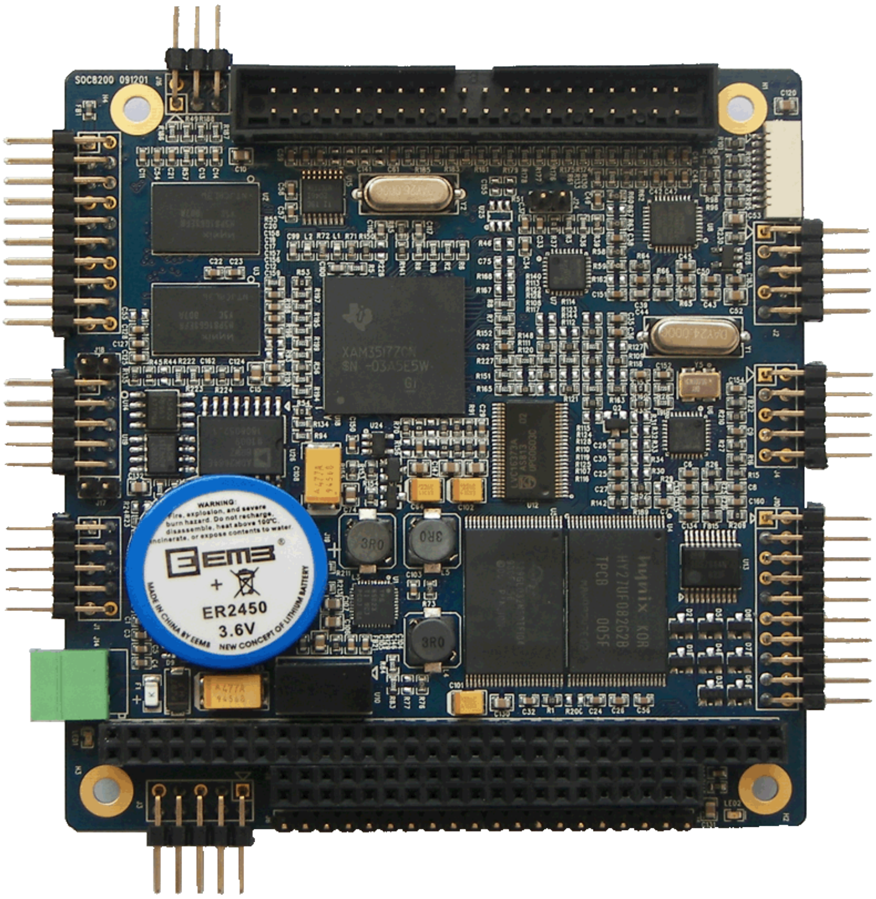
SOC8200

32-bit microprocessor Base on AM3517
LCD, VGA, AV, S-video, serial port, Ethernet network, CAN, RS485, Audio In/Out, SD, CF, USB



User Manual

Room 509, Luohu Science&Technology Building, #85 Taining Road., Shenzhen, Guangdong, China 518020
Tel: +86-755-25635656 / 25636285 Fax: +86-755-25616057
Email: market@embedinfo.com http://www.armkits.com

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Rev	Date	Description
1.0	July 10,2010	Initial version
2.0	Dec 28,2010	Modified u-boot: Added NORFLASH support, Added TV/S-video output support
3.0	May 28,2011	Increased the support on wince6.0

Important Notice

Room 509, Luohu Science&Technology Building, #85 Taining Rd., Shenzhen, Guangdong, China
Tel: +86-755-25635656 / 25636285 Fax: +86-755-25616057
Email: market@embedinfo.com http://www.armkits.com

CONTENT

1 System Overview

The document describes user how to develop with SOC8200, the detailes for hardware specification, features, and software development.

1.1 Introduction

SOC8200 is an industrial evaluation kit designed and manufactured by Embest Info&Tech Co.,LTD., SOC8200 is based on processor AM3517 of Texas Instrument (TI). Processor AM3715 is integrated with 600Mhz ARM Cortex-A8 Core which is dedicated using to Process industrial signal. SOC8200 provides, 10/100Mbps Ethernet interface, S-VIDEO interface, Audio input and output interfaces, USB device, USB HOST, SD card interface, series port, CF card, SPI interface, I2C interface, JTAG interface, CAMERA interface, LCD interface, touch screen interface and keyboard as well as HDMI (DVI-D) interface. This high performance and low power consumption enable the device to support the following applications:

Industrial control, field communication, medical equipment, instrumentation, security systems etc.

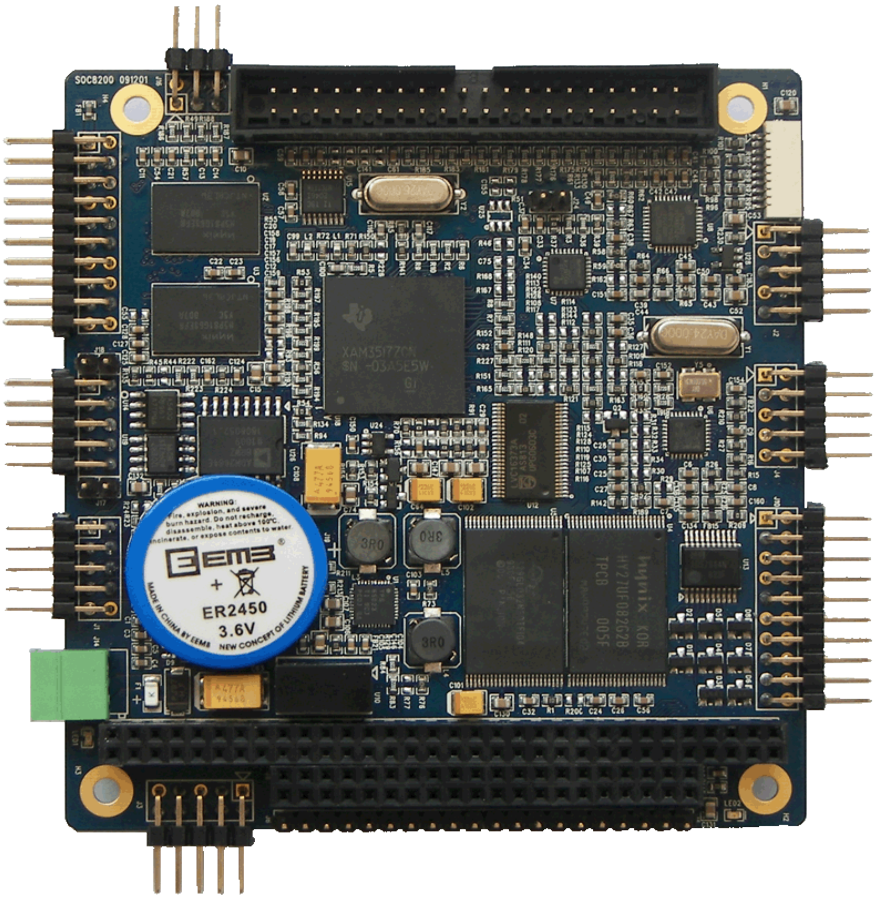


Fig1.1   SOC8200 Single Board Computer

1.2 System Module

- AM3517 industrial applications processors
  600MHz ARM Cortex-A8 Core
  NEON SIMD Coprocessor
  POWERVR SGX Graphics Accelerator
  16KB I-Cache，16KB D-Cache，256KB L2-Cache，112KB ROM，64KB Share SRAM

- Memory
  256MB DDR2 SDRAM，32bit
  256MB NAND Flash，8bit
  4MB NOR Flash，16bit

- Audio / Video Interface
  Audio input interface
  Stereo output
  TFT LCD Video Output Interface(16bit true color signal)
  Standard VGA output interface

- Peripheral Interface
  UART、USB Host、USB OTG、Ethernet、SD/MMC、CF、Versatile Expansion Interfaces（McBSP、IIC、McSPI、TV-OUT）、PC104 Expansion Interface（GPMC Bus、MMC、USB、McSPI、UART、Clock、HDQ）

- Operating System
  Linux
  WinCE 6.0

1.3 Architecture Diagram

The full system architecture diagram as follows:

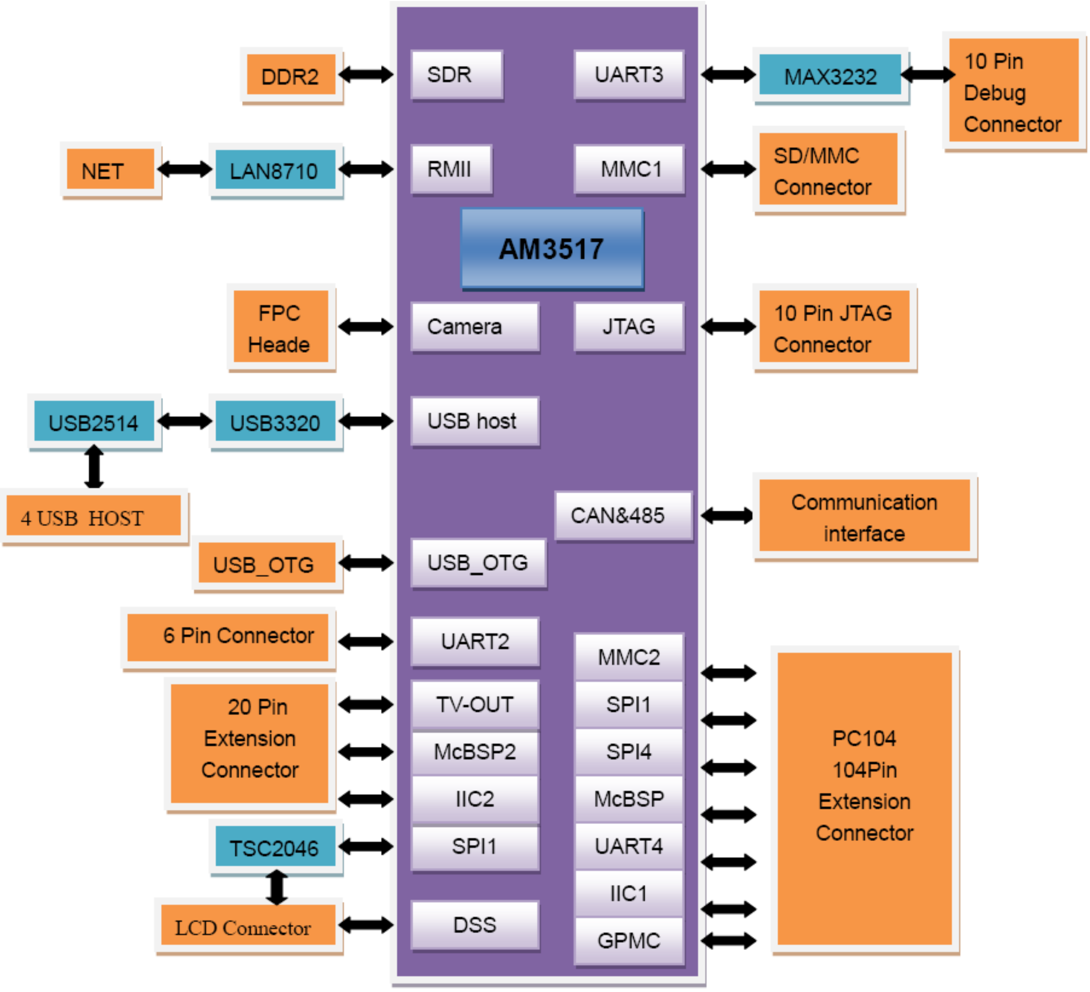


Fig1.3 SOC8200 architecture diagram

2 Hardware system

2.1 Hardware Overview

2.1.1 Single Board Computer

The SOC8200 board has onboard 256MB DDR2 SDRAM, 256MB Nand Flash and 4MB Nor Flash and extends various functions through pins including serial port, Ethernet, CAN, RS485, SD/MMC card, CF card, Audio In/Out, Camera, LCD, USB Host, USB Device, expansion connector and JTAG. Embest has designed an expansion board and function interface boards for the SOC8200. It would be convenient for customer to use the SOC8200 with the expansion board for evaluating the functionality of Texas Instruments' Sitara AM3517 microprocessor. And in the later period customer can add functions through function interface boards according to their own requirements which can effectively shorten the period of research and development of products and speed up time to market.

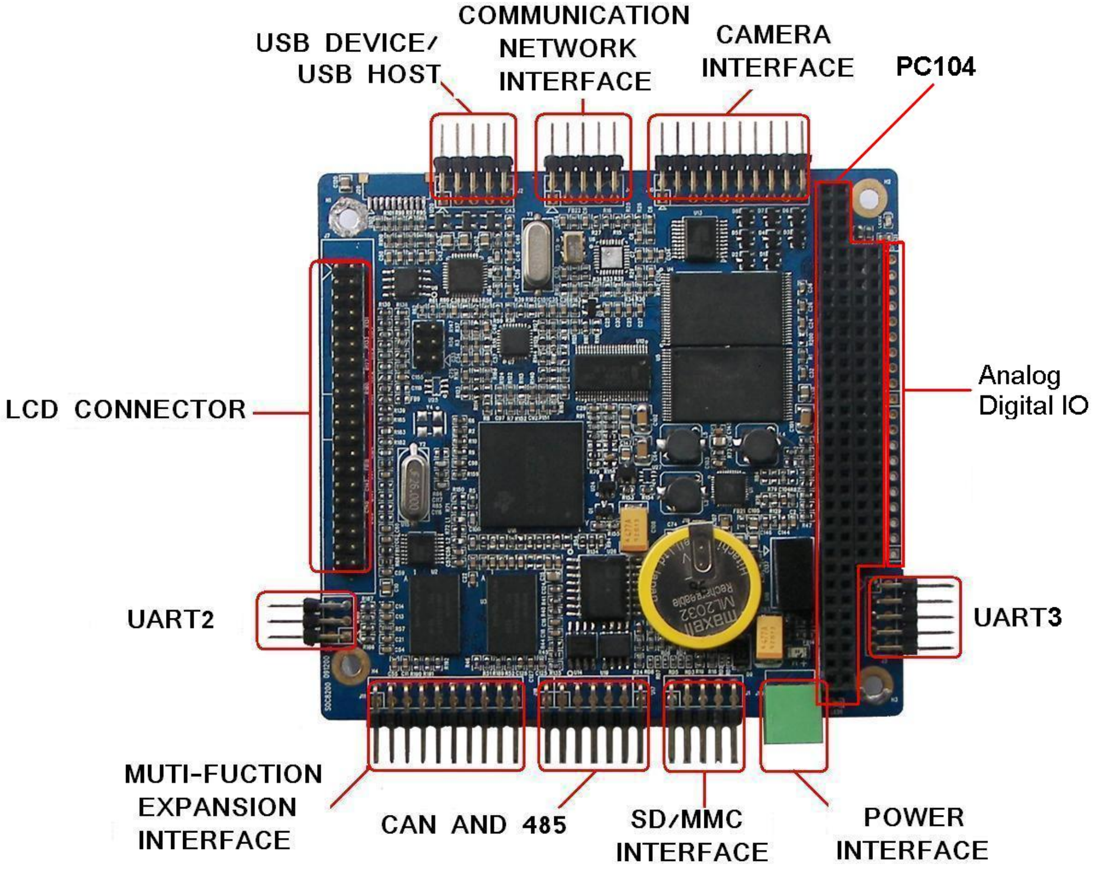


Fig2.1.1 SOC8200 Connection Diagram

2.1.2 Hardware Features

Processor

- AM3517 industrial applications processors
- NEON SIMD Coprocessor
- 600MHz ARM Cortex-A8 Core
- POWERVR SGX Graphics Accelerator (AM3517 only)
- 16KB I-Cache, 16KB D-Cache, 256KB L2-Cache, 112KB ROM, 64KB Share SRAM

Memory

- 256MB DDR2 SDRAM, 32bit
- 256MB NAND Flash, 8bit
- 4MB NOR Flash, 16bit (driver has not provided at present)

Signals Routed to Pins

- One 5-wire Debug serial port (RS232)
- One 5-wire serial port (TTL)
- Two USB 2.0 Host High-speed ports, 480Mbps
- One USB 2.0 Device High-speed port, 480Mbps
- One channel Audio input
- Two channel Audio output
- 16-bit LCD output
- 10-bit Camera video input
- One channel S-Video output
- One channel AV output
- One RS485 serial port
- One channel CAN bus interface
- 10/100Mbps network interface
- SD/MMC interface
- Multi-functional expansion interface (McBSP, IIC, McSPI, TV-OUT)
- PC104 expansion interface (GPMC Bus, MMC, USB, McSPI, UART1, Clock, HDQ)
- JTAG interface

2.1.3 Electric Characteristic

- SOC8200 Single Board Computer Dimensions: 96mm*90mm (8 layer PCB design)
- Input voltage: +5V
- Power Consumption: About 3W
- Working Temp.: -40℃~85℃
- Working Humidity: 20%~90%

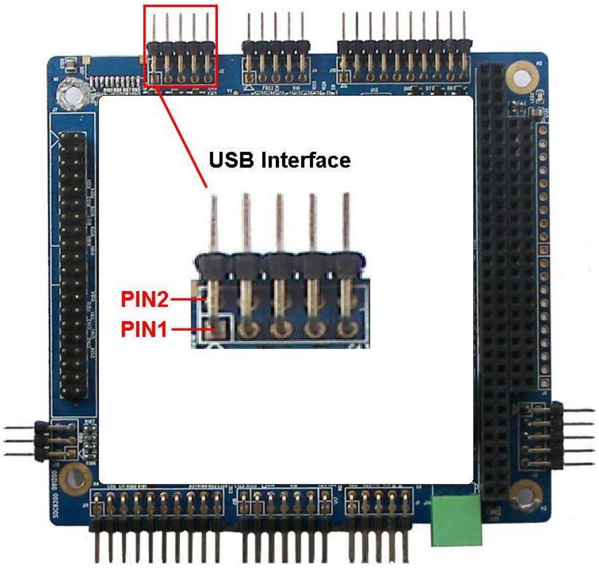
2.1.4 Schematic

Please refer to the http://www.armkits.com/download/soc8200sch.pdf

The schematic is only used for customer reference, if customers want to use it for their own development, we do not provide any technic support on it.

