DIMM PC

Intel Pxa255
Computer system
(preliminary version)

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1 Overview

Intel PXA255 DIMM PC board is intended for running embedded network applications. DIMM PC is designed mainly for the development of highly efficient Internet devices, and for network infrastructure applications, but it’s use is on a large scale, cause it contains all of important interfaces.

The DIMM PC is based on the new Intel XScale architecture. Intel XScale processor family increases efficiency and decreases processor power consumption. The Intel XScale micro architecture is based on the Intel Strong ARM technology. Intel Strong ARM and Intel XScale are compatible with the ARM architecture, which in turn guarantees the compatibility of software solutions.

DIMM PC is delivered in variety configurations, which may differ in processor frequency, SDRAM or FLASH size and amount of peripheries. CPU, SDRAM and FLASH memory is located on stand alone DIMM module, that means is easy to change processor frequency or memory size, without necessity to change main DIMM base board. If you need next extend FLASH storage space, plug Compact FLASH card in base board.

Furthermore, there are two network interfaces. The card contains two 3,3V PCMCIA slots and one 3,3V Compact FLASH connector. Two of them can be used at the same time. The board can be either powered by AC adapter or Power LAN system via power cord (outdoor application).

The board can be supplied in stylish case for indoor or outdoor application as well as with software for WLAN application, upon customer's request.

System is delivered with LINUX operating system. As the board communication interface serves RS232 connector. To work with on-board software easily and effectively, use terminal station. You may also use SSH network protocol. Your own applications can be stored in DIMM on-board FLASH memory or to the external Compact FLASH card. In the event that you are not interested to use software, we have developed, we will deliver the board without it.

1.1 Hardware specification

- DIMM module with XScale PXA 255
- 2 x 10/100Mb Ethernet
- 2 x PCMCIA slot, 1 x Compact Flash socket,
- 1 x IDE connector - in real time can work:
    - 2 x PCMCIA
    - 1 x PCMCIA + 1 x Compact Flash
    - 1 x PCMCIA + IDE
    - 1 x Compact Flash + IDE
- RS232 connector (terminal output)
- IR serial interface
- SPI interface
- UART serial connector (3.3-5V)
- JTAG connector
- RESET switch
- 6 - 48V power supply
- Power over LAN supply support
- Standard display interface with Touch screen
- Optional high color TFT display 640x480
- ATA2 interface for connecting HDD, CD-ROM, etc. (5V power suply)
- 2 x PS/2 - mouse and keyboard - controlled by programmable IO coprocessor
- Real Time Clock battery backup

Possible DIMM module configurations

- CPU XScale PXA255 200 - 400 MHz
- FLASH 8 - 32MB
- SDRAM 32 - 64MB
- AC97 audio (optional)

1.2 Software specification

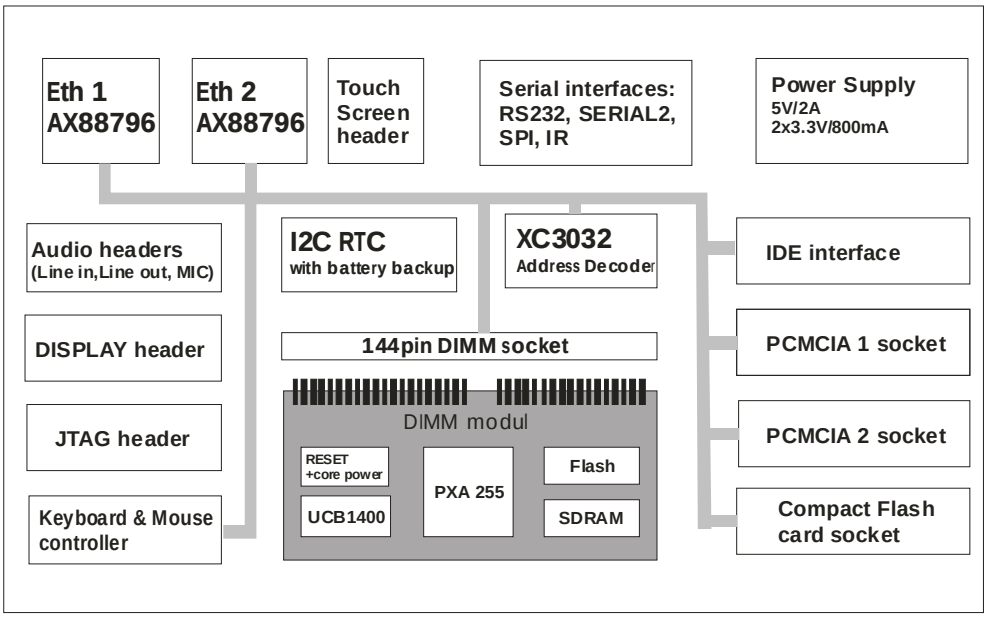
- **OS Linux 2.4**
- File systems (ROMFS, JFFS2, EXT2, NFS, RAMFS)
- Terminal
- SSH,TFTP
- LINUX base utilities (Bash,Vi, ...)
- Network drivers
- DemoMP3player

