+3.3V supply
19	SERIRQ	serial interrupt
20	LDRQ#	LPC DMA request

J14   LPT1 parallel port

26 pin header. (DB9 pin numbers in parantheses). Use an off-the-shelf 26 pin to DB25 cable. Please note that there are two different configurations for these cables…

1 (1)	PSTB#	printer strobe
3 (2)	PP0	printer data 0
5 (3)	PP1	printer data 1
7 (4)	PP2	printer data 2
9 (5)	PP3	printer data 3
11 (6)	PP4	printer data 4
13 (7)	PP5	printer data 5
15 (8)	PP6	printer data 6
17 (9)	PP7	printer data 7
19 (10)	ACK#	printer acknowledge
21 (11)	BUSY	printer busy
23 (12)	PE	printer paper end
25 (13)	SLCT	printer select
2 (14)	AFD#	printer auto feed
4 (15)	ERR#	printer error
6 (16)	INIT#	printer init
8 (17)	SCI#	printer select in
10 (18)	GND	ground
12 (19)	GND	ground
14 (20)	GND	ground
16 (21)	GND	ground
18 (22)	GND	ground
20 (23)	GND	ground
22 (24)	GND	ground
24 (25)	GND	ground
26	nc	no connect

J11 GPIO expansion

These pins are connected to the GPIO pins of the Winbond W83627HF super I/O controller. Please refer to the Winbond data sheet for programming instructions.

1	VCC	+5V supply
2	GND	ground
3	WIO10	GP10 (also connected to LCD header)
4	WIO11	GP11
5	WIO12	GP12
6	WIO13	GP13
7	WIO14	GP14
8	WIO15	GP15
9	WIO16	GP16
10	WIO17	GP17
11	WIMSO	MSO/IRQIN0
12	WIO20	GP20
13	WIO21	GP21
14	WIO22	GP22
15	WIO23	GP23
16	WIO24	GP24
17	WIO25	GP25 (pulled up)
18	WIO26	GP26
19	WIO30	GP30 (pulled up)
20	WIO31	GP31
21	WIO32	GP32 (pulled up)
22	WIO33	GP33
23	WIO34	GP34 (pulled up)
24	WIO35	GP35
25	VCC	+5V supply
26	GND	ground

BAT1 RTC battery

Socketed CR2032 Lithium battery.

J22 RTC clear jumper

1-2   normal operation
2-3   clear RTC

J17 miniPCI socket

This socket implements the miniPCI interface. Please see schematic for pinout.

J18 PCI socket

This socket implements the 3.3V PCI interface. Please see schematic for pinout.

-12V and +12V supplies are not connected.

J19   TFT LCD

This header can be used to interface a TFT LCD panel. CMOS to LVDS conversion will be required for most panels. Not tested, will be installed by request only.

1	LCVCC	+5V power, controlled by LCDEN
2	LCVCC	"
3	V3	+3.3V power
4	V3	"
5	GND	ground
6	GND	ground
7	LCB7	blue bit 7
8	LCB6	blue bit 6
9	LCB5	blue bit 5
10	LCB4	blue bit 4
11	GND	ground
12	LCB3	blue bit 3
13	LCB2	blue bit 2
14	LCB1	blue bit 1
15	LCB0	blue bit 0
16	GND	ground
17	LCG7	green bit 7
18	LCG6	green bit 6
19	LCG5	green bit 5
20	LCG4	green bit 4
21	GND	ground
22	LCG3	green bit 3
23	LCG2	green bit 2
24	LCG1	green bit 1
25	LCG0	green bit 0
26	GND	ground
27	LCR7	red bit 7
28	LCR6	red bit 6
29	LCR5	red bit 5
30	LCR4	red bit 4
31	GND	ground
32	LCR3	red bit 3
33	LCR2	red bit 2
34	LCR1	red bit 1
35	LCR0	red bit 0
36	HSYNC	horizontal sync
37	LCDEN	LCD power enable
38	LCCLK	LCD pixel clock
39	LCDDE	LCD data enable
40	GND	ground
41	VSYNC	vertical sync
42	PWM	CS5536 GPIO27 / MFGPT7 timer output
43	LCDIO1	W83627HF GP10
44	DISPEN	LCD display enable

J25   I2C header

This optional header can be used to connect user specific hardware, e.g. a front panel microcontroller, or for a licensing dongle.