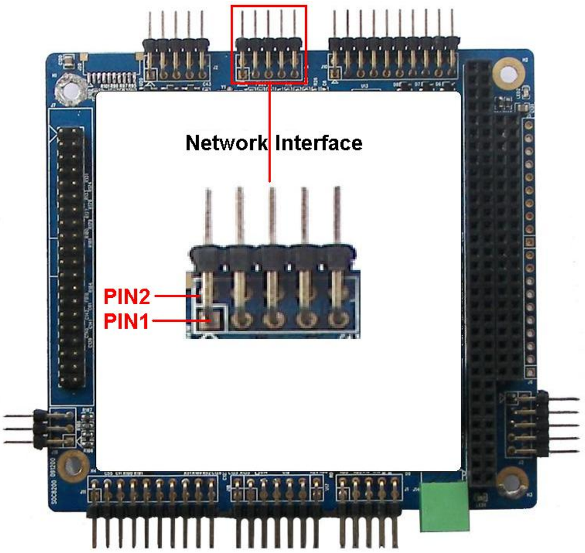
2.2 Hardware Interface

2.2.1 USB host & USB Interface

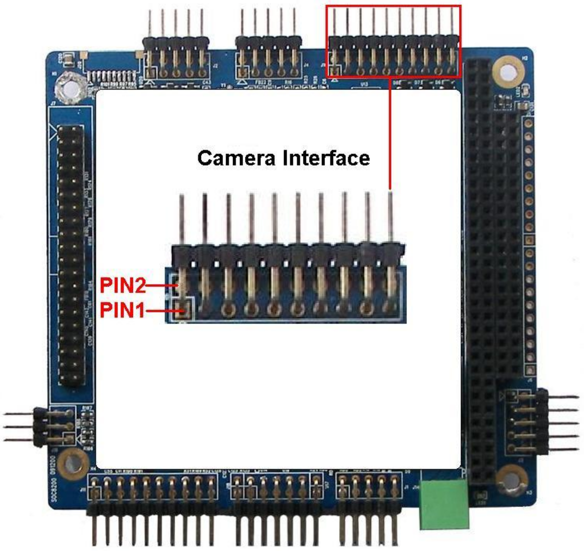
PIN	Description	
1	OTG_DM	
2	OTG_DP	
3	OTG_BUS	
4	OTG_ID	
5	U1_DM	
6	U1_DP	
7	GND	
8	POWER_USB	
9	U2_DM	
10	U2_DP	

2.2.2 Network interface

SOC8200 is 10M/100M adaptive network interface

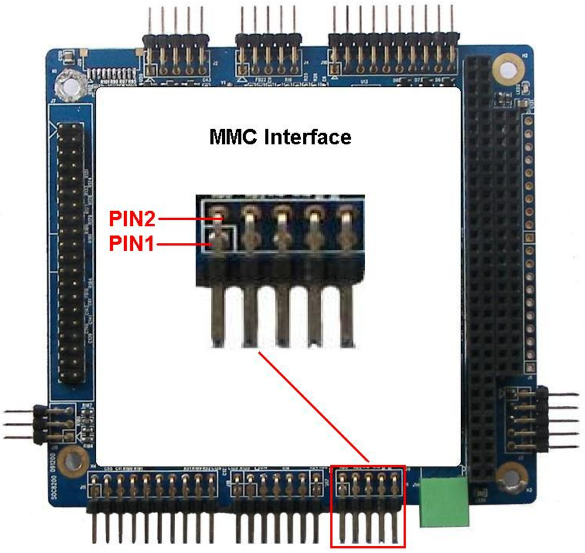
PIN	Description	
1	GND	
2	VCC_IO	
3	TXN	
4	TXP	
5	GND	
6	RXN	
7	RXP	
8	LED2/NINTSEL	
9	LED1/REGOFF	
10	GND	

2.2.3 Camera Interface

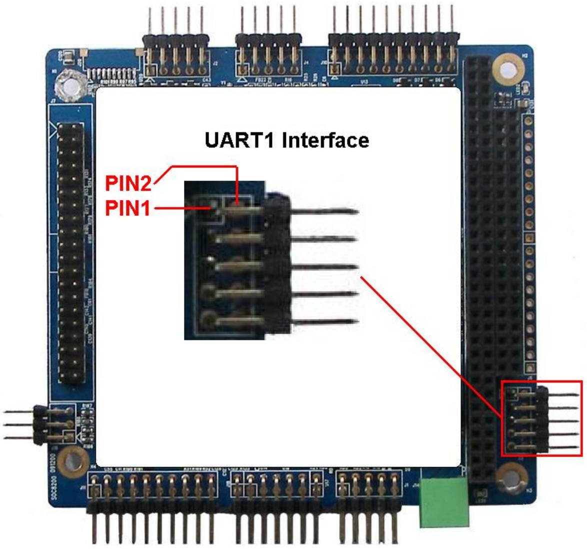
PIN	Description	
1	GND	
2	CAM_D0	
3	CAM_D1	
4	CAM_D2	
5	CAM_D3	
6	CAM_D4	
7	CAM_D5	
8	CAM_D6	
9	CAM_D7	
10	CAM_D8	
11	CAM_D9	
12	GND	
13	CAM_PCLK	
14	GND	
15	CAM_HS	
16	CAM_VS	
17	VCC_IO	
18	IIC3_SDA	
19	IIC3_SCL	

20	GND	

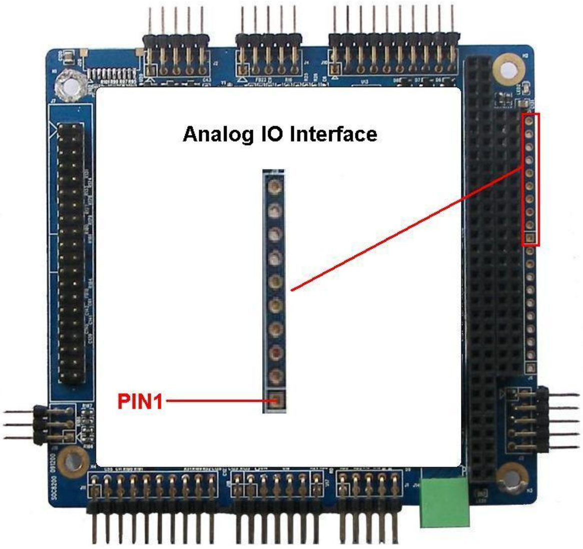
2.2.4 MMC Interface

PIN	Description	
1	VCC_IO	
2	MMC1_CLK	
3	MMC1_CMD	
4	MMC1_D0	
5	MMC1_D1	
6	MMC1_D2	
7	MMC1_D3	
8	MMC1_CD	
9	MMC1_WP	
10	GND	

2.2.5 UART1 Interface

PIN	Description	
1	N/A	
2	N/A	
3	R1IN	
4	T2OUT	
5	T1OUT	
6	R2IN	
7	N/A	
8	N/A	
9	GND	
10	N/A	

2.2.6 Analog IO Interface

<table>
<tr><th>PIN</th><th>Description</th><td rowspan="11">
</td></tr>
<tr><td>1</td><td>CH7</td></tr>
<tr><td>2</td><td>CH6</td></tr>
<tr><td>3</td><td>CH5</td></tr>
<tr><td>4</td><td>CH4</td></tr>
<tr><td>5</td><td>CH3</td></tr>
<tr><td>6</td><td>CH2</td></tr>
<tr><td>7</td><td>CH1</td></tr>
<tr><td>8</td><td>CH0</td></tr>
<tr><td>9</td><td>GND</td></tr>
<tr><td>10</td><td>VCC_IO</td></tr>
</table>

2.2.7 Digital IO Interface

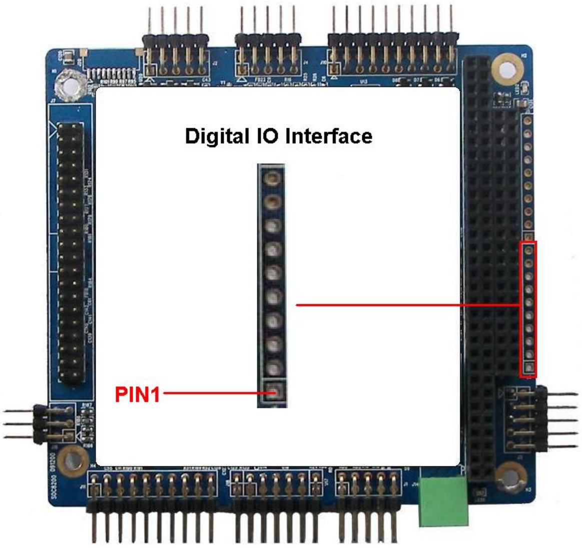
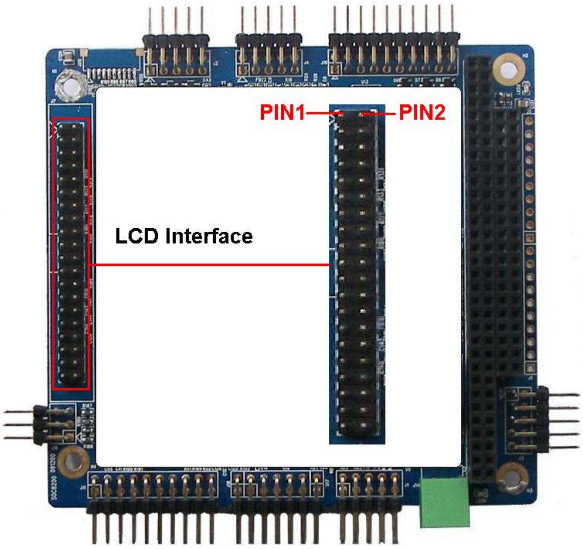
<table>
<tr><th>PIN</th><th>Description</th><td rowspan="11">
</td></tr>
<tr><td>1</td><td>CH7</td></tr>
<tr><td>2</td><td>CH6</td></tr>
<tr><td>3</td><td>CH5</td></tr>
<tr><td>4</td><td>CH4</td></tr>
<tr><td>5</td><td>CH3</td></tr>
<tr><td>6</td><td>CH2</td></tr>
<tr><td>7</td><td>CH1</td></tr>
<tr><td>8</td><td>CH0</td></tr>
<tr><td>9</td><td>GND</td></tr>
<tr><td>10</td><td>VCC_IO</td></tr>
</table>

Table2.7 Digital IO Interface

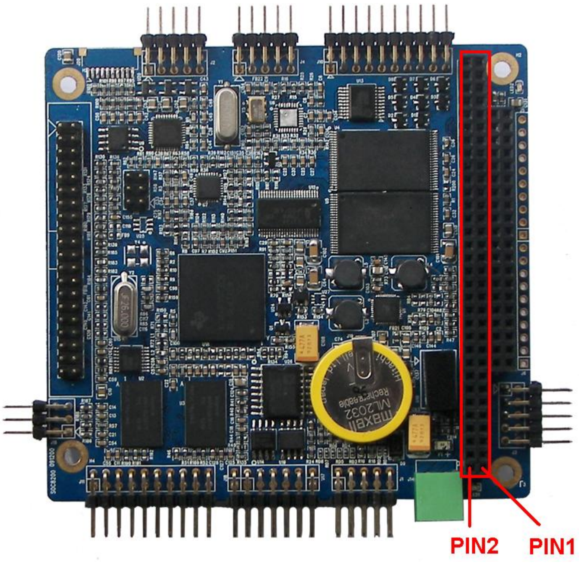
2.2.8 TFT_LCD Interface

PIN	Description	
1	GND	
2	DSS_CLK	
3	DSS_HS	
4	DSS_VS	
5	GND	
6	N/A	
7	DSS_D11	
8	DSS_D12	
9	DSS_D13	
10	DSS_D14	
11	DSS_D15	
12	GND	
13	DSS_D5	
14	DSS_D6	
15	DSS_D7	
16	DSS_D8	
17	DSS_D9	
18	DSS_D10	
19	GND	
20	N/A	
21	DSS_D0	
22	DSS_D1	
23	DSS_D2	
24	DSS_D3	
25	DSS_D4	
26	GND	
27	DSS_DEN	
28	VCC_IO	
29	VCC_IO	
30	N/A	
31	N/A	
32	Y+	
33	X-	
34	Y-	
35	X+	
36	LCD_PEN	
37	VCC_5V	
38	LCD_ADJ	
39	GND	

40	N/A	

2.2.9 PC104 Interface

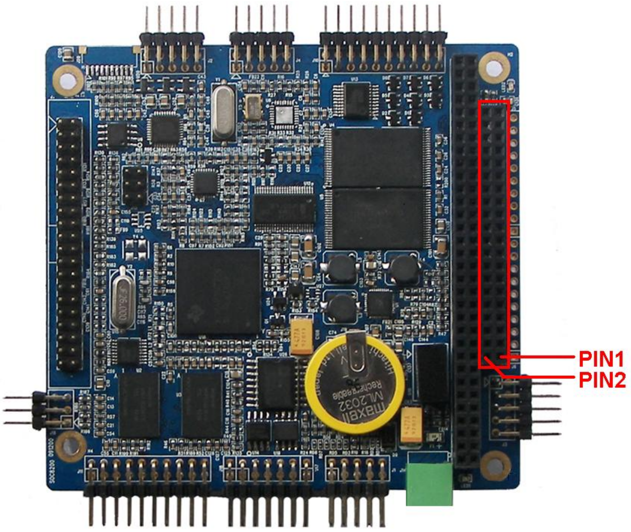
2.2.9.1 PC104-64

PIN	Description	
1	GND	
2	N/A	
3	VCC_5V	
4	VCC_5V	
5	VCC_IO	
6	VCC_IO	
7	GND	
8	SYS_RST	
9	POWER_RST	
10	SYS_CLKOUT2	
11	SYS_CLKOUT1	
12	HDQ_SIO	
13	SYS_32K	
14	GND	
15	IRQ	
16	GPIO58	
17	GPIO57	
18	GPIO56	
19	GPT11	
20	GPT10	
21	GPT9	
22	IIC1_SDA	
23	IIC1_SCL	
24	GND	
25	UART4_RX	
26	RS485_TXEN	
27	RS485_RXEN	
28	UART4_TX	
29	GND	
30	MCBSP4_DX	
31	MCBSP4_DR	
32	MCBSP4_CLKX	
33	MCBSP4_FSX	
34	MCBSP_CLKS	
35	GND	

36	GPIO157	
37	GPIO162	
38	SPI4_CS0	
39	SPI4_SOMI	
40	SPI4_SIMO	
41	SPI4_CLK	
42	GND	
43	SPI1_CS3	
44	SPI1_CS2	
45	SPI1_SOMI	
46	SPI1_SIMO	
47	SPI1_CLK	
48	GND	
49	MMC2_D7	
50	MMC2_D6	
51	MMC2_D5	
52	MMC2_D4	
53	MMC2_D3	
54	MMC2_D2	
55	MMC2_D1	
56	MMC2_D0	
57	MMC_CMD	
58	MMC2_CLK	
59	GND	
60	U3_DP	
61	U3_DM	
62	U4_DM	
63	U4_DP	
64	GND	