2 Hardware

2.1 Block Diagram

DIMM PC computer system consists of two basic elements:

- DIMM Base board
- DIMM processor modul

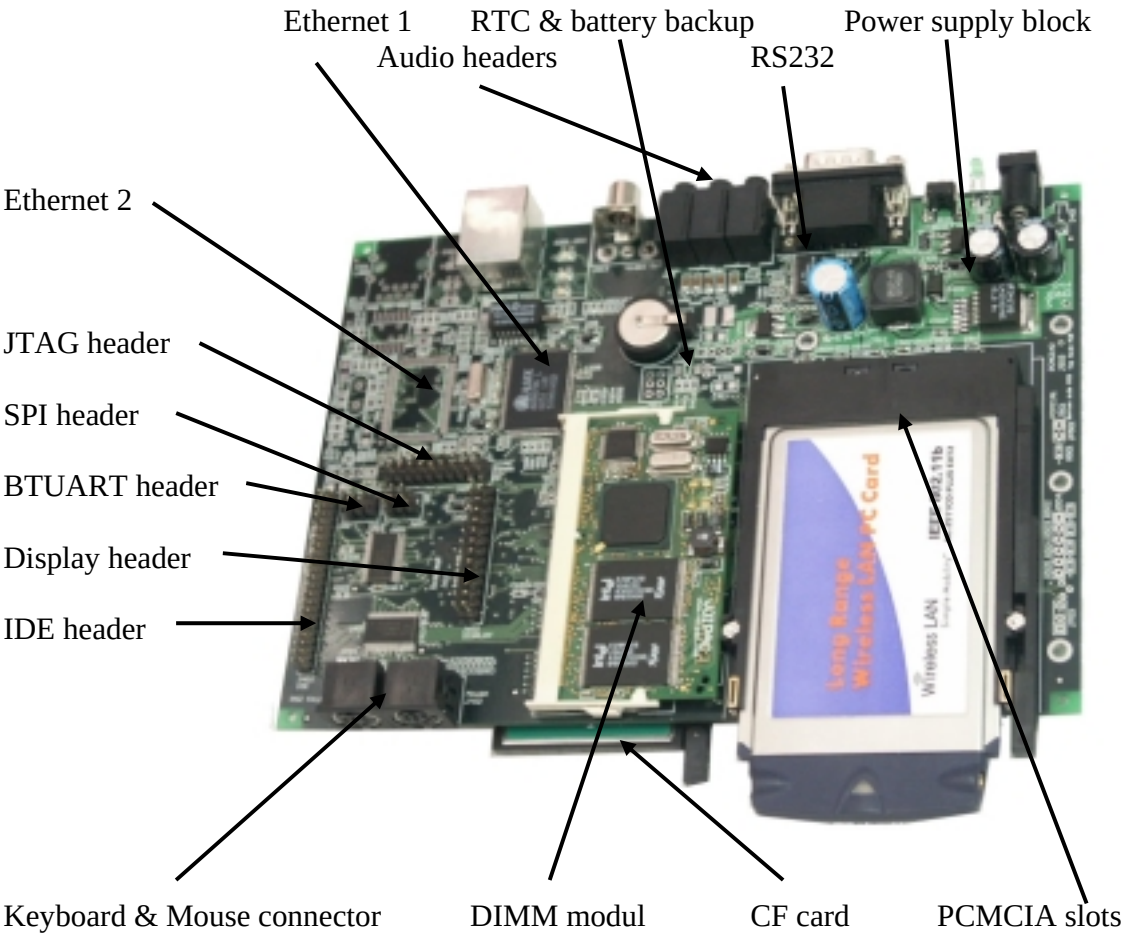


Block diagram of DIMM PC

2.2 DIMM Base Board

2.2.1 Board Layout

All components (except PCMCIA1, CF card and TFT display connectors) are located on top side of board.