1	+3.3V	power supply
2	SMB_SCL	I2C clock
3	SMB_SDA	I2C data
4	GND	ground

J21   IDE header

1	HDRST#	IDE reset
2	GND	ground
3	HDD7	IDE data 7
4	HDD8	IDE data 8
5	HDD6	IDE data 6
6	HDD9	IDE data 9
7	HDD5	IDE data 5
8	HDD10	IDE data 10
9	HDD4	IDE data 4
10	HDD11	IDE data 11
11	HDD3	IDE data 3
12	HDD12	IDE data 12
13	HDD2	IDE data 2
14	HDD13	IDE data 13
15	HDD1	IDE data 1
16	HDD14	IDE data 14
17	HDD0	IDE data 0
18	HDD15	IDE data 15
19	GND	ground
20	key	key pin (missing)
21	HDRQ	IDE DMA request
22	GND	ground
23	HDIOW#	IDE I/O write
24	GND	ground
25	HDIOR#	IDE I/O read
26	GND	ground
27	HDIORDY	IDE I/O ready
28	CSEL	cable select (pull down)
29	HDACK#	IDE DMA acknowledge
30	GND	ground
31	HDIRQ	IDE interrupt
32	nc	no connect
33	HDA1	IDE address 1
34	HDPDIA#	IDE diagnostic, 80 pin cable ID
35	HDA0	IDE address 0
36	HDA2	IDE address 2
37	HDCS0#	IDE chip select 0
38	HDCS1#	IDE chip select 1
39	HDLED#	IDE led output
40	GND	ground

41	VCC	5V power
42	VCC	5V power
43	GND	ground
44	GND	ground

J28   CompactFlash master / slave jumper

1-2   Install the jumper to make the CF card master, remove for slave.

3-4   Do not use.

If a CF card is installed, recommend to use a 40 pin cable for the external HDD to avoid problems.

J23   CompactFlash

The CompactFlash card is used in True IDE mode. Hot insertion is not supported – please power off the unit before inserting a CF card.

1	GND	ground
2	D3	IDE data
3	D4	IDE data
4	D5	IDE data
5	D6	IDE data
6	D7	IDE data
7	CS0#	IDE decode (1F0..1F7)
8	A10	ground
9	ATASEL#	ground to select true IDE mode
10	A9	ground
11	A8	ground
12	A7	ground
13	VCC	+3.3V power supply
14	A6	ground
15	A5	ground
16	A4	ground
17	A3	ground
18	A2	IDE address
19	A1	IDE address
20	A0	IDE address
21	D0	IDE data
22	D1	IDE data
23	D2	IDE data
24	IO16#	16 bit decode, not connected
25	CD2#	card detect, not connected
26	CD1#	card detect. not connected
27	D11	IDE data
28	D12	IDE data
29	D13	IDE data
30	D14	IDE data
31	D15	IDE data
32	CS1#	IDE decode (3F6..3F7)
33	VS1#	not connected
34	IOR#	IDE read strobe
35	IOW#	IDE write strobe
36	WE#	connected to +3.3V

37	IRQ	IDE interrupt
38	VCC	+3.3V power supply
39	CSEL#	cable select, ground = master
40	VS2#	not connected
41	RESET#	IDE reset, active low
42	IORDY	IDE ready
43	INPACK#	IDE DMA request
44	REG#	IDE DMA acknowledge
45	DASP#	pulled up
46	PDIAG#	pulled up
47	D8	IDE data
48	D9	IDE data
49	D10	IDE data
50	GND	ground

The CompactFlash specification can be found at www.compactflash.org.

J26   Front panel header

1	HDLED+	HDD LED, anode
2	PWRLED+	power LED, anode
3	HDLED-	HDD LED, cathode
4	PWRLED-	power LED, cathode
5	RESET#	system reset
6	PWRSW#	power switch
7	GND	ground
8	GND	ground
9	nc	no connect
10	key	key pin (missing)

POST codes

The system BIOS writes POST / diagnostic codes to port 80h. To make these codes visible, use a miniPCI POST card such as PC Engines POST.5A. A POST code table can be found at:

http://www.bioscentral.com/postcodes/awardbios.htm -> look for version 4.51PG