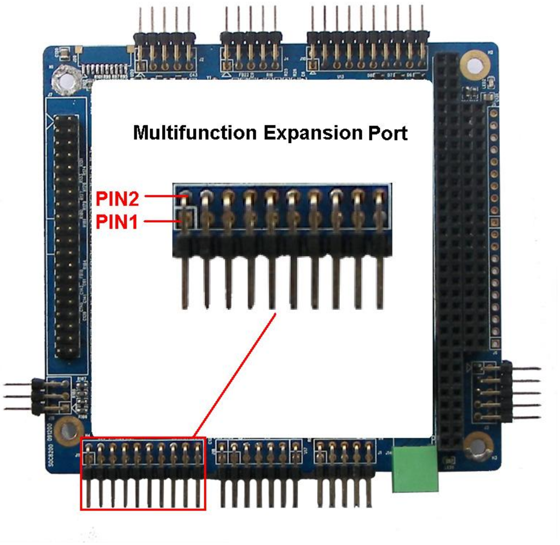
Table2.9 PC104-64 Interface

2.2.9.2 PC104-40

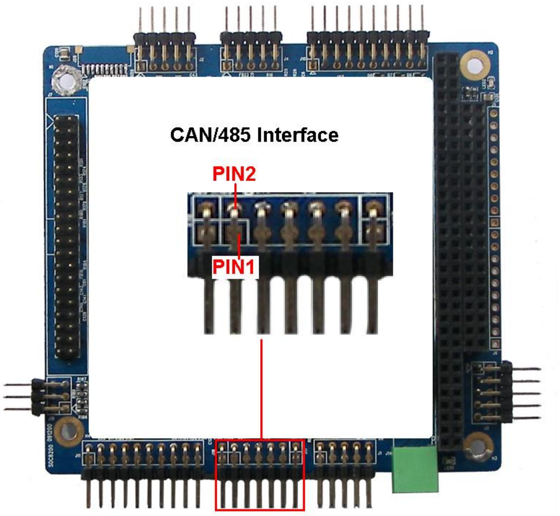
PIN	Description	
1	GND	
2	GPMC_NCS4	
3	GPMC_NCS3	
4	GPMC_NCS2	
5	GPMC_A10	
6	GPMC_A9	
7	GPMC_A8	
8	GPMC_A7	
9	GPMC_A6	
10	GPMC_A5	
11	GPMC_A4	
12	GPMC_A3	
13	GPMC_A2	
14	GPMC_A1	
15	GPMC_NBE1	
16	GPMC_WAIT3	
17	SYS_RST	
18	GPMC_CLE	
19	GND	
20	GPMC_ALE	
21	GPMC_CLK	
22	GPMC_WE	
23	GPMC_OE	
24	GPMC_D15	
25	GPMC_D14	
26	GPMC_D13	
27	GPMC_D12	
28	GPMC_D11	
29	GPMC_D10	
30	GPMC_D9	
31	GPMC_D8	
32	GPMC_D7	
33	GPMC_D6	
34	GPMC_D5	
35	GPMC_D4	
36	GPMC_D3	
37	GPMC_D2	
38	GPMC_D1	
39	GPMC_D0	

40	GND	

2.2.10 Multifunctional Expansion Interface

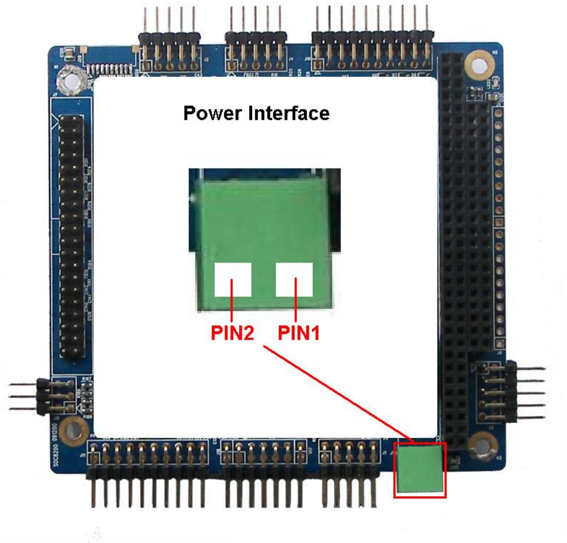
PIN	Description	
1	GND	
2	TV_OUT1	
3	GND	
4	TV_OUT2	
5	GND	
6	VCC_IO	
7	GND	
8	MCBSP2_CLKX	
9	MCBSP2_FSX	
10	MCBSP2_DR	
11	MCBSP2_DX	
12	IIC2_SDA	
13	IIC2_SCL	
14	GND	
15	SPI2_CLK	
16	SPI2_SIMO	
17	SPI2_SOMI	
18	SPI2_CS0	
19	SPI2_CS1	
20	GND	

2.2.11 Can/485 Interface

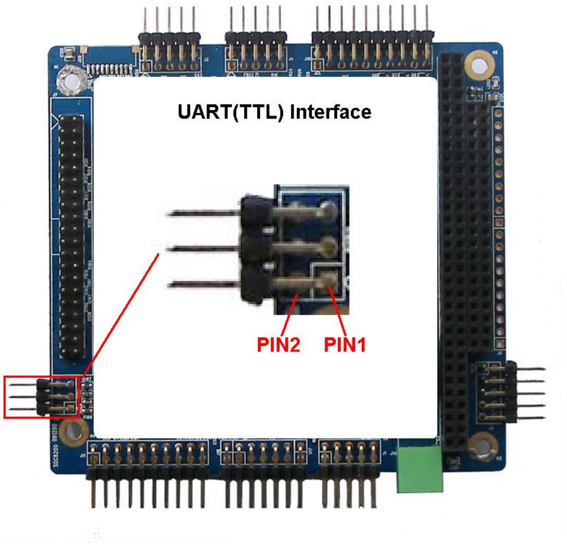
PIN	Description	
1	CANH	
2	CANH	
3	CANL	
4	CANL	
5	CHGND	
6	CHGND	
7	RS485A	
8	RS485B	
9	RS485Z	
10	RS485Y	
11	MCBSP2_DX	
12	IIC2_SDA	

13	IIC2_SCL	
14	GND	
15	SPI2_CLK	
16	SPI2_SIMO	
17	SPI2_SOMI	
18	SPI2_CS0	
19	SPI2_CS1	
20	GND	

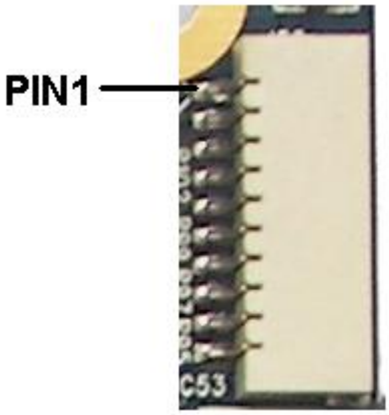
2.2.12 Power Interface

PIN	**Description**	
1	VCC_5V	
2	GND	

2.2.13 UART (TTL) Interface

PIN	**Description**	
1	VCC_IO	
2	GND	
3	UART2_CTS	
4	UART2_RTS	
5	UART2_TX	
6	UART2_RX	

2.2.14 JTAG Interface

PIN	Description	
1	VCC	
2	TMS	
3	TDI	
4	NTRST	
5	TD0	
6	RTCK	
7	TCK	
8	EMU0	
9	EMU1	
10	GND	

3 Linux System

3.1 Linux system Overview

This chapter provides an overview of software system of SOC8200, including the introduction of pre-installed software, specifications of SOC8200 BSP package and various specifications contained in SOC8200 CD.
SOC8200 software system includes: pre-compiled images, application system source code, cross compilation tools, auxiliary tools for development. Images, applications, source code and auxiliary tools of can be found in the release SOC8200 CD.

The SD card of SOC8200 has the following software:

- x-loader--------------------------(x-load.bin.ift_for_NAND)
- u-boot------------------------------(flash-uboot.bin)
- kernel--------------------------(uImage)
- rootfs-------------------------------(ubi.img)

In addition, the CD provides the following programs and software:

- The image files for burning
- Cross compilation tools
- Source code for each part of system
- User testing program and development demonstration
- Some tools that may be used by users when operating SOC8200

3.1.1 Pre-installed software

Software image has been contained in FLASH before the delivery. A completed system consists of four parts: i.e. x-loader, u-boot, kernel and rootfs. The Fig 3.1 shows the structure of the system:

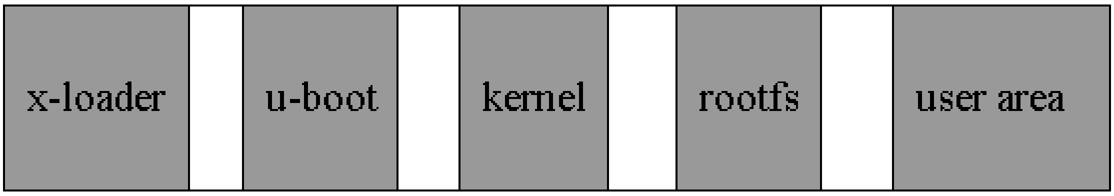


Fig 31 System compose map

Features and functions of each part of the system are:

1. x-loader is a first level bootstrap program. After the system start-up, the ROM inside the CPU will copy the x-loader to internal RAM and perform work. Its main function is to initialize the CPU, copy u-boot into the memory and give the control power to u-boot;
2. u-boot is a second level bootstrap program. It is used for interacting with users and updating images and leading the kernel;
3. The latest 2.6.32.x kernel is employed and can be customized based on SOC8200;
4. Rootfs employs Open-source system. It is small in capacity and powerful.

3.1.2 BSP features

SOC8200 BSP is used for customizing and generating the Linux operating system applicable to SOC8200 hardware platform. Users can conduct a secondary development on the basis of this BSP. The BSP in the CD attached in SOC8200 contains the following showed in table 3.1

Item		**Description**
Bootloader	x-loader	NAND / ONENAND
		MMC / SD
		FAT
	u-boot	NAND / ONENAND
		MMC / SD
		FAT
		NET
Kernel	Linux-2.6.32	ROM/CRAM/EXT2/EXT3/FAT/NFS/ JFFS2/UBIFS
Device Driver	serial	Serial port driver
	full function serial x2	Full function serial(TTY level+RS232 level
	RTC	Hardware clock driver
	net	10/100M Ethernet driver
	flash	Nand flash driver
	lcd	TFT LCD driver
	touch screen	Touch screen driver
	vga	Supports VGA output
	mmc/sd	MMC/SD controller driver
	cf	Support CF card device
	usb otg	USB otg 2.0 driver
	usb ehci	USB ehci driver
	video	Supports video output
	audio	Sound driver (supports audio Play)
	buzzer	Buzzer driver
	can	CAN driver
	led	LED driver
	rs485	RS485 driver
	Watch dog	Watch dog driver
	Analog Input	8 channel analog input

	Digital output	Control independently

Table 3.1 BSP specifications

3.2 Linux System Quick Operation

Windows System Environment Preparation

In the course of system operation, when needs HyperTerminal in the PC, the Hyper Terminal configuration is as follows:

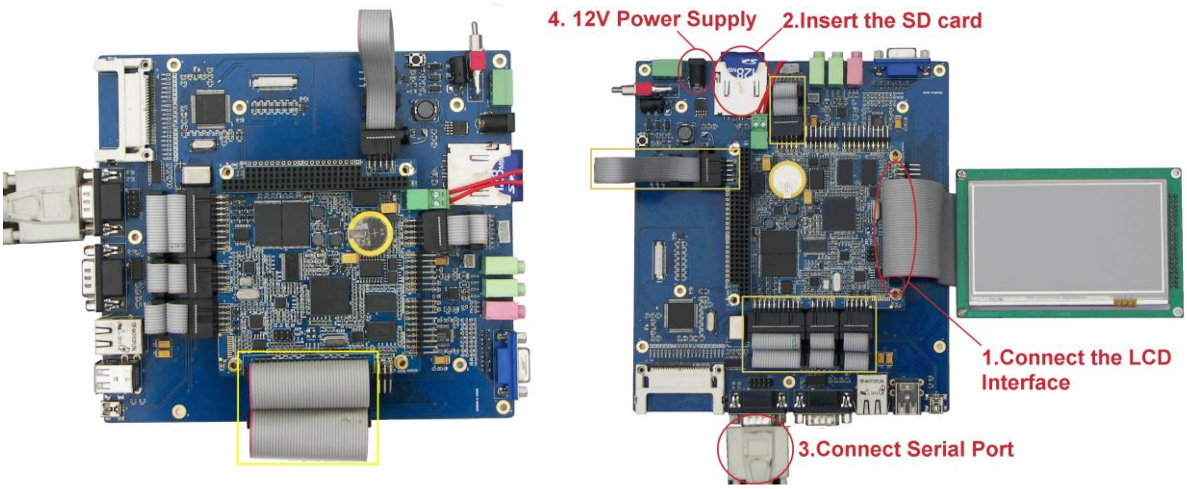
- Baud rate: 115200
- Data bit: 8
- Parity check: no
- Stop bit: 1

SOC8200 Hardware Environment Preparation

Before booting the linux system, you should make sure the following labeled before turn on power:

1. Confirm that you have connected the LCD. (If you have bought the LCD)
2. Confirm whether the SD card accessed；
3. Confirm whether the serial port accessed；
4. Confirm that you have connect the interface where the yellow box marked on the map.

If got the confirmation, please connect 12V power supply, when the hyper terminal on the PC shows SOC8200 information, it proves successful.



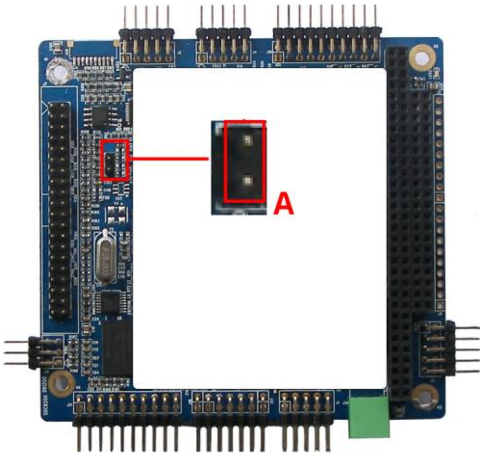
If you need to use VGA interface, please note the above-mentioned the yellow box which you should connect

3.2.1 System boot methods

3.2.1.1 NAND Flash Boot

You can use the jumper cap to choose the boot type, if connect the **Place A**, the board will boot image from SD card, otherwise the board will boot image from NAND Flash.

The nand flash already has the solidified code of VGA display, user only need to connect the serial port and set the hyper terminal configuration. User can boot linux system from nand flash without connect the jumper cap. If customers do not use VGA, please refer to 【3.3.2 Update the image for NAND Flash】.



3.2.1.2 SD card Boot

If you need to boot from the SD card, please refer to the following **Display Options**

3.2.2 Display Options

User need to replace the uImage to display LCD (4.3inch, 7inch) or VGA, concrete steps are as follows:

1.Replace the SD card uImage file

Copy the image to the SD card and delete previous uImage. And rename the uImage_xx as uImage on the SD card.

Warning：The XX’’LCD is the size of LCD you are using, it is included 4.3inch, 7inch, 10.4inch, VGA).

2. Enter U-boot Shell

```
40X

Texas Instruments X-Loader 1.45 (Mar 19 2010 - 16:09:58)
Starting X-loader on MMC
Reading boot sector

213544 Bytes Read from MMC
Starting OS Bootloader from MMC...
Starting OS Bootloader...



U-Boot 2009.11-svn ( 3 鏈?19 2010 - 16:14:31)
```

```
OMAP34xx/35xx-GP ES1.0, CPU-OPP2 L3-165MHz
AM3517EVM Board + LPDDR/NAND
I2C:     ready
DRAM:    256 MB
NAND:    256 MiB
In:      serial
Out:     serial
Err:     serial
Die ID #79640000000000000001543b2106011005
Net:     davinci_emac_initialize
Ethernet PHY: GENERIC @ 0x00
DaVinci EMAC
Hit any key to stop autoboot:    3
```

When it starts to this here, the system will count down for 3 seconds. Then press any key, it will enter the u-boot shell.

3. U-boot parameter settings

Input the following in bold type in the u-boot shell.

```
OMAP3517EVM # setenv bootargs console=ttyS2,115200n8 root=/dev/ram0 rw
rootfstype=ext2 initrd=0x81600000,40M
OMAP3517EVM # setenv bootcmd ‘mmc init\;fatload mmc 0 80300000
uImage\;fatload mmc 0 81600000 ramdisk.gz\;bootm 0x80300000’
OMAP3517EVM # saveenv
OMAP3517EVM # boot
```

3.2 3 Linux Function Test

3.2 3.1 Test on LED

Led1 on the SOC8200 has been used as power indicator light, led2 can be used.

The following (Linux systems) can complete the led2 test.

1. Light LED2.

```
[root@OMAP3EVM /]# echo -n 1 >/sys/class/leds/led/brightness
```

2. Extinguish LED2.

```
[root@OMAP3EVM /]# echo -n 0 >/sys/class/leds/led/brightness
```

3.2 3.2 Test on Touch Screen

After entering Linux system, execute the following commands to test:

1. Input the following commands to execute the touch screen calibration procedures:

```
[root@OMAP3EVM /]# ts_calibrate
```

Follow prompts on the screen, click the "+" icon five times to complete the calibration.