2.2.2 Connector and jumpers

J101 DIMM socket - 144pin DIMM socket for processor module
Detailed description in chapter 2.3.2

J201 LAN1 - RJ45 for ethernet1

Pin	Description	Pin	Description
1-2	TXD	4-5	Vcc - power on LAN
3-6	RXD	7-8	Vss – power on LAN

J301 LAN2 - RJ45 for ethernet2

Pin	Description	Pin	Description
1-2	TXD	3-6	RXD

J401 Power – power supply, DC 9-48V
Supply DC voltage 9-48V (connector: 5.5x2.1mm, centre positive)

J402 IDE – 44pin header for IDE interface (hdd, CDROM, etc…)

Pin	Description	Pin	Description
1	Reset/	2	Ground
3	D7	4	D8
5	D6	6	D9
7	D5	8	D10
9	D4	10	D11
11	D3	12	D12
13	D2	14	D13
15	D1	16	D14
17	D0	18	D15
19	Ground	20	KEY -removed
20	DMARQ	21	GND
23	IOW/	24	GND
25	IOR/	26	GND
27	IORDY/	28	CSEL
29	DMACK/	30	GND
31	IRQ	32	IOCS16/
33	A1	34	PDIAG/
35	A0	36	A2
37	CS1FX/	38	CS3FX/
39	DASP/	40	GND
41	+5V	42	+5V
43	GND	44	Reserved

J501 PCMCIA1 – PCMCIA1 socket (3.3V cards only)

Pin	Description	Pin	Description
1	GND	2	D3
3	D4	4	D5
5	D6	6	D7
7	CE1/	8	A10
9	OE/	10	A11
11	A9	12	A8
13	A13	14	A14
15	WE/	16	IREQ/
17	VCC	18	VPP1
19	A16	20	A15
21	A12	22	A7
23	A6	24	A5
25	A4	26	A3
27	A2	28	A1
29	A0	30	D0
31	D1	32	D2
33	IOIS16/	34	GND
35	GND	36	CD1/
37	D11	38	D12

39	D13	40	D14
41	D15	42	CE2/
43	VS1	44	IORD/
45	IOWR/	46	A17
47	A18	48	A19
49	A20	50	A21
51	VCC	52	VPP2
53	A22	54	A23
55	A24	56	A25
57	VS2	58	RESET
59	WAIT/	60	INPACK/
61	REG/	62	SPKR/
63	STSCHG/	64	D8
65	D9	66	D10
67	CD2/	68	GND

J502 COMPACT FLASH – Compact Flash card socket (3.3V cards only)

Pin	Description	Pin	Description
1	GND	2	D3
3	D4	4	D5
5	D6	6	D7
7	CE1/	8	A10
9	OE/	10	A9
11	A8	12	A7
13	VCC	14	A6
15	A5	16	A4
17	A3	18	A2
19	A1	20	A0
21	D0	22	D1
23	D2	24	IOIS16/
25	CD2/	26	CD1/
27	D11	28	D12
29	D13	30	D14
31	D15	32	CE2/
33	VS1/	34	IORD/
35	IOWR/	36	WE/
37	IRQ	38	VCC
39	CSEL/	40	VS2/
41	RESET	42	WAIT/
43	INPACK/	44	REG/
45	BVD2/SPKR	46	BVD1/STSCHG
47	D8	48	D9
49	D10	50	GND

J503 PCMCIA2 – PCMCIA2 socket (3.3V cards only)
Same as a PCMCIA1

J504 Xilinx JTAG – 6pin header for Xilinx programming

Pin	Description	Pin	Description
1	TMS	4	TCK
2	TDI	5	+3.3V
3	TDO	6	GND

J601 JTAG – JTAG/Debug port

Pin	Description	Pin	Description
1	VREF	2	+3.3V
3	nTRST	4	GND
5	TDI	6	GND
7	TMS	8	GND
9	TCK	10	GND
11	NC	12	GND
13	TDO	14	GND
15	nRESET	16	GND
17	NC	18	GND
19	NC	20	GND