2. After the calibration is complete, enter the following commands for touch-screen test

```
[root@OMAP3EVM /]# ts_test
```

Follow prompts on the on screen prompts, choose to draw point, draw a line test.

3.2 3.3 Test on RTC

SOC8200 has a hardware clock, it is used to save and restore the system time, refer to the following test methods:

1. Set the system time at 5:55 p.m. on the March 24, 2010:

```
[root@OMAP3EVM /]# date 032417552010
Wed Mar 24 17:55:00 UTC 2010
```

2. Write the system time into RTC:

```
[root@OMAP3EVM /]# hwclock -w
```

3. Read RTC:

```
[root@OMAP3EVM /]# hwclock
Wed Mar 24 17:55:06 2010    0.000000 seconds
```

The hardware clock RTC will be set to March 24 2010 and the system time is saved in the hardware clock.

4. Reboot the system and input the following commands to restore the system time.

```
[root@OMAP3EVM /]# hwclock -s
[root@OMAP3EVM /]# date
Wed Mar 24 17:55:37 UTC 2010
```

3.2 3.4 Test on MMC/SD card

1. Insert the MMC/SD card and system displays the detection information:

```
[root@OMAP3EVM /]# mmc0: new MMC card at address 0001
mmcblk1: mmc0:0001 000000 122 MiB
mmcblk1: p1
```

2. Mount the MMC/SD card to directory of /mnt:

```
[root@OMAP3EVM /]# mount -t vfat /dev/mmcblk1p1 /mnt/
[root@OMAP3EVM /]# ls /mnt
MLO                             u-boot.bin                   ubi.img
flash-uboot.bin            uImage                        x-load.bin.ift_for_NAND
```

3. Umount the SD card:

```
[root@OMAP3EVM /]# umount /mnt
```

3.2 3.5 Test on USB OTG

Use the SOC8200 as DEVICE,USB OTG as slave：

1. The user can connected to switch development board and the pc machine via **USB mini B to USB A cable** after the system runs.

Install the Linux USB Ethernet/RNDIS Gadget driver according to the appendix 1.

2.After successful connection, PC will show a virtual network card as displayed in Fig 5.1：

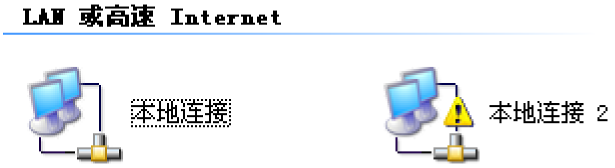
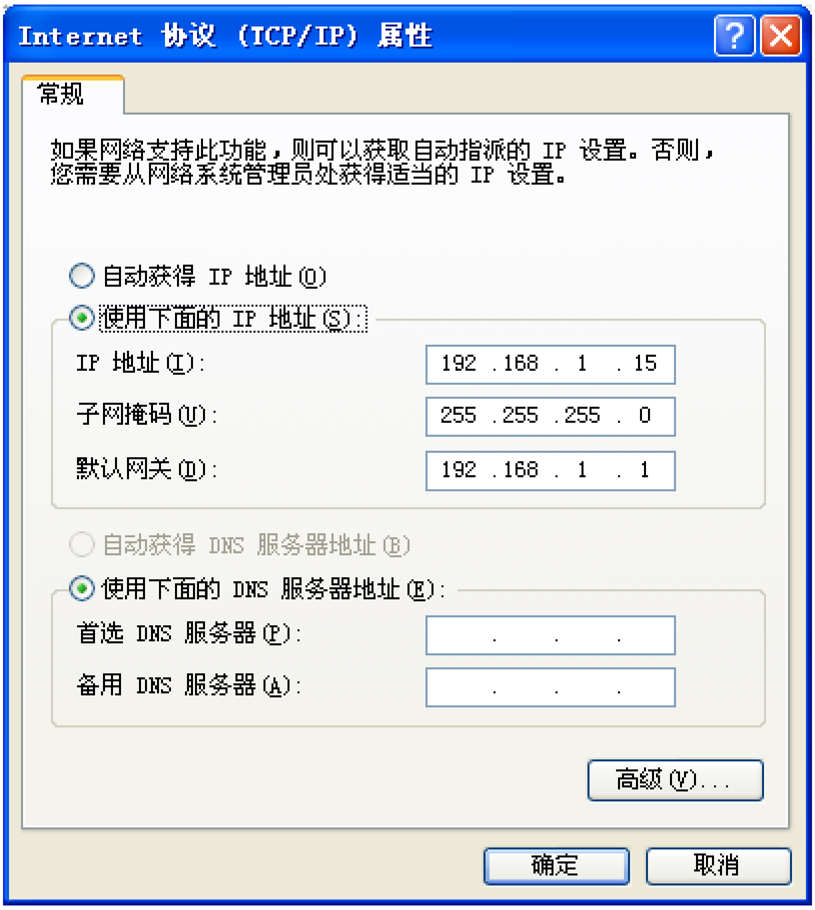


Fig 5.1 virtual network card

3. Set the IP address of the virtual network card, for example:



Internet 协议 (TCP/IP) 属性

如果网络支持此功能，则可以获取自动指派的 IP 设置。否则，您需要从网络系统管理员处获得适当的 IP 设置。

○ 自动获得 IP 地址(O)

● 使用下面的 IP 地址(S):

IP 地址(I): 192 . 168 . 1 . 15

子网掩码(U): 255 . 255 . 255 . 0

默认网关(D): 192 . 168 . 1 . 1

○ 自动获得 DNS 服务器地址(B)

● 使用下面的 DNS 服务器地址(E):

首选 DNS 服务器(P): . . .

备用 DNS 服务器(A): . . .

Fig 5.2 IP Configuration

4. Set the IP network segment of SOC8200 board as the same as virtual network card:

```
[root@OMAP3EVM /]# ifconfig usb0 192.168.1.105
[root@OMAP3EVM /]# ifconfig
usb0        Link encap:Ethernet   HWaddr CA:A3:26:97:50:A8
            inet addr:192.168.1.105   Bcast:192.168.1.255   Mask:255.255.255.0
            UP BROADCAST RUNNING MULTICAST   MTU:1500   Metric:1
            RX packets:145 errors:0 dropped:0 overruns:0 frame:0
            TX packets:6 errors:0 dropped:0 overruns:0 carrier:0
            collisions:0 txqueuelen:1000
            RX bytes:14777 (14.4 KiB)   TX bytes:796 (796.0 B)
```

5. Use the following command on the hyper terminal to test the SOC8200 board whether had connected successfully.

```
  [root@OMAP3EVM /]# ping 192.168.1.15
PING 192.168.1.15 (192.168.1.15): 56 data bytes
64 bytes from 192.168.1.15: seq=0 ttl=128 time=6.592 ms
64 bytes from 192.168.1.15: seq=1 ttl=128 time=0.549 ms
64 bytes from 192.168.1.15: seq=2 ttl=128 time=0.488 ms
64 bytes from 192.168.1.15: seq=3 ttl=128 time=0.458 ms
```

⚠ The address of OTG should not the same as net, user may change it.

3.2 3.6 Test on USB HOST

SOC8200 connect USB device:

1. Insert U-disk to the USB-HOST interface when SOC8200 board runs, and the system pops the detection information automatically.

```
[root@OMAP3EVM /]# usb 1-1.1: new full speed USB device using ehci-omap and address 4
usb 1-1.1: not running at top speed; connect to a high speed hub
usb 1-1.1: New USB device found, idVendor=1976, idProduct=1307
usb 1-1.1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
usb 1-1.1: Product: USB Reader
usb 1-1.1: Manufacturer: ChipsBnk
usb 1-1.1: SerialNumber: 110074973765
scsi1 : usb-storage 1-1.1:1.0
scsi 1:0:0:0: Direct-Access     ChipsBnk SD/MMCReader     4081 PQ: 0 ANSI: 2
sd 1:0:0:0: [sdb] 1990656 512-byte logical blocks: (1.01 GB/972 MiB)
sd 1:0:0:0: [sdb] Write Protect is off
sd 1:0:0:0: [sdb] Assuming drive cache: write through
sd 1:0:0:0: [sdb] Assuming drive cache: write through
sdb: sdb1
sd 1:0:0:0: [sdb] Assuming drive cache: write through
sd 1:0:0:0: [sdb] Attached SCSI removable disk
```

2. Mount the U-disk to directory of /mnt:

```
  [root@OMAP3EVM /]# mount -t vfat /dev/sdb1/mnt/
```

3. Check the U-disk information.

```
[root@OMAP3EVM /]# ls /mnt/
MLO                        ramdisk.gz                uImage-vga
emtest_auto             saMmapLoopback            ubi.img
fancuo.mp3               u-boot.bin             x-load.bin.ift_for_NAND
flash-uboot.bin        uImage
```

4. Umount the USB-host.

```
  [root@OMAP3EVM /]# umount /mn
```

3.2 3.7 Test on network

The board has a 10/100M self-adapting network card DM9000; users can connect the board to the LAN and enter the following commands for a test:

```
[root@OMAP3EVM /]# ifconfig eth0 192.192.192.201
eth0: attached PHY driver [Generic PHY] (mii_bus:phy_addr=ffffffff:00, id=7c0f1)
[root@OMAP3EVM /]# PHY: ffffffff:00 - Link is Up - 100/Full

[root@OMAP3EVM /]# ping 192.192.192.90
PING 192.192.192.90 (192.192.192.90): 56 data bytes
64 bytes from 192.192.192.90: seq=0 ttl=128 time=5.005 ms
64 bytes from 192.192.192.90: seq=1 ttl=128 time=0.396 ms
64 bytes from 192.192.192.90: seq=2 ttl=128 time=0.305 ms
64 bytes from 192.192.192.90: seq=3 ttl=128 time=0.305 ms
64 bytes from 192.192.192.90: seq=4 ttl=128 time=0.305 ms
```

⚠ Warning: user may change IP address, press ctrl+c to quit.

3.2 3.8 Test on camera

Connect camera module (Option) and CCD camera well, and execute following commands to test after entering the system.

```
  [root@OMAP3EVM /mnt]# saMmapLoopback
Capture: Opened Channel
Capture: Current Input: Composite
Capture: Input changed to: Composite
Capture: Current standard: NTSCvpfe-capture vpfe-capture: width = 720, height = 480, bpp = 2

vpfe-capture vpfe-capture: adjusted width = 720, height = 480, bpp = 2, bytesperline = 1440,
sizeimage = 691200

Capture: Number of requested buffers = 2
Capture: Init done successfully



Display: Opened Channel
Display: Capable of streaming
Display: Number of requested buffers = 3
Display: Init done succetvp514x 3-005d: tvp5146 (Version - 0x03) found at 0xba (OMAP I2C
adapter)
ssfully

Display: Stream on...
```

```
Capture: Stream on...
```

LCD shows the image collected by the camera. (press ctrl+c to quit the test)

3.2 3.9 Test on CAN

If the user want to connect the CAN device, please use the CAN8200。

The steps for the CAN connection:

1. The steps for setting:

Set the CAN baud rate as 125 k/bits, and enable the CAN devices.

```
[root@OMAP3EVM bin]# /usr/bin/ip link set can0 type can bitrate 125000 triple-sampling on
[root@OMAP3EVM bin]# /usr/bin/ip link set can0 up
ti_hecc ti_hecc.1: setting CANBTC=0xc00a8
```

2. Send the data:

Input the following commands for send data as " **1122334455667788**".

```
[root@OMAP3EVM bin]# /usr/bin/cansend can0 111#1122334455667788
```

3. Receive the data:

Input the following commands for receive the data:

```
[root@OMAP3EVM bin]# /usr/bin/candump can0
```

Receive the data that your send:

```
  can0          80   [8] 01 02 03 04 05 06 07 08
  can0          80   [8] 01 02 03 04 05 06 07 08
```

3.2 3.10 Test on ADC

The user can input the analog voltage for PIN1~8 (/dev/adc7 ~ /dev/adc0) on connector J5, the input analog voltage rate is 0v ~ 3.3v, for the 12 bit AD conversion, the system will display the digit voltage.

Input the following commands to check the PIN1 analog voltage:

```
[root@OMAP3EVM /]# adc_test -d /dev/adc7
The channel: /dev/adc0 0x0fff data: 3.2990 V
The channel: /dev/adc0 0x0fff data: 3.2990 V
The channel: /dev/adc0 0x0fff data: 3.2990 V
```

⚠ If it is the pin2, the commands is "adc_test -d /dev/adc6". When the pins is empty, the digit voltage is 2.2V.

3.2 3.11 Test on SD card

1. Connect to the SD card to the SOC8200 board, if the appear the following information on the debug port, the SD card had detected.

```
mmc0: new high speed SD card at address 0001
mmcblk0: mmc0:0001 APPSD 1.85 GiB
 mmcblk0: p1
```

2. Input the following commands to mount the SD card.

```
[root@OMAP3EVM /]# mount -t vfat /dev/mmcblk0p1 /mnt
[root@OMAP3EVM /]# ls /mnt
```

```
Windows Embedded CE 6.0 R2        NCP      linux-2.6.24
```

3. Umount the SD card.

```
  [root@OMAP3EVM /]# umount /mnt
```

3.2 3.12 Test on buzzer

1. Enable the buzzer:

```
[root@OMAP3EVM /]# echo 1 > /sys/class/misc/beep/val
```

2. Off the buzzer:

```
[root@OMAP3EVM /]# echo 0 > /sys/class/misc/beep/val
```

3.2 3.13 Test on AUDIO

The board has audio input and output interface, and we have alsa-utils audio test tools in the filesystem, users can enter the following commands for a test:

1. Recording Test：

```
[root@OMAP3EVM /]# arecord -t wav -c 2 -r 44100 -f S16_LE -v k
Recording WAVE 'k' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
Plug PCM: Hardware PCM card 0 'omap3evm' device 0 subdevice 0
Its setup is:
    stream             : CAPTURE
    access             : RW_INTERLEAVED
    format             : S16_LE
    subformat          : STD
    channels           : 2
    rate               : 44100
    exact rate       : 44100 (44100/1)
    msbits             : 16
    buffer_size    : 22052
    period_size    : 5513
    period_time    : 125011
    tstamp_mode    : NONE
    period_step    : 1
    avail_min        : 5513
    period_event : 0
    start_threshold    : 1
    stop_threshold      : 22052
    silence_threshold: 0
    silence_size : 0
    boundary         : 1445199872
    appl_ptr         : 0
    hw_ptr             : 0
```

Press CONTROL+C to quit the test.

2. Playback Testing：

```
[root@OMAP3EVM /]# aplay -t wav -c 2 -r 44100 -f S16_LE -v k
Playing WAVE 'k' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
Plug PCM: Hardware PCM card 0 'omap3evm' device 0 subdevice 0
Its setup is:
   stream          : PLAYBACK
   access          : RW_INTERLEAVED
   format          : S16_LE
   subformat       : STD
   channels        : 2
   rate            : 44100
   exact rate      : 44100 (44100/1)
   msbits          : 16
   buffer_size     : 22052
   period_size     : 5513
   period_time     : 125011
   tstamp_mode     : NONE
   period_step     : 1
   avail_min       : 5513
   period_event : 0
   start_threshold   : 22052
   stop_threshold    : 22052
   silence_threshold: 0
   silence_size : 0
   boundary        : 1445199872
   appl_ptr        : 0
   hw_ptr          : 0
```

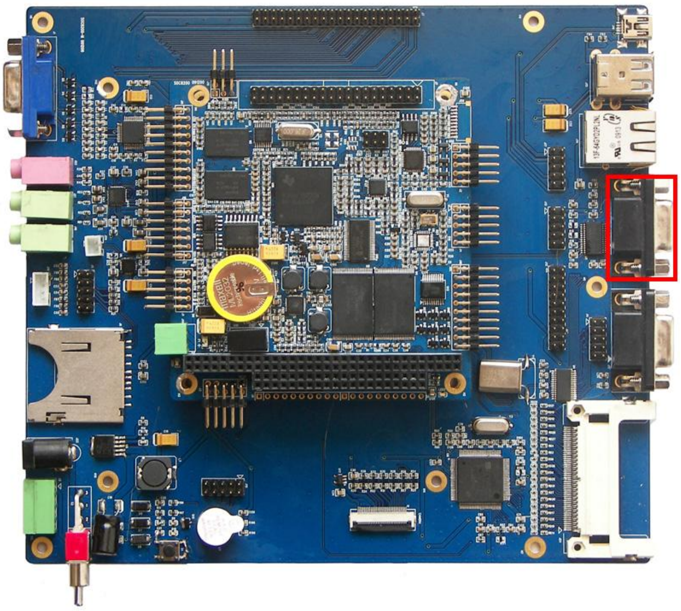
3.2 3.14 Test on full-function serial port

SOC8200-M has 3 serial port:

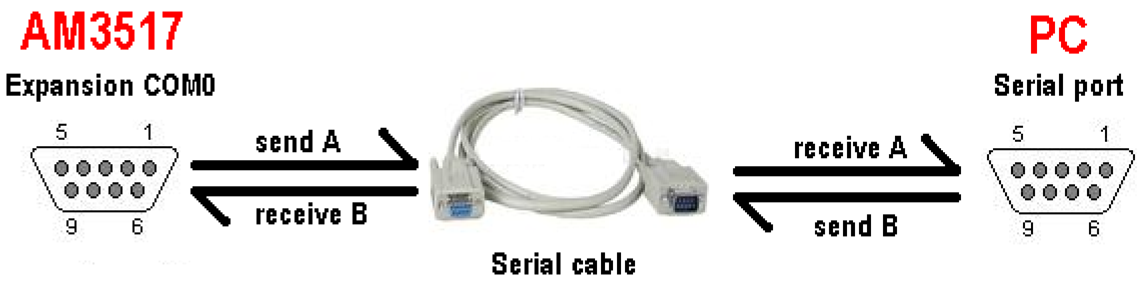
Interface	Type	Encapsulation	Device nodes	dBm	Test program	
Extended serial port 0	Full-function serial port	Interface for DB9	/dev/ttySCMA0	RS232	3 line	com_norts
					9 line	com_rts
Extended serial port 1	Full-function serial port	Interface for IDC	/dev/ttySCMA1	TTL	3 line	com_norts
					9 line	com_rts
Debug port	Three-wire serial port	Interface for IDC	/dev/ttyS2	RS232	System Integration	

1. Test preparation

As the following Fig, the red pane is extended serial port 0, the test is subject to extended serial port 0.



The step for the connection:



The serial setting for the PC:

Baud rate: 115200

Data bit: 8

Stop bit: 1

```
Parity bit: None
Control flow: Hardware
DTR: On
RTS: On
```

2. Test for communication:

1) Connect the extended serial port 0 and PC via 3-wire mode

Input the following commands, the SOC8200 board will send data “1234567890 " to the PC. If the PC has send the data to SOC8200 board, the board will receive the data too.

```
[root@OMAP3EVM ]# com_norts -d /dev/ttySCMA0
SEND: 1234567890
RECV: www.armkits.com
RECV: www.armkits.com
SEND: 1234567890
RECV: www.armkits.com
RECV: www.armkits.com
SEND: 1234567890
```

2)Connect the extended serial port 0 and PC via 9-wire mode:

Input the following commands, the SOC8200 board will send data " 1234567890 " to the PC. If the PC has send the data to SOC8200 board, the board will receive the data too.

```
[root@OMAP3EVM ]# com_rts -d /dev/ttySCMA0
SEND: 1234567890
RECV: SOC8200
RECV: SOC8200
SEND: 1234567890
RECV: SOC8200
RECV: SOC8200
SEND: 1234567890
RECV: SOC8200
RECV: SOC8200
SEND: 1234567890
```

For the test program com_rts and com_norts, the user can add the " -s " to change the send content.

3.2 3.15 Test on digit output

The pins 1 to 8 on the connector J6 can output the digit voltage 0V and 3.3V, the default the output 3.3v when reset the board.

1. Device introduce:

```
[root@OMAP3EVM /]# cd /sys/class/misc/digital/
[root@OMAP3EVM digital]# ls
dev        out2       out4       out6       out8       power      uevent
out1       out3       out5       out7       outall     subsystem
```

As the above, the out1 has corresponding the pin1, the outall has corresponding the pins for 1 to 8.

2. Set the only pin voltage:

```
[root@OMAP3EVM digital]# echo 1 > out3
[root@OMAP3EVM digital]# cat out3
1
```

3. Set the all pins voltage:

```
  [root@OMAP3EVM digital]# echo aa > outall
[root@OMAP3EVM digital]# cat outall
aa
```

3.3 Linux Image Update

SOC8200 supports MMC/SD boot or NAND boot; different start-up modes will have different method for updating the image. We will introduce the update of image under different start-up modes.

3.3.1 Update the image for SD card

3.3.1.1 Prepare

1 The formatting of MMC/SD card

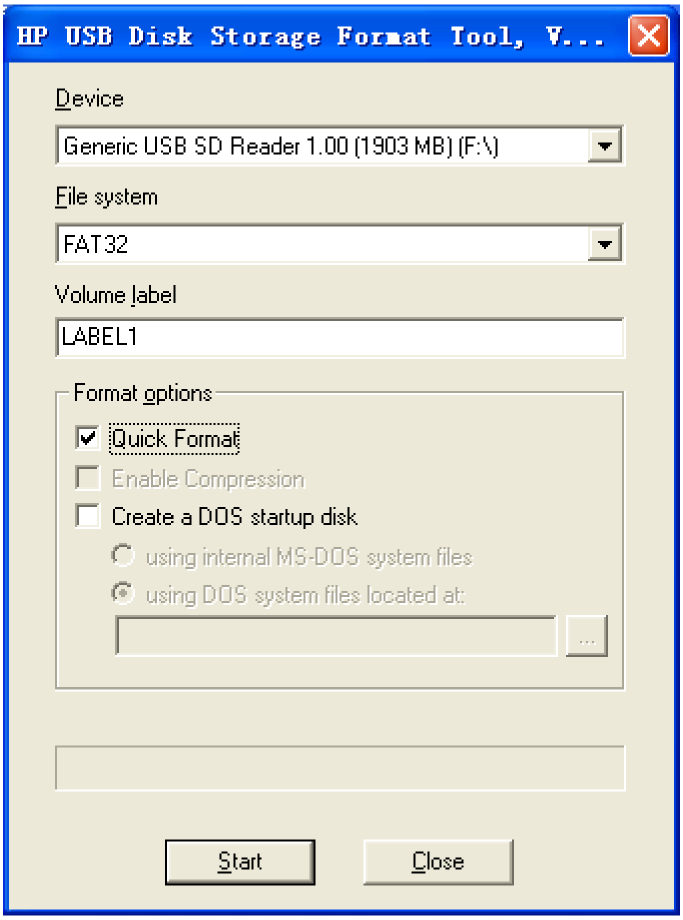
Recommend to use HP USB Disk Storage Format Tool:

The software is download from:

http://www.embedinfo.com/english/download/SP27213.exe.

1) Insert MMC/SD card into the card reader in PC

2) Open the HP USB Disk Storage Format Tool, the following tips will show:



Device: Generic USB SD Reader 1.00 (1903 MB) (F:\)

File system: FAT32

Volume label: LABEL1

Format options

☑ Quick Format

□ Enable Compression

□ Create a DOS startup disk

○ using internal MS-DOS system files

● using DOS system files located at:

Fig 3.4 Formatting tool of HP USB Disk

3) Select “FAT32”

4) Click “Start”

5) When formatting is completed, click “OK”

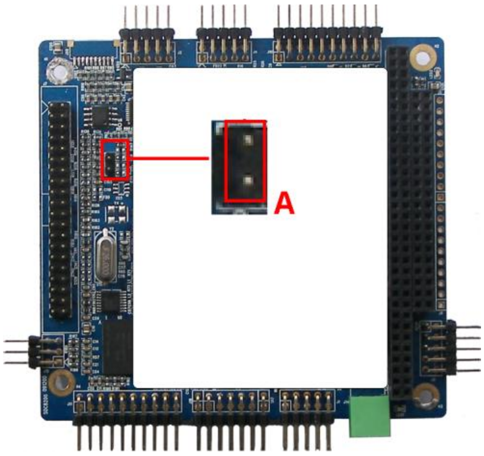
This tool will delete all partition on the SD/MMC card.

2. Preparing the SD card file
1)Copy the all the file on the directory of disk/linux/image.
2) Depending on your display device LCD (4.3inch,7inch) or VGA, rename uImage_xx as uImage

The foregoing "XX" mean your LCD inch, it is included 4.3inch, 7inch and VGA.

3.3.1.2 Update the image

1. Enter to the u-boot command
Insert the SD card to the SOC8200 board, and make sure you had connect the jumper cap on the J24 (the "A" on the following Fig)



Despite update the image for SD card or NAND Flash, it must start the image for SD card.

The users have to enter to the u-boot command line mode first:

```
40X

Texas Instruments X-Loader 1.45 (Mar 19 2010 - 16:09:58)
Starting X-loader on MMC
Reading boot sector

213544 Bytes Read from MMC
Starting OS Bootloader from MMC...
Starting OS Bootloader...
```

```
U-Boot 2009.11-svn ( 3 鏈?19 2010 - 16:14:31)

OMAP34xx/35xx-GP ES1.0, CPU-OPP2 L3-165MHz
AM3517EVM Board + LPDDR/NAND
I2C:     ready
DRAM:    256 MB
NAND:    256 MiB
In:      serial
Out:     serial
Err:     serial
Die ID #796400000000000001543b2106011005
Net:     davinci_emac_initialize
Ethernet PHY: GENERIC @ 0x00
DaVinci EMAC
Hit any key to stop autoboot:   3
```

When it starts to this here, the system will count down for 3 seconds. Then press any key, it will enter the u-boot command line mode.

2. Set U-boot parameter

Input the following in bold type in the u-boot .

Set the boot baud rate, boot from ram0 (SD card) and select the file system as ext2:

```
OMAP3517EVM # setenv bootargs console=ttyS2, 115200n8 root=/dev/ram0 rw
rootfstype=ext2 initrd=0x81600000, 40M
```

Set the image (uImage, ramdisk.gz) boot.from SD card:

```
OMAP3517EVM # setenv bootcmd ‘mmc init\; fatload mmc 0 80300000 uImage\; fatload
mmc 0 81600000 ramdisk.gz\; bootm 0x80300000’
```

Save the env and boot kernel:

```
OMAP3517EVM # saveenv
OMAP3517EVM # boot
```

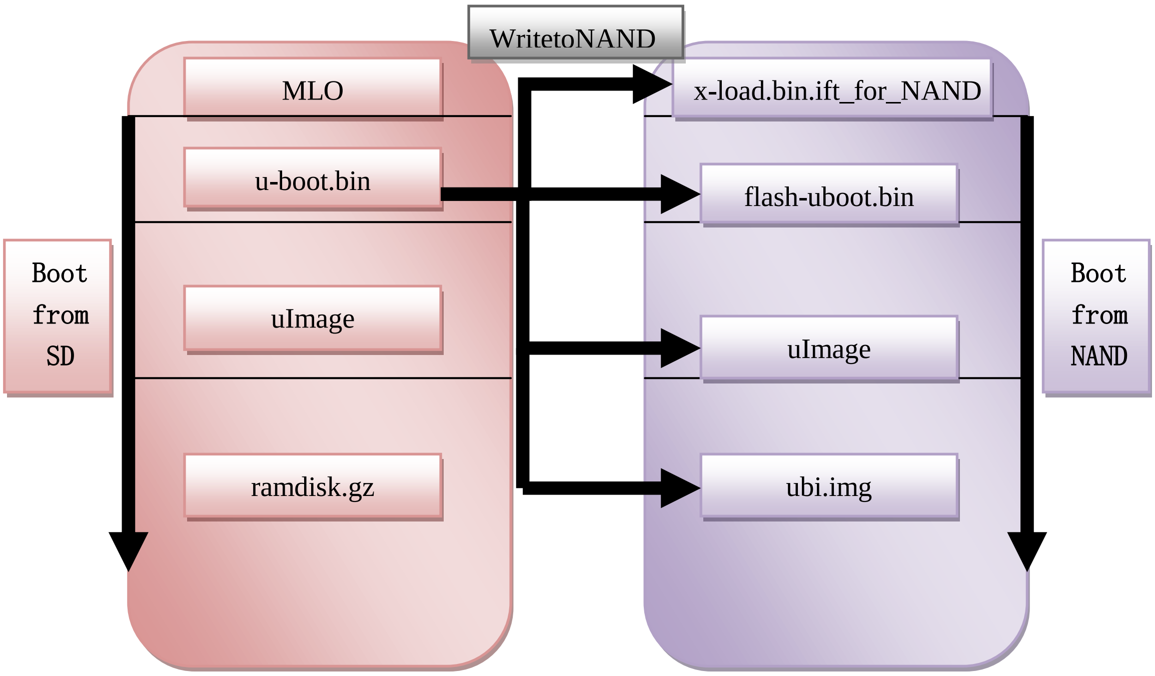
3.3.2 Update the image for NAND Flash

3.3.2.1 Prepare

Use HP USB Disk Storage Format Tool 2.0.6 software to format the SD card, copy all files from the CD linux / image / to the SD card and depending on your display device LCD (4.3,7) or VGA, rename uImage_xx To uImage

Notice：the foregoing "XX" mean your LCD inch, it is included 4.3inch, 7inch and VGA.

3.3.2.2 Update system image



Nand Flash update principle

Update the image for NAND Flash must input the commands in u-boot shell, please refer the following steps:

1、The update of x-loader boot image

Input the following commands in the u-boot shell:

Update image for SD card:

```
mmc init
fatload mmc 0 80000000 x-load.bin.ift_for_NAND
nand erase 0 80000
nandecc hw
nand write.i 80000000 0 $filesize
```

2. The update of u-boot boot image

Input the following commands in the u-boot shell:

Update image for SD card:

```
mmc init
fatload mmc 0 80000000 flash-uboot.bin
nand erase 80000 160000
nandecc sw
nand write.i 80000000 80000 $filesize
```

3. The update of kernel boot image

Input the following commands in the u-boot shell:

Update image for SD card:

```
mmc init
fatload mmc 0 80000000 uImage
nand erase 280000 300000
nandecc sw
nand write.i 80000000 280000 $filesize
```

4、The update of filesystem boot image

Input the following commands in the u-boot shell:

Update image for SD card:

```
mmc init
fatload mmc 0 81000000 ubi.img
nand erase 680000
nandecc sw
nand write.i 81000000 680000 $filesize
```

5、Modify the u-boot environment parameter

Input the following commands in the u-boot shell:

```
OMAP3517EVM # setenv bootargs console=ttyS2, 115200n8 ubi.mtd=4 root=ubi0: rootfs rootfstype=ubifs
OMAP3517EVM # setenv bootcmd nand read.i 80300000 280000 300000\; bootm 80300000
OMAP3517EVM # saveenv
```

3.4 Linux System Deveplopment

This section will introduce how to establish a Linux system development platform run on SOC8200 hardware platform with the use of SOC8200 BSP. Details to be provided contain the formation of cross compilation environment, the generation of system image and demonstrate how to customize the system.

For the SD card, After formatting and dividing into FAT and EXT3 under ubuntu system, the FAT needs reformatting under windows system, otherwise, start-up with SD card can be realized.

The Linux said thereof is ubuntu 7.10 which will be referred as ubuntu.

3.4.1.1 Install the cross compilation environment

User must well form an arm Linux cross compilation environment before developing the SOC8200. We will take ubuntu operating system as the example to introduct the formation of cross compilation environment. The operation in Linux is similar with that in ubuntu system.

Insert the CD, ubuntu will put the CD under /media/cdrom directory, and the cross compilation tool will be put under /media/cdrom/linux/tools directory.

Users can execute the following commands to start up the installation of cross compilation tool:

```
cd /media/cdrom/linux/tools
tar xvjf arm-2009q1-203-arm-none-linux-gnueabi-i686-pc-linux-gnu.tar.bz2 -C
/home/embest
```

The manual takes /home/embest as default installation directory. Users may change the path.

3.4.1.2 The installation of other tools

Other tools included in linux/tools directory of CD may be used for source code. Users can execute the following commands for installation:

```
mkdir /home/embest/tools
cp /media/cdrom/linux/tools/mkimage /home/embest/tools
cp /media/cdrom/linux/tools/signGP /home/embest/tools
cp /media/cdrom/linux/tools/mkfs.ubifs /home/embest/tools
cp /media/cdrom/linux/tools/ubinize /home/embest/tools
cp /media/cdrom/linux/tools/ ubinize.cfg /home/embest/tools
```

3.4.1.3 Adding environment variable

After installation of the above tools, those tools can be added into environment variable with the following commands:

```
export PATH=/home/embest/arm-2009q1/bin:/home/embest/tools:$PATH
```

Users can put it into the barsrc file, and the adding of environment variable can be finished as the system starts.