J602 DISPLAY – Extended LCD display connector

Pin	Description	Pin	Description
1	HSYNC (Line CLK)	2	CLK (Dot Clock)
3	Red Data 1	4	VSYNC (Frame CLK)
5	Red Data 3	6	Red Data 2
7	Red Data 5 (MSB)	8	Red Data 4
9	Green Data 0 (LSB)	10	Green Data 1
11	Green Data 2	12	Green Data 3
13	Green Data 4	14	Green Data 5 (MSB)
15	Blue Data 1	16	Blue Data 2
17	Blue Data 3	18	Blue Data 4
19	Blue Data 5 (MSB)	20	SDA
21	ENAB (1=LCD ON)	22	SCL
23	+3.3V	24	+5V
25	GND	26	VIDEO_OUT

J603 Backlight – Backlight for LCD display

Pin	Description	Pin	Description
1	+5V	3	BCKL_ON – 1=Enable Backlight
2	GND		0=Disable Backlight
		4	NC

J604 IR – Fast Infrared communication port (STUART/IR)

Pin	Description	Pin	Description
1	+3.3V	3	IR_TXD - transmit data
2	IR_MODE (GPIO 15 pin)	4	IR_RXD - received data
		5	GND

J605 RS232 – Standard serial asynchronous RS232 interface (V.28 voltage levels)

Pin	Description	Pin	Description
1	SP0 DCD	6	SP0 DSR
2	SP0 RXD	7	SP0 RTS
3	SP0 TXD	8	SP0 CTS
4	SP0 DTR	9	SP0 RI
5	GND		

J606 SERIAL2 – asynchronous serial port (BTUART), 5V I/O pins accept 5V,3.3V

Pin	Description	Pin	Description
1	SP1 CTS	2	SP1 TXD
3	SP1 RTS	4	+3.3V
5	SP1 RXD	6	GND

J607 SPI – Synchronous serial port (SSPC), 5V tolerant I/O pins accept 5V,3.3V

Pin	Description	Pin	Description
1	SSP FRM	2	SSP RXD
3	SSP CLK	4	+3.3V
5	SSP TXD	6	GND

J608 Line OUT – Stereo Line Out

Stereo jack for external headphones

J609 Line IN – Stereo Line In

Stereo jack for external audio source

J610 MIC – External Microphone

Input jack for external microphone

J611 TOUCH – Connector for Touch Screen

Pin	Description	Pin	Description
1	TMSY	2	TMSX
3	TSPY	4	TSPX

J612 Display2 – Connector for display SHARP LQ64D343

Pin	Description	Pin	Description
1	GND	2	CLK (Dot Clock)
3	HSYNC (Line CLK)	4	VSYNC (Frame CLK)
5	GND	6	Red Data 0 (LSB) = GND
7	Red Data 1	8	Red Data 2

9	Red Data 3	10	Red Data 4
11	Red Data 5 (MSB)	12	GND
13	Green Data 0 (LSB)	14	Green Data 1
15	Green Data 2	16	Green Data 3
17	Green Data 4	18	Green Data 5 (MSB)
19	GND	20	Blue Data 0 (LSB) = GND
21	Blue Data 1	22	Blue Data 2
23	Blue Data 3	24	Blue Data 4
25	Blue Data 5 (MSB)	26	GND
27	ENAB (1=LCD ON)	28	+5V
29	+5V	30	NC
31	NC		

J613 Video_OUT – Composite video signal from extended Video modul for Base Board Connected with J602-pin26

Jumpers
JP501 – Xilinx programming enable

2.2.3 Description of on-board devices

2.2.3.1 Memory map

The board used standard address map with the following modification:

Pin	Description
CS0	(0-0x03FF.FFFF) flash memory
CS1	(0x0400.0000-0x07FF.FFFF) unused, used as GPIO pin
CS2	(0x0800.0000-0x0BFF.FFFF) Ethernet chip 1
CS3	(0x0C00.0000-0x0FFF.FFFF) Ethernet chip 2
CS4	(0x1000.0000-0x13FF.FFFF) PCMCIA status buffer (U502)
CS5	(0x1400.0000-0x17FF.FFFF) unused, used as GPIO pin
PCE1, PCE2 (PSKTSEL=0)	(0x2000.0000-0x2FFF.FFFF) PCMCIA 1 /CF
PCE1, PCE2 (PSKTSEL=1)	(0x3000.0000-0x3FFF.FFFF) PCMCIA 2 /IDE

2.2.3.2 Ethernet controllers

There are two ASIX 100Mbit fast Ethernet chip AX88796. Each chip is equipped with three status LED's (active status, speed status, link status)