3.4.2 system complie

3.4.2.1 Preparation

The source code of each part of the system is under the linux/source of CD. Users can copy it to the system and unzip it before developing. For example:

```
mkdir /home/embest/work
cd /home/embest/work
tar xvf /media/cdrom/linux/source/ x-loader-03.00.00.04.tar.bz2
tar xvf /media/cdrom/linux/source/ u-boot-03.00.00.04.tar.bz2
tar xvf /media/cdrom/linux/source/ linux-03.00.00.04.tar.bz2
sudo tar xvf /media/cdrom/linux/source/rootfs.tar.bz2
```

When the above steps are finished, the current directory will generate linux-2.6.22-omap, u-boot-1.3.3 and x-load-1.41 these three directories.

3.4.2.2 x-loader image generated

DevKit8200 supports MMC/SD boot or NAND boot. The burned x-loader image files are different with the different boot modes, and the corresponding methods for mapping will differ too.

We will introduce the generation of x-loader image file under different boot modes.

1. To generate x-loader image file MLO used for SD card start-up

When the above steps are finished, the current directory will generate the file MLO we need.

```
cd x-load-03.00.00.04
make distclean
make am3517evm_config
make
signGP x-load.bin
mv x-load.bin.ift MLO
```

2. To generate the x-load.bin.ift_for_NAND start-up

1)To alter the file x-loader-1.4.1/include/configs/am3517evm.h and annotate the following:

```
vi x-loader-03.00.00.04/include/configs/am3517evm.h
//#define CONFIG_MMC                    1
```

(2)Cross compilation

```
cd x-load-1.41
make distclean
make am3517evm _config
make
signGP x-load.bin
mv x-load.bin.ift x-load.bin.ift_for_NAND
```

When the above steps are finished, the current directory will generate the file x-load.bin.ift_for_NAND we need.

3.4.2.3 u-boot image generated

```
cd u-boot-03.00.00.04/
make distclean
make am3517_evm_config
make
```

When the above steps are finished, the current directory will generate the file u-boot.bin we need.

3.4.2.4 kernel image generated

User may change linux-03.00.00.04/drivers/video/omap2/displays/
panel-sharp-lq043t1dg01.c, the default display is VGA.

```
//#define LCD_43inch        1
//#define LCD_7inch 1
#define VGA         1
```

Compilation

```
cd linux-03.00.00.04/
make distclean
cp arch/arm/configs/omap3_soc8200_defconfig .config
make
make uImage
```

When the above steps are finished, the arch/arm/boot directory will generate the file uImage we need.

3.4.2.5 ubifs image generated

```
cd /home/embest/work
sudo /home/embest/tools/mkfs.ubifs -r rootfs -m 2048 -e 129024 -c 812 -o ubifs.img
sudo /home/embest/tools/ubinize -o ubi.img -m 2048 -p 128KiB -s 512
/home/embest/tools/ubinize.cfg
```

When the above steps are finished, the current directory will generate the file ubi.img we need.

3.4.3 System Customization

Actually, Linux kernel has many options for configuring the kernel. According to the default configuration, users can add or delete some configuration to suit different need. The following example illustrates the general process of system customization.

3.4.3.1 Alteration of kernel configuration

Kernel source code provides the default configuration file:
arch/arm/configs/omap3_soc8200_defconfig
Users can customize the system on the basis of this file

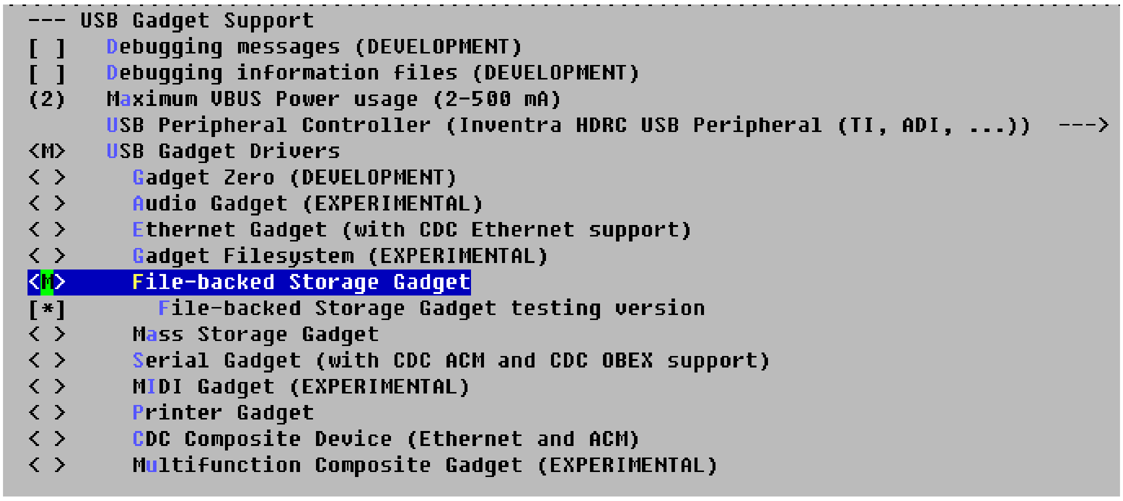
```
cd linux-03.00.00.04/
cp arch/arm/configs/omap3_soc8200_defconfig .config
make menuconfig
```

The example that we use usb gadget to simulate usb mass storage device will be taken to introduce the system customization:

1. Select Device drivers

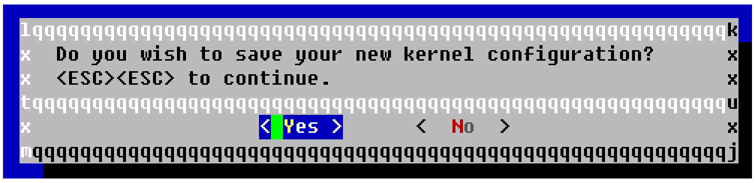
Symbol: USB_FILE_STORAGE [=m]
Prompt: File-backed Storage Gadget
Defined at drivers/usb/gadget/Kconfig:713
Depends on: <choice> && BLOCK [=y]
Location:
-> Device Drivers
-> USB support (USB_SUPPORT [=y])
-> USB Gadget Support (USB_GADGET [=y])
-> USB Gadget Drivers (<choice> [=m])

2. Select the following Fig option (File-backed Storage Gadget).



```
 --- USB Gadget Support
 [ ]   Debugging messages (DEVELOPMENT)
 [ ]   Debugging information files (DEVELOPMENT)
 (2)   Maximum VBUS Power usage (2-500 mA)
       USB Peripheral Controller (Inventra HDRC USB Peripheral (TI, ADI, ...))  --->
 <M>   USB Gadget Drivers
 < >     Gadget Zero (DEVELOPMENT)
 < >     Audio Gadget (EXPERIMENTAL)
 < >     Ethernet Gadget (with CDC Ethernet support)
 < >     Gadget Filesystem (EXPERIMENTAL)
 <M>     File-backed Storage Gadget
 [*]       File-backed Storage Gadget testing version
 < >     Mass Storage Gadget
 < >     Serial Gadget (with CDC ACM and CDC OBEX support)
 < >     MIDI Gadget (EXPERIMENTAL)
 < >     Printer Gadget
 < >     CDC Composite Device (Ethernet and ACM)
 < >     Multifunction Composite Gadget (EXPERIMENTAL)
```

3. Select the “exit” until display the following Fig.



```
lqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqk
x  Do you wish to save your new kernel configuration?              x
x  <ESC><ESC> to continue.                                         x
tqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqu
x                    < Yes >        <  No  >                       x
mqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqj
```

Select the ”Yes”.

3.4.3.2 Compilation

Save the configuration and execute the following command to recompile the kernel:

```
make
make uImage
```

After the above steps are finished, arch/arm/boot directory will generate a new kernel image uImage; drivers/usb/gadget directory will generate a new module file **g_file_storage.ko**.

3.4.3.3 Test

Update kernel image file ulmage in SD card, copy file g_file_storage.ko to the SD card and reboot the system from SD. Execute the following commands to stimulate the SOC8200 into usb mass storage device for PC’s visit:

```
root@DevKit8000:~# mount –t vfat /dev/mmcblk0p1 /mnt
root@DevKit8000:~# cd /mnt
root@DevKit8000:/mnt# insmod g_file_storage.ko file=/dev/mmcblk0p1 stall=0 removable=1
g_file_storage gadget: File-backed Storage Gadget, version: 7 August 2007
g_file_storage gadget: Number of LUNs=1
g_file_storage gadget-lun0: ro=0, file: /dev/mmcblk0p1
musb_hdrc musb_hdrc: MUSB HDRC host driver
musb_hdrc musb_hdrc: new USB bus registered, assigned bus number 2
usb usb2: configuration #1 chosen from 1 choice
hub 2-0:1.0: USB hub found
hub 2-0:1.0: 1 port detected
```

Use the USB line (USB mini B to USB A) to connect the development board and PC, PC will give a hint that usb mass storage device is found; a new mobile hard disk is found and users can perform operation for it.

⚠ Please make sure that the kernel image has been updated, otherwise, module g_file_storage.ko will fail to load and the similar tips will show:
insmod: cannot insert '/media/mmcblk0p1/g_file_storage.ko': Device or resource busy

3.4.4 The Development Of Application

This section will introduce how to conduct the development of application on the SOC8200 hardware platform, including the formation of SOC8200 software environment. Examples will be taken to show the general process of the development of SOC8200 application.

3.4.4.1 LED application development

1.Coding

Led_acc.c source code, The led lamps in the development board will flash.

```
#include <stdio.h>
#include <unistd.h>
#include <sys/types.h>
#include <sys/ipc.h>
#include <sys/ioctl.h>
#include <fcntl.h>
```

```
#define LED "/sys/class/leds/led/brightness"

int main(int argc, char *argv[])
{
        int f_led;
        unsigned char i = 0;
        unsigned char dat;
        if((f_led = open(LED, O_RDWR)) < 0){
            printf("error in open %s",LED);
            return -1;
        }

    for(;;){
            i++;
            //dat = i&0x1 ? '1':'0';
            //dat = (i&0x2)>>1 ? '1':'0';
            dat = (i&0x4)>>2 ? '1':'0';
            write(f_led, &dat, sizeof(dat));

        usleep(300000);
        }
}
```

2. Cross compilation

```
arm-none-linux-gnueabi-gcc led_acc.c -o led_acc
```

3. Download and run

Resources can be put into the SOC8200 board system in the way of SD card or U flash card or download. Then enter the directory that file led_acc exists, and input the following commands and enter, then the led_acc will run in the background.

```
./led_acc &
```

4 WinCE System

4.1 WinCE system Overview

SOC8200 software system includes: pre-compiled images and applications and their corresponding static library, dynamic link library, header file and source code; cross compilation tools, auxiliary tools for development. Images, applications, Cross compilation tools used for generating image and application can be downloaded from Microsoft. Image, application, source code and auxiliary tools of SOC8200 can be found in the release CD or SD card of SOC8200.
The SD card of SOC8200 has the following software:

- X-Loader image(MLO)
- Ethernet Bootloader(EBOOT)image(EBOOTSD.nb0)
- Windows Embedded CE 6.0 sample OS image(NK.bin)

The CD of SOC8200 includes:

- Windows Embedded CE 6.0 SOC8200 Board Support Package(BSP)source code for TI OMAP35X
- Windows Embedded CE 6.0 project for SOC8200 BSP
- SOC8200 application development example(source code)
- Auxiliary development tools

This section mainly introduces and SOC8200 software system and covers description of pre-compiled images and BSP and test kit, some functions and features of various images and applications in the CD.

4.1.1 Pre-compiled image

The pre-compiled images include boot image X-Loader and EBOOT and sample OS image.
X-Loader is a first level bootloader. After the start-up of system, the ROM inside the CPU will copy the x-loader to internal RAM and perform work. Its main function is to initialize the CPU, and copy EBOOT to DDR memory and execute EBOOT. EBOOT is a second level bootloader, by default, it will copy system image to DDR memory and hand the control right to the operating system. EBOOT also can provide related functions to manage the basic hardware and set the shared data in operating system.
Windows Embedded CE 6.0 provide multimedia module, industry module, PDA module, mobile module and micro kernel module, user can choose the module that they want.Taking Mobile Handheld as an example, the pre-compiled images support the following:

Image	**Feature**
X-Loader	To boot EBOOT
EBOOT	To boot the operating system from the network (network card or RNDIS)
	To boot the operating system with SD card
	To boot the operating system from the NAND Flash
Demonstrated operating system	Windows Explorer
	Console Window
	CAB File Installer/Uninstaller
	Internet Explorer 6.0
	ActiveSync
	Power Management (Full)
	.NET Compact Framework 3.5
	Hive-based Registry
	RAM and ROM File System
	Device Drivers

4.1.2 Board Support Package (BSP)

SOC8200 BSP is used to customize the boot image and Windows Embedded CE 6.0 OS image run on SOC8200 hardware platform. It supports the following:

Module	**Feature**
X-Loader module	NAND
	ONENAND
	SD
EBOOT module	NAND
	ONENAND
	SD
OAL module	ILT
	REBOOT
	Watchdog
	RTC
KITL module	RNDIS KITL
Driver module	NLED driver
	GPIO/I2C/SPI/MCBSP driver
	Series port driver
	6X6 keyboard driver
	Audio driver
	NAND(K9F1G08)driver
	Display driver(LCD/DVI. S end/TV)/ TOUCH driver

	SD/MMC/SDIO driver
	DM9000 network card driver
	USB OTG driver
	USB EHCI driver
	VRFB driver
	DSPLINKK/CMEMK driver
	GPIO keyboard driver
	PWM(TPS65930)driver
	ADC(TPS65930)driver
	ONENAND driver
	SMSC911X network card driver
	CAN driver
	Buzzer drive
Power management module	Backlight driver
	Battery driver
	Sleep / wake-up button driver
	Expansion of power management
Application module	Flash Plug-in and Flash player
	MP3/MPEG4/H264 DSP Hardware decoder
	BSPINFO(control panel)
	CETK

4.2 WinCE system quick start

4.2.1 system boot

⚠

When you boot the board and operate the system, you may use the terminal, Please open PC Window Hyper terminal software and set the following:

- Baud rate: 115200
- Data bit: 8
- Parity check: no
- Stop bit: 1
- Flow control: no

4.2.1.1 Boot from Nand Flash

NAND Flash system in the renewal of the reference image methods, please refer to 【 4.4.2 Update the image for NAND Flash 】.

4.2.1.2 Boot from SD card

Copy image files **MLO、EBOOTSD.nb0、NK.bin** From CD:\WinCE\image\ VGA_1024x768(lcd_800x480 or lcd_480x272)\SD directory to SD card.

If users need to switch to SD card, need to start in SOC8200 J24 connected to the motherboard jump line on cap, electric start, the system immediately instead from MMC/SD start.

the method to update the image from the SD card will be show in 【4.4.1 Update the image for SD card】

4.3 WINCE System Development

4.3.1 Development environment building

4.3.1.1 Install the cross compilation environment

Based on the development of the SOC8200 involves two aspects: the bottom SOC8200 is based on the hardware configuration and the development of Windows CE 6.0 operating system; Embedded security The upper is developed on the basis of the operating system application. Two levels of Windows CE 6.0 development are Embedded security must be based on Visual Studio 2005 (VS2005) integrated development environment.

Developing applications need installing software and updating:

- Visual Studio 2005
- Visual Studio 2005 SP1
- Visual Studio 2005 SP1 Update for Vista (if applicable)
- ActiveSync 4.5

The development of Windows Embedded CE 6.0 requires sequential installation of software and updating:

- Visual Studio 2005
- Visual Studio 2005 SP1
- Visual Studio 2005 SP1 Update for Vista (if applicable)
- Windows Embedded CE 6.0 Platform Builder
- Windows Embedded CE 6.0 SP1
- Windows Embedded CE 6.0 R2
- Windows Embedded CE 6.0 Product Update Rollup 12/31/2008

If there is an old CE development environment in the system, the use of Windows Embedded CE 6.0 development platform may be influenced. Uninstalling the old one and then installing the new one is recommended.

Please refer to appendix part, determine the of all kinds of resources get streams of information;

All of these software or component system since there are dependent relationship with Suggestions listed in strict accordance with the installation, and installed in order default path.

4.3.2 system complie

If the sample Windows Embedded CE 6.0 OS image in the CD of SOC8200 satisfies your applications, you just need to add it into your application and get the authorization of Microsoft Corporation. Otherwise, you will need to re-customize the system and rebuild the image. This section describes how to use SOC8200 Board Support Package (BSP) to create the Windows Embedded CE 6.0 system image run on SOC8200 hardware platform.

4.3.2.1 Preparation

Embest Info&Tech Co.,LTD., has completed in SOC8200 hardware platform driver and the related resources integration, so the user is in use in SOC8200 customize Windows CE 6.0 system, Embedded security before has need of the following preparation:
Decompress [SOC8200\WinCE\BSP\AM35x_BSP.rar] to obtain AM35x_BSP directory.
Decompress [SOC8200\WinCE\BSP\COMMON_TI_V1.rar] to obtain COMMON_TI_V1 directory.
Decompress [SOC8200\WinCE\BSP\AM35x_OSDesign.rar] to obtain AM35x_OSDesign directory.

- Copy Decompress directory [SOC8200\WinCE\BSP\AM35x_BSP] to [C:\WINCE600\PLATFORM] directory。
- Copy Decompress directory [SOC8200\WinCE\BSP\AM35x_OSDesign] to [C:\WINCE600\OSDesigns] directory。
- Copy Decompress directory [SOC8200\WinCE\BSP\COMMON_TI_V1] to [C:\WINCE600\PLATFORM\COMMON\SRC\SOC\] directory。

C:\WINCE600\OSDesigns OSDesigns need to establish the folder.

For the 4.3” LCD
Modify C:\wince600\platform\am35x_bsp\src\bsp_common\display\Lcd_cfg.h

```
//-------------------------------------------
//#define lcd_7inch    1
#define lcd_43inch    1
//#define lcd_vga_1024x768    1
//--------------------------------------------
```

For the 7” LCD

Modify C:\wince600\platform\am35x_bsp\src\bsp_common\display\Lcd_cfg.h

```
//-------------------------------------------
#define lcd_7inch    1
//#define lcd_43inch    1
//#define lcd_vga_1024x768    1
//--------------------------------------------
```

For the VGA

Modify C:\wince600\platform\am35x_bsp\src\bsp_common\display\Lcd_cfg.h

```
//-------------------------------------------
//#define lcd_7inch      1
//#define lcd_43inch      1
#define lcd_vga_1024x768      1
//--------------------------------------------
```

If user needs to use SOC8200 BS to develop Windows Embedded CE 6.0 operating system, the construction of Windows Embedded CE 6.0 development platform is required.

This manual takes the default installation path for Windows Embedded CE 6.0 software, i.e. its default path is [C:\WINCE600].

4.3.2.2 System Complie

1. Open the file SOC8200 .sln[C:\WINCE600\OSDesigns\SOC8200] or take the following steps to create a new project:
   - Open Visual Studio 2005.
   - Select the menu: File [New->Project].
   - Select template type of Platform Builder for CE 6.0
   - Select a file name and open Windows Embedded CE 6.0 OS Design Wizard
   - Set the Embest SOC8200 BSP into the BSP list.
   - Continue to finish the Wizard.
2. Select submenu [Build-> Global Build Settings]
   - Copy Files to Release Directory After Build
   - Make Run-Time Image After build
3. If KITL is needed, set Enable Kernel Debugger and Enable KITL into Build Options page [Project-> Properties].
4. Select [Build-> Build Solution] to build BSP. These operations cover the whole compilation including sysgen operating system’s components. After a entire compilation process is completed, the build commands under Solution Explorer window can be used to save the build time.
5. Images including NK.bin, EBOOTSD.nb0 and MLO and so on will be generate; Copy the files MLO, EBOOTSD.nb0 and NK.bin under [C:\WINCE600\OSDesigns\SOC8200\SOC8200\RelDir\SOC8200_ARMV4I_Release] to the SD card. Insert the SD card into the device and boot the device for a test.

⚠ In the system in the process of compiling, the user should be in the "solution" choice "in the box with AM35x_BSP_ARMV4I_Release".

4.3.2.3 System Customization

Windows Embedded CE 6.0 consists of a number of independent modules. Each module provides specific functions, of which some modules can be divided into several components. Each component has specific feature, making OEM/ODM customize a stable and efficient version according to specific application.

Taking Mobile Handheld as a template, sample SOC8200 OS image adds features of components including:

Component	**Path**
CAB File Installer/Uninstaller	Core OS->CEBASE->Application – End User
.NET Compact Framework 3.5	Core OS->CEBASE->Applications and Services Development->.NET Compact Framework 3.5
OS Dependencies for .NET Compact Framework 3.5	Core OS->CEBASE->Applications and Services Development->.NET Compact Framework 3.5-> OS Dependencies for .NET Compact Framework 3.5
Point-to-Point Protocol over Ethernet (PPPoE)	Core OS->CEBASE->Communication Services and Networking->Networking – Wide Area Network (WAN)
USB Function Driver	Core OS->CEBASE->Core OS Services->USB Host Support
USB Host Support	Core OS->CEBASE->Core OS Services->USB Host Support
USB Human Input Device (HID) Class Driver	Core OS->CEBASE->Core OS Services->USB Host Support
USB HID Keyboard and Mouse	Core OS->CEBASE->Core OS Services->USB Host Support-> USB Human Input Device (HID) Class Driver
USB Storage Class Driver	Core OS->CEBASE->Core OS Services->USB Host Support
RAM and ROM File System	Core OS->CEBASE->File Systems and Data Store->File System – Internal (Choose 1)
Hive-based Registry	Core OS->CEBASE->File Systems and Data Store->Registry Storage – Internal (Choose 1)
exFAT File System	Core OS->CEBASE->File Systems and Data Store->Storage Manager
FAT File System	Core OS->CEBASE->File Systems and Data

	Store->Storage Manager
Storage Manager Control Panel Applet	Core OS->CEBASE->File Systems and Data Store->Storage Manager
Transaction-Safe FAT File System (TFAT)	Core OS->CEBASE->File Systems and Data Store->Storage Manager
Video/Image Compression Manager	Core OS->CEBASE->Graphics and Multimedia Technologies->Media->Video Codecs and Renderers
Console Window	Core OS->CEBASE->Shell and User Interface->Shell->Command Shell
SD Memory	Device Drivers->SDIO->SDIO Memory
serial	Device Drivers->USB Function->USB Function Clients
Windows Embedded CE Test Kit	Device Drivers

Components can be added or deleted in window Catalog Items View of Visual Studio 2005(VS2005) integrated development environment.

4.4 WinCE image update

4.4.1 Update the image for SD card

4.4.1.1 Prepare

Run the software of HP Disk Storage Format Tool and format the SD card for FAT or FAT32 filesystem.

4.4.1.2 Image update

Copy CD directory WinCE_6\Image\VGA_1024X768(lcd_800x480 or lcd_480x272)\SDdirectory file **MLO**、**EBOOTSD.nb0**、**NK.bin** to SD card.

⚠

1) You can download the software HP USB Disk Storage Format Tool 2.0.6 from the follow website: http://www.embedinfo.com/english/download/SP27213.exe

2) Directory VGA_1024x768 VGA output 1280 X768 resolution corresponding to the screen, lcd_800x480 corresponding output 800 x480 resolution LCD screen and lcd_480x272 output 480 X272 resolution corresponding LCD screen.

4.4.2 Update the image for NAND Flash

4.4.2.1 Prepare

(1)Run the software of HP Disk Storage Format Tool and format the SD card for FAT or FAT32 filesystem.

(2) Copy the image file

MLO
XLDRNAND.nb0
EBOOTSD.nb0
NK.bin
from CD:\winCE\image\ VGA_1024x768(lcd_800x480或lcd_480x272)\NAND directory to SD card.

4.4.2.2 Image update

(1) In SOC8200 J24 connected to the motherboard jump line, the position of the cap J24 10.1.2 have introduced in. Insert SD card restart your system. HyperTerminal will start printing the output information, at the same time press [SPACE] to enter the EBOOT menu.
(2) Press [5] to enter the Flash manage menu.
(3) Press [a], [b], [c] separately to write the image (XLDR, EBOOT, NK) to flash.
(4) Press [0] to return to the main menu, and press [2], [4], [7], [y] to change the boot device.
(5) SD card out.Power on the system again, and then the board will boot from the NAND flash.

4.5 The development of application

This section introduces how to develop the application run on SOC8200 hardware platform on the basis of Windows Embedded CE 6.0 operating system. The following preparations should be made:

1. If user needs to use SOC8200 BS to develop Windows Embedded CE 6 operating system, the construction of Windows Embedded CE 6.0 development platform is required.
2. The installation of Windows Mobile 6 Professional SDK is advised. You can obtain this software through [http://www.microsoft.com/downloads/details.aspx?familyid=06111A3A-A651-4745-88EF-3D48091A390B&displaylang=en].
3. The development example of this manual is based on the development of Windows Mobile 6 Professional SDK.

4.5.1 The interface and demonstration of application

The Application Programming Interface (API) used by SOC8200 application development employs the standard application interface of Windows Embedded CE 6.0. SOC8200 just has an additional GPIO interface based on standard API.

1. For interface definition of Windows Embedded CE 6.0 standard application, please refer to related help documents of MSDN Windows Embedded CE 6.0 API.
2. The example of the use of standard API is provided in the section of 7.2. The development demonstration of interface application.
3. Some interfaces are just used for drivers. They can't be used by the application programmer.

4.5.1.1The definition and demonstration of GPIO interface

GPIO device name L"GIO1:" to expand DeviceIoControl interface definition, corresponding IOCTL code includes:

IOCTL Code	Description
IOCTL_GPIO_SETBIT	Set GPIO pin as 1
IOCTL_GPIO_CLRBIT	Set GPIO pin as 0
IOCTL_GPIO_GETBIT	Read GPIO pin
IOCTL_GPIO_SETMODE	Set the working mode of GPIO pin
IOCTL_GPIO_GETMODE	Read the working mode of GPIO pin
IOCTL_GPIO_GETIRQ	Read the corresponding IRQ of GPIO pin

Operation example is showed below:

1. Open GPIO device

```
    HANDLE hFile = CreateFile(_T("GIO1:"), (GENERIC_READ|GENERIC_WRITE),
(FILE_SHARE_READ|FILE_SHARE_WRITE), 0, OPEN_EXISTING, 0, 0);
```

2. Set/read the working mode of GPIO

```
    DWORD id = 0, mode = 0;
```

Set the working mode of GPIO:

```
    DWORD pInBuffer[2];
    pInBuffer[0] = id;
    pInBuffer[1] = mode;
    DeviceIoControl(hFile, IOCTL_GPIO_SETMODE, pInBuffer, sizeof(pInBuffer), NULL, 0, NULL, NULL);
```

Read the working mode of GPIO:

```
    DeviceIoControl(hFile, IOCTL_GPIO_GETMODE, &id, sizeof(DWORD), &mode, sizeof(DWORD),
NULL, NULL);
```

"id" is GPIO Pin number, "mode" is GPIO mode, including:

Mode definition	Description
GPIO_DIR_OUTPUT	Output mode

GPIO_DIR_INPUT	Input mode
GPIO_INT_LOW_HIGH	Rising edge trigger mode
GPIO_INT_HIGH_LOW	Falling edge trigger mode
GPIO_INT_LOW	low level trigger mode
GPIO_INT_HIGH	high level trigger mode
GPIO_DEBOUNCE_ENABLE	Jumping trigger enable

3. The operation of GPIO Pin

```
    DWORD id = 0, pin = 0;
```

Output high level:

```
    DeviceIoControl(hFile, IOCTL_GPIO_SETBIT, &id, sizeof(DWORD), NULL, 0, NULL, NULL);
```

Output low level:

```
    DeviceIoControl(hFile, IOCTL_GPIO_CLRBIT, &id, sizeof(DWORD), NULL, 0, NULL, NULL);
```

Read the pin state

```
    DeviceIoControl(hFile, IOCTL_GPIO_GETBIT, &id, sizeof(DWORD), &pin, sizeof(DWORD), NULL, NULL);
```

"id" is GPIO pin number, "pin" returns to pin state

4. Other optional operation

Read the corresponding IRQ number of GPIO pin

```
    DWORD id = 0, irq = 0;
    DeviceIoControl(hFile, IOCTL_GPIO_GETIRQ, &id, sizeof(DWORD), &irq, sizeof(DWORD), NULL, NULL);
```

"id" is GPIO pin number, "irq" returns IRQ number

5. Close GPIO device

```
    CloseHandle(hFile);
```

⚠

1. GPIO pin definition: 0~191 MPU Bank1~6 GPIO pin, 192~209 TPS65930 GPIO 0~17.

2. GPIO interrupt mode is used for drivers, application cannot set this mode.

3. For definition of IOCTL code and GPIO mode, please refer to CD file [\wince_6\inc\gpio.h] User should include the header file.

Appendix

Appendix I Dimension

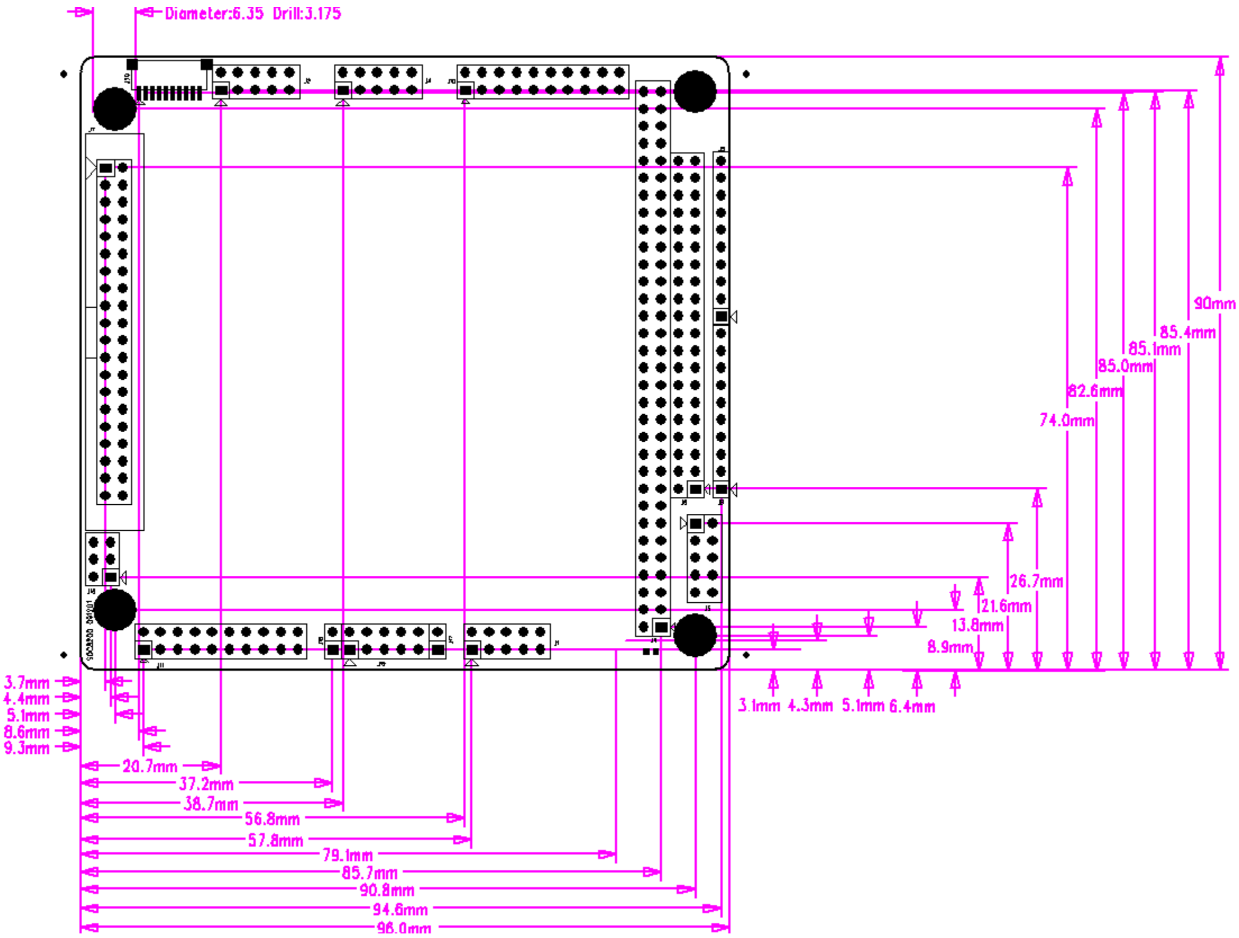
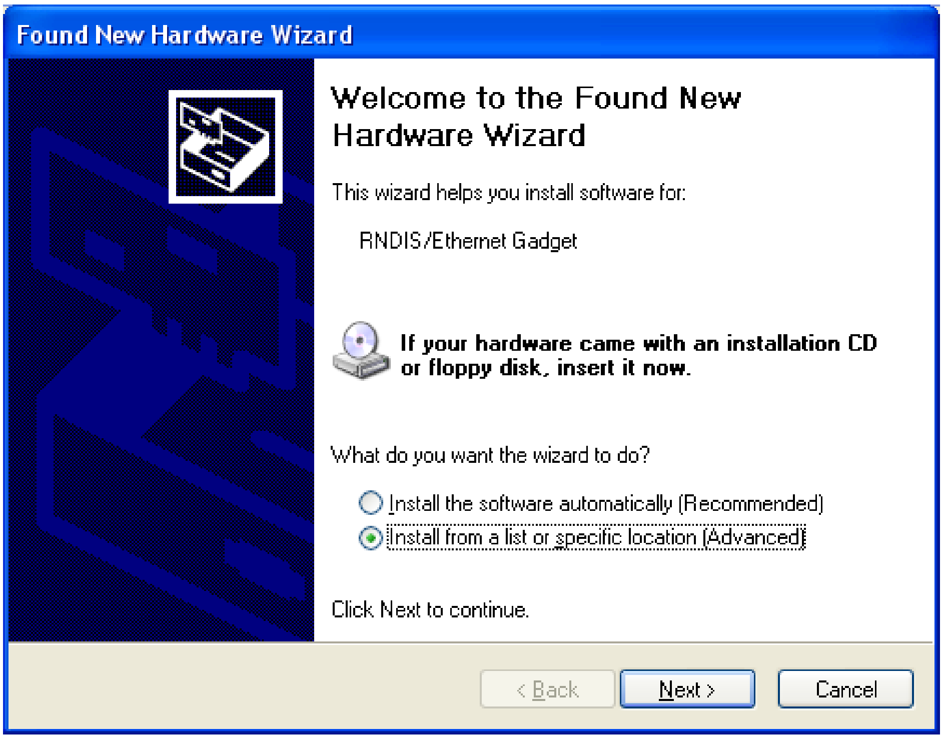


Fig 2.2 Dimension Drawing

Appendix II Driver installation of Linux USB Ethernet/RNDIS Gadget

1. If you don't install driver of Linux USB Ethernet/RNDIS Gadget, PC will find the new hardware and give you a hint on the screen, please select "From list or designated location", then click "Next"



Welcome to the Found New Hardware Wizard

This wizard helps you install software for:

RNDIS/Ethernet Gadget

If your hardware came with an installation CD or floppy disk, insert it now.