2.2.3.3 RTC

DS1339 RTC chip is used. 3V lithium battery backup and 32.768kHz clock are used. Device is connected on I2C bus, and is located on address 0x68/0xE8 (first byte of I2C protocol)

2.2.3.4 Keyboard and mouse controller

In development at this time

2.2.3.5 PXA255 serial ports

The PXA255 has three asynchronous serial ports (FFUART-SP0, BTUART-SERIAL2 and STUART-IR) and one synchronous serial port (SSPC).
The FFUART supports full handshaking. The maximum tested baud rate on this UART is 230.4 kbps. The BTUART supports RTS/CTS only and supports baud rates up to 921.6 kbps. STUART is tested at maximum baud rate 230.4kbps, but it does not support modem control capability. STUART shares GPIO pins for transmit and receive data with the Fast Infrared Communication Port (FICP) –IR. It supports a variety of IrDA transceivers, operates at half-duplex and provides direct connection to commercially available Infrared Data Association (IrDA) compliant LED transceivers. FICP or Standard UART, only one of the ports can be used at a time.
The synchronous serial port (SSPC) supports three protocols: National Semiconductor s Microwire, Texas Instruments Synchronous Serial Protocol, and Motorola's Serial Peripheral Interface. SSPC supports serial bit rates from 7.2 KHz to 1.84 MHz and serial data formats may range from 4 to 16 bits in length.

Interface	Connector/Header
RS232-SP0	J605 – RS232
BTUART	J606 – SERIAL2
STURAT/IR	J604 – IR
SSPC	J607 - SPI

2.2.4 Switch and led's

B101 - RESET switch
resets the system

D201 – Full duplex/Collision status Ethernet 1 device
D202 – Speed status Ethernet 1 device (10/100Mbit)
D203 – Link status Ethernet 1 device

D301 - Full duplex/Collision status Ethernet 2 device
D302 - Speed status Ethernet 2 device (10/100Mbit)
D303 - Link status Ethernet 2 device

D603 – power led

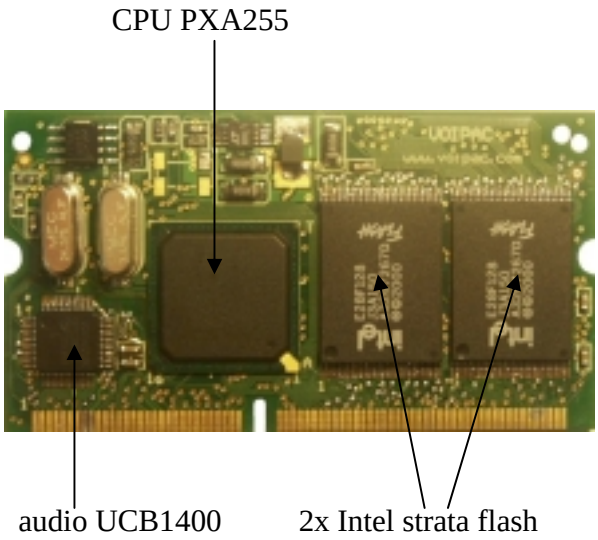
2.2.5 Power

A standard 2.1mm DC jack is used to provide power the board. The center of jack is positiv. It is recommended to power the board by stabilised source 7.5V-12V.