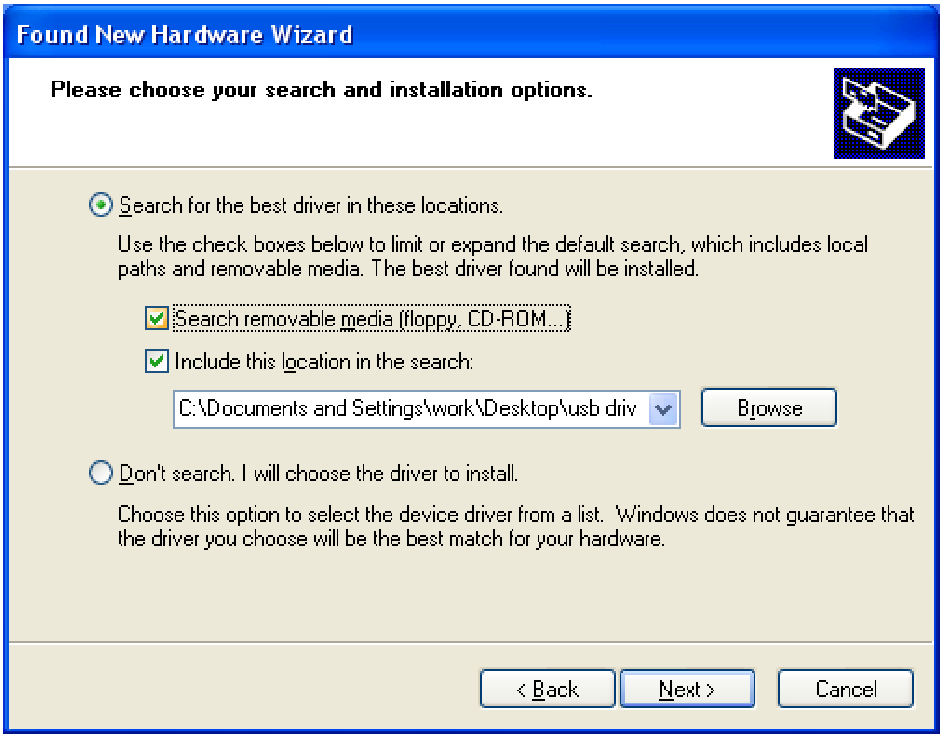
What do you want the wizard to do?

○ Install the software automatically (Recommended)

● Install from a list or specific location (Advanced)

Click Next to continue.

2. Designate a path for the usb driver, and the usb driver directory is [disk\linux\tools], then click "Next"


Found New Hardware Wizard

Please choose your search and installation options.

● Search for the best driver in these locations.

Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.

☑ Search removable media (floppy, CD-ROM...)

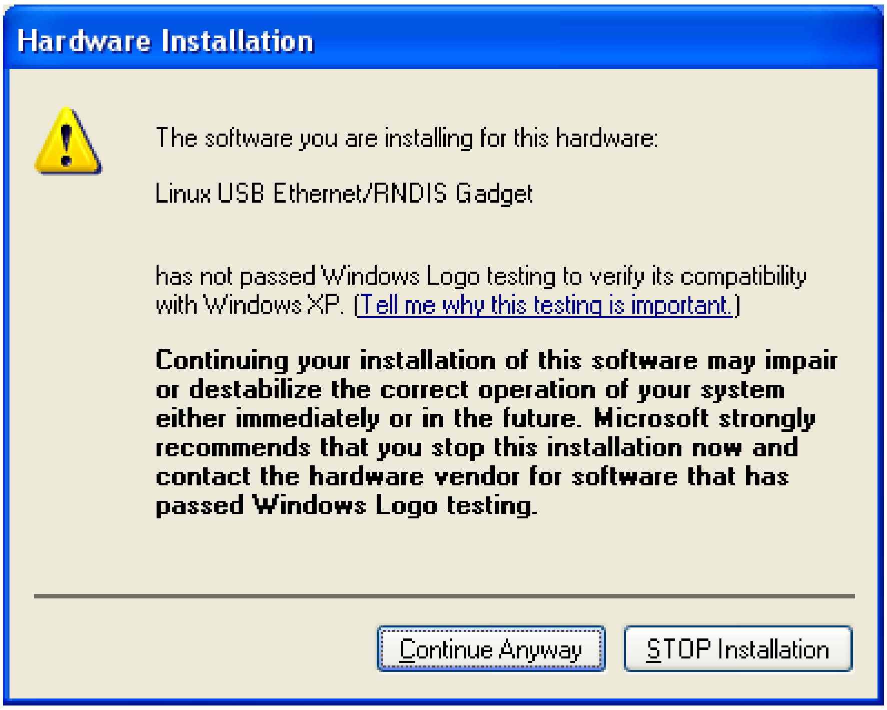
☑ Include this location in the search:

C:\Documents and Settings\work\Desktop\usb driv

○ Don't search. I will choose the driver to install.

Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.

3. When the following appears, select "Continue"


Hardware Installation

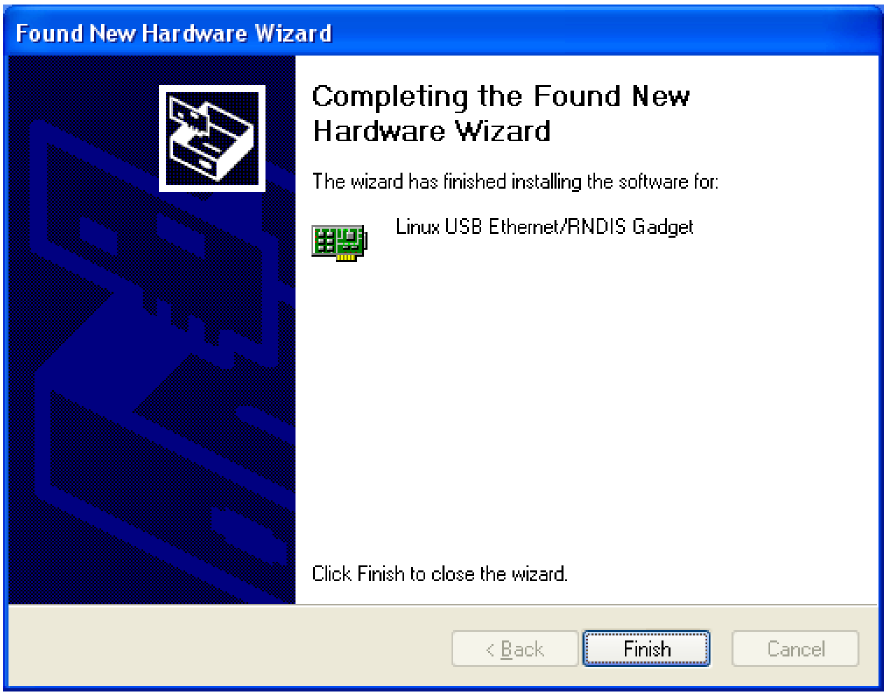
The software you are installing for this hardware:

Linux USB Ethernet/RNDIS Gadget

has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)

Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.

4. Please wait until the installation is completed



Completing the Found New Hardware Wizard

The wizard has finished installing the software for:

Linux USB Ethernet/RNDIS Gadget

Click Finish to close the wizard.

Appendix III Linux Boot Disk Format

How to create a dual-partition card for SOC8200 to boot Linux from first partition and have root file system at second partition.

一、Introduction

This guide is meant for those looking to create a **dual-partition** card, booting from a FAT partition that can be read by the OMAP3 ROM bootloader and Linux/Windows, then utilizing an ext3 partition for the Linux root file system.

二、Details

Text marked with [] shows user input.

1、Determine which device the SD Card Reader is on your system

Plug the SD Card into the SD Card Reader and then plug the SD Card Reader into your system. After doing that, do the following to determine which device it is on your system.

```
$ [dmesg | tail]
...
[ 6854.215650] sd 7:0:0:0: [sdc] Mode Sense: 0b 00 00 08
    [ 6854.215653] sd 7:0:0:0: [sdc] Assuming drive cache: write through
[ 6854.215659] sdc: sdc1
[ 6854.218079] sd 7:0:0:0: [sdc] Attached SCSI removable disk
[ 6854.218135] sd 7:0:0:0: Attached scsi generic sg2 type 0
...
```

In this case, it shows up as /dev/sdc (note sdc inside the square brackets above).

2、Check to see if the automounter has mounted the SD Card

Note there may be more than one partition (only one shown in the example below).

```
$ [df -h]
Filesystem            Size Used Avail Use% Mounted on
...
/dev/sdc1             400M 94M 307M 24%   /media/disk
...
```

Note the "Mounted on" field in the above and use that name in the umount commands below.

3、If so, unmount it

```
$ [umount /media/disk]
```

4、Start fdisk

Be sure to choose the whole device (/dev/sdc), not a single partition (/dev/sdc1).

```
$ [sudo fdisk /dev/sdc]
```

5、Print the partition record

So you know your starting point. **Make sure to write down the number of bytes on the card (in this example, 2021654528).**

```
Command (m for help): [p]

Disk /dev/sdc: 2021 MB, 2021654528 bytes
255 heads, 63 sectors/track, 245 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
   Device Boot       Start           End       Blocks Id System
/dev/sdc1     *                1            246       1974240 + c W95 FAT32 (LBA)
Partition 1 has different physical/logical endings:
     Phys = (244, 254, 63) logical = (245, 200, 19)
```

6、Delete any partitions that are there already

```
Command (m for help): [d]
Selected partition 1
```

7、Set the Geometry of the SD Card

If the print out above does not show 255 heads, 63 sectors/track, then do the following expert mode steps to redo the SD Card:

1）、Go into expert mode.

```
Command (m for help): [x]
```

2）、Set the number of heads to 255.

```
Expert Command (m for help): [h]
Number of heads (1-256, default xxx): [255]
```

3）Set the number of sectors to 63.

```
Expert Command (m for help): [s]
Number of sectors (1-63, default xxx): [63]
```

4）Now Calculate the number of Cylinders for your SD Card.

```
#cylinders = FLOOR (the number of Bytes on the SD Card (from above) / 255 / 63 / 512 )

So for this example:   2021654528 / 255 / 63 / 512 = 245.79.   So we use 245 (i.e. truncate, don't
round).
```

5）Set the number of cylinders to the number calculated.

```
Expert Command (m for help): [c]
Number of cylinders (1-256, default xxx): [enter the number you calculated]
```

6）Return to Normal mode.

```
Expert Command (m for help): [r]
```

8、Print the partition record to check your work

```
Command (m for help): [p]

Disk /dev/sdc: 2021 MB, 2021654528 bytes
255 heads, 63 sectors/track, 245 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
```

9、Create the FAT32 partition for booting and transferring files from Windows

```
Command (m for help): [n]
Command action
   e   extended
   p   primary partition (1-4)
[p]
Partition number (1-4): [1]
First cylinder (1-245, default 1): [(press Enter)]
Using default value 1
Last cylinder or +size or +sizeM or +sizeK (1-61, default 61): [+5]

Command (m for help): [t]
Selected partition 1
Hex code (type L to list codes): [c]
Changed system type of partition 1 to c (W95 FAT32 (LBA))
```

10、Mark it as bootable

```
Command (m for help): [a]
Partition number (1-4): [1]
```

11、Create the Linux partition for the root file system

```
Command (m for help): [n]
Command action
   e   extended
   p   primary partition (1-4)
[p]
Partition number (1-4): [2]
First cylinder (7-61, default 7): [(press Enter)]
Using default value 52
Last cylinder or +size or +sizeM or +sizeK (7-61, default 61): [(press Enter)]
Using default value 245
```

12、Print to Check Your Work

```
Command (m for help): [p]
```

```
Disk /dev/sdc: 2021 MB, 2021654528 bytes
255 heads, 63 sectors/track, 245 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id   System
/dev/sdc1   *           1           6      409626    c   W95 FAT32 (LBA)
/dev/sdc2               7          61     1558305   83   Linux
```

13、Save the new partition records on the SD Card

This is an important step. All the work up to now has been temporary.

```
Command (m for help): [w]
The partition table has been altered!

Calling ioctl () to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.
The kernel still uses the old table.
The new table will be used at the next reboot.

WARNING: If you have created or modified any DOS 6.x
partitions, please see the fdisk manual page for additional
information.
Syncing disks.
```

14、Format the partitions

The two partitions are given the volume names LABEL1 and LABEL2 by these commands. You can substitute your own volume labels.

```
$ [sudo mkfs.msdos -F 32 /dev/sdc1 -n LABEL1]
mkfs.msdos 2.11 (12 Mar 2005)

$ [sudo mkfs.ext3 -L LABEL2 /dev/sdc2]
mke2fs 1.40-WIP (14-Nov-2006)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
195072 inodes, 389576 blocks
19478 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=402653184
12 block groups
32768 blocks per group, 32768 fragments per group
16256 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912

Writing inode tables: done
Creating journal (8192 blocks): done
Writing superblocks and filesystem accounting information:
```

⚠ In ubuntu is formatted good FAT and EXT3 double division, FAT division in window to need to format a, otherwise it may appear not SD card from the start

Appendix IV TFTP Server Build

1, installation client

```
$>sudo apt-get install tftp-hpa
$>sudo apt-get install tftpd-hpa
```

2, installation inet

```
$>sudo apt-get install xinetd
$>sudo apt-get install netkit-inetd
```

3, server configuration

First of all, in the root directory, and build a tftpboot attribute to any user both:

```
$>cd /
$>sudo mkdir tftpboot
$>sudo chmod 777 tftpboot
```

Secondly, in the/etc/inetd conf. Add:

```
$>sudo    vi    /etc/inetd.conf    //Put the following statement added this file
tftpd dgram udp wait root /usr/sbin/in.tftpd /usr/sbin/in.tftpd –s /tftpboot
```

And then, inetd reload process:

```
$>sudo /etc/init.d/inetd reload
```

Finally, into the directory/etc/xinetd.d/, and in which the new document, the content of the TFTP designated to join TFTP file:

```
$>cd /etc/xinetd.d/              // Into the directory /etc/xinetd.d/
$>sudo touch tftp                //New document tftp
$>sudo vi tftp
//Edit documents TFTP, Put the following content to join TFTP file
service tftp{
        disable = no
        socket_type      = dgram
        protocol           = udp
        wait                   = yes
        user                   = root
        server                = /usr/sbin/in.tftpd
        server_args       = -s /tftpboot -c
        per_source         = 11
        cps                        = 1002
}
```

4, restart service:

```
$>sudo /etc/init.d/xinetd restart
$>sudo in.tftpd -l /tftpboot
```

5, test server

Test in/tftpboot folder, establish a new file

```
$>touch abc
```

Entering another folder

```
$>tftp 192.168.1.15    (192.168.1.15 For the machine IP)
$>tftp> get abc
```

If you can download instructions server has been installed success.

Appendix V WinCE related resources links

1. Visual Studio 2005 SP1 Update for Vista (if applicable)

http://download.microsoft.com/download/c/7/d/c7d9b927-f4e6-4ab2-8399-79a2d5cdfac9/VS80sp1-KB932232-X86-ENU.exe

2. Windows Embedded CE 6.0 Platform Builder Service Pack 1

http://www.microsoft.com/downloads/details.aspx