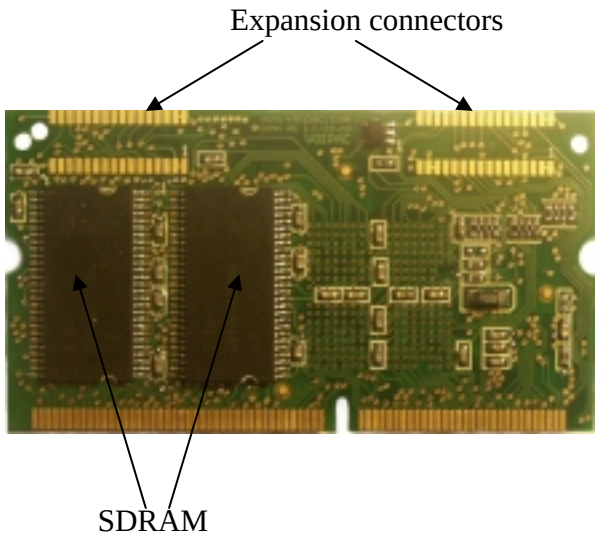
2.3 DIMM processor modul

2.3.1 Board Layout

Top view



Bottom view



2.3.2 Connector and jumpers

Pin	Signal	Description
1	TSMY	Touch Screen, neg Y-connector (see UCB 1400)
2	TSMX	Touch Screen, neg X-connector (see UCB 1400)
3	TSPY	Touch Screen, pos Y-connector (see UCB 1400)
4	TSPX	Touch Screen, pos X-connector (see UCB 1400)
5	MICP	Microfon Input (see UCB 1400)
6	FF_RI	Full Function UART Ring Indicator (TTL-Level)
7	MICGND	Microfon GND – Signal (see UCB 1400)
8	LINE_IN_R	Line_In – right channel (see UCB 1400)
9	LINE_OUT_R	Line_Out – right channel (see UCB 1400)
10	LINE_IN_L	Line_In – left channel (see UCB 1400)
11	VREFDRV	reference voltage for head phone driver (see UCB 1400)
12	LINE_OUT_L	Line_Out – left channel (see UCB 1400)

13	AD3	Analog Input 3 (see UCB 1400)
14	AD2	Analog Input 2 (see UCB 1400)
15	AD1	Analog Input 1 (see UCB 1400)
16	AD0	Analog Input 0 (see UCB 1400)
17	AGND	Analog GND
18	GND	GND
19	TMS	JTAG Test Mode Select
20	TCK	JTAG Test Clock
92	D15	memory data bus
21	TRST#	JTAG Test Reset
22	TDO	JTAG Test Data Out
23	RESET_INPUT	# Reset Input
24	TDI JTAG	Test Data In
25	RESET_OUT#	Reset Output
26	L_BIAS / GPIO77	LCD bias drive
27	BT_RxD / GPIO42	Bluetooth UART Receive Pin (3,3V-Level)
28	BATT_FAULT	Battery Fault, switches processor into sleepmode
29	BT_TxD / GPIO43	Bluetooth UART Transmit Pin (3,3V-Level)
30	IR_RXD / GPIO46	IrDA Receive Pin (3,3V- Level)
31	FF_RxD / GPIO34	Full Function UART Peceive Pin (3,3V-Level)
32	IR_TxD / GPIO47	IrDA Transmit Pin (3,3V-Level)
33	FF_TxD / GPIO39	Full Function UART Transmit Pin (3,3V-Level)
34	USB_N	USB-Port neg. Pin (3,3V-Level)
35	+3,3V_A	analogpower supply for audio
36	+3,3V	power supply
37	SDA	I2C data signal
38	USB_P	USB-Port pos. Pin (3,3V-Level)
39	SSP_TxD / GPIO25	Synchronous Serial Port Transmit Pin
40	SCL	I2C Clock Signal
41	SSP_CLK / GPIO23	Synchronous Serial Port Clock Pin
42	SSP_FRM / GPIO25	Synchronous Serial Port Frame Pin
43	DREQ0 / GPIO20	DMA Request Channel 0
44	SSP_RxD / GPIO26	Synchronous Serial Port Receive Pin
45	FF_DCD / GPIO36	Full Function UART Carrier Detect Pin (3,3V Level)
46	DREQ1 / GPIO19	DMA Request Channel 1
47	FF_DTR / GPIO40	Full Function UART Data Term. Rdy. Pin (3,3V-Level)
48	FF_DSR / GPIO37	Full Function UART Data Set Rdy. Pin (3,3V-Level)
49	FF_RTS / GPIO41	Full Function UART Rdy. To Send Pin (3,3V-Level)
50	FF_CTS / GPIO35	Full Function UART Clear To Send Pin (3,3V-Level)
51	BT_RTS / GPIO45	Bluetooth UART Ready To Send Pin (3,3V-Level)
52	BT_CTS / GPIO44	Bluetooth UART Clear To Send Pin (3,3V-Level)
53	GPIO10 General	Purpose I/O-Pin
54	GPIO11 General	Purpose I/O-Pin
55	LDD14 / GPIO72	LCD interface data bus
56	LDD15 / GPIO73	LCD interface data bus
57	LDD12 / GPIO70	LCD interface data bus

58	LDD13 / GPIO71	LCD interface data bus
59	LDD10 / GPIO68	LCD interface data bus
60	LDD11/ GPIO69	LCD interface data bus
61	LDD8 / GPIO66	LCD interface data bus
62	LDD9 / GPIO67	LCD interface data bus
63	GPIO0	General Purpose I/O-Pin
64	GPIO1	General Purpose I/O-Pin
65	GND	Ground
66	GND	Ground
67	L_FCLK / GPIO74	LCD Interface Frame Clock
68	L_LCLK / GPIO75	LCD Interface Line Clock
69	L_PCLK / GPIO76	LCD Interface Pixel Clock
70	LDD6 / GPIO64	LCD interface data bus
71	LDD7 / GPIO65	LCD interface data bus
72	LDD4 / GPIO62	LCD interface data bus
73	LDD5 / GPIO63	LCD interface data bus
74	LDD2 / GPIO60	LCD interface data bus
75	LDD3 / GPIO61	LCD interface data bus
76	LDD0 / GPIO58	LCD interface data bus
77	LDD1 / GPIO59	LCD interface data bus
78	GND	Ground
79	PWE# / GPIO49	PCMCIA Interface Write Enable
80	POE# / GPIO48	PCMCIA Interface Output Enable
81	PIOW# / GPIO51	PCMCIA Interface I/O Write
82	PIOR# / GPIO50	PCMCIA Interface I/O Read
83	PWAIT# / GPIO56	PCMCIA Interface Wait
84	PIOIS16# / GPIO57	PCMCIA Interface I/O select 16 Bit
85	PREG# / GPIO55	PCMCIA Interface Register Select
86	PSKTSEL / GPIO54	PCMCIA Interface Socket Select
87	PCE1# / GPIO52	PCMCIA Interface Low Byte Enable
88	PCE2# / GPIO53	PCMCIA Interface High Byte Enable
89	+3,3V	power supply
90	+3,3V	power supply
91	D14	memory data bus
93	D12	memory data bus
94	D13	memory data bus
95	D10	memory data bus
96	D11	memory data bus
97	D8	memory data bus
98	D9	memory data bus
99	D6	memory data bus
100	D7	memory data bus
101	D4	memory data bus
102	D5	memory data bus
103	D2	memory data bus
104	D3	memory data bus

105	D0	memory data bus
106	D1	memory data bus
107	GND	Ground
108	GND	Ground
109	RDY / GPIO18	Ready Pin (Wait)
110	WE#	Memory Write Enable
111	RD/WR#	Read not Write
112	OE#	Memory Output Enable
113	GND	Ground
114	CS5# / GPIO33	Chip Select
115	CS4# / GPIO80	Chip Select
116	CS3# / GPIO79	Chip Select
117	CS2# / GPIO78	Chip Select
118	CS1# / GPIO15	Chip Select
119	A25	Memory address bus
120	A24	Memory address bus
121	A23	Memory address bus
122	A22	Memory address bus
123	A21	Memory address bus
124	A20	Memory address bus
125	A19	Memory address bus
126	A18	Memory address bus
127	A17	Memory address bus
128	A16	Memory address bus
129	A15	Memory address bus
130	A14	Memory address bus
131	A13	Memory address bus
132	A12	Memory address bus
133	A11	Memory address bus
134	A10	Memory address bus
135	A9	Memory address bus
136	A8	Memory address bus
137	A7	Memory address bus
138	A6	Memory address bus
139	A5	Memory address bus
140	A4	Memory address bus
141	A3	Memory address bus
142	A2	Memory address bus
143	A1	Memory address bus
144	A0	Memory address bus

2.3.3 Description of on-board devices

CPU
Intel PXA255 is used. Possible frequency is 200, 300 or 400MHz.

SDRAM
Modul uses two 256 or 512 Mbit SDRAM devices organized as one 32-Bit Bank (32Mx32bit or 16Mx32bit). They support 100MHz operation.

FLASH memory
4, 8 or 16MB Intel Strata Flash memory chips are used.

Used chips	Total capacity
E28F320-J3 (4MByte)	8MByte (4Mx32bit)
E28F640-J3 (8MbByte)	16MByte (8Mx32bit)
E28F128-J3 (16MByte)	32MByte (16Mx32bit)

AC-97 stereo audio codec
The PXA255 implements a standart ac'97 Codec interface. A Philips UCB1400 AC'97 codec allows this interface to transmit and receive analog audio data. The UCB1400 is located at AC'97 input 0. UCB1400 also integrates a Headphone Output Apmplifier, a Microphone Input Amplifier and Touch Screen controller.

3 Software & Development Tools

System is supplied with following software configuration:
Bootloader: Armboot ver. 1.2.0 (ethernet system loading support)
Linux OS: Debian Linux ver. 2.4.19

3.1 Connecting to the board

We need two connection : via serial port and ethenet network. Serial port we use as console and network we use for downloading file to the board memory. Serial console Use direct serial cable, connect it to RS232 on PXABoard and computer. Start terminal on computer (on Debian minicom, gtkterm) with cofiguration:

- 38400 baud rate
- 8 data bits
- None Parity
- 1 Stop-Bit
- None Flow Control

Ethernet network Use crossover ethernet cable or hub with normal direct cable. Default address of board is set to 192.168.1.100. The default password for user root is root.

3.2 Flashing boot loader via JTAG

First we have to copy developing boot loader armboot into flash memory.
We can use Jflashmm. Jtag cable is also needed.

3.3 Flashing kernel and rootfs via Ethernet network

Now you see in terminal this dump after board start:

```
ARMboot 1.0.2 (Jun  9 2003 - 12:53:59)

ARMboot code: a3000000 -> a301751c
CPU: Intel XScale-PXA250 (ARM 5TE) revision B2
Clock: Mem=99.53MHz (*27), Run=199.07MHz (*2), Turbo=199.07MHz (*1.0,inactive)
DRAM Configuration:
Bank #0: a0000000 32 MB
Bank #1: a4000000 0 KB
Bank #2: a8000000 0 KB
Bank #3: ac000000 0 KB
Flash: 8 MB
*** Using default environment
Hit any key to stop autoboot:  0
Unknown command 'FIXME' - try 'help'
ArmBoot>
```

Firstly we set IP address board and tftp server. Default address is 192.168.1.100 for board and 192.168.1.111 for tftp server. We can change it, but it depend on your network enviroment.

```
ArmBoot> setenv ipaddr 192.168.1.100
ArmBoot> setenv serverip 192.168.1.111
ArmBoot>saveenv
Un-Protected 1 sector
Saving Environment to Flash... done
Protected 1 sector
ArmBoot>
```

Then we erese flash for kernel (bank 1, sector 1 to 3).

```
ArmBoot> erase 1:1-3
Erase Flash Sectors 1-3 in Bank # 1:
Erasing sector 1 ... ok
Erasing sector 2 ... ok
Erasing sector 3 ... ok
Done
ArmBoot>
```

Now we can download kernel to the memory and then copy to the flash (0xa0000000 is in RAM, 0x40000 is flash and 0x30000 is length). Length is in long (4bytes), because the bus width is 32 bit.

```
ArmBoot> tftpboot 0xa0000000 pxa/zImage
ARP broadcast 1
eth addr: 00:50:04:e0:31:f3
TFTP from server 192.168.1.111; our IP address is 192.168.1.100
Filename 'pxa/zImage'.
Load address: 0xa0000000
Loading: ###################################
Done
CHAPTER 4. BOARD USING 22
Bytes transferred = 654788 (9fdc4 hex)
ArmBoot>
```

Now we can copy downloaded file into flash

```
ArmBoot> cp 0xa0000000 0x40000 0x30000
Copy to Flash... 100% done.
ArmBoot>
```

We erese flash for rootfs (bank 1, sector 4 to 31),

```
ArmBoot> erase 1:4-31
Erase Flash Sectors 4-31 in Bank # 1:
Erasing sector 4 ... ok.
…
Erasing sector 31 ... ok.
Done
ArmBoot>
```

Now download /rootfs to the memory and copy to the flash.

```
ArmBoot> tftpboot 0xa0000000 pxa/crfs-root.bin
ARP broadcast 1
eth addr: 00:50:04:e0:31:f3
TFTP from server 192.168.1.111; our IP address is 192.168.1.100
Filename 'voipac2/crfs-root.bin'.
Load address: 0xa0000000
Loading: ###################################
Done
Bytes transferred = 4075520 (3e3000 hex)
ArmBoot>
```

And can copy downloaded file into flash

```
ArmBoot> cp 0xa0000000 0x10000 0x100000
Copy to Flash... 100% done.
ArmBoot>
```

Now we can start kernel by command go 0x40000. The default password for user root is root. You can connect via serial port again and now via ethernet network ssh 192.168.1.100 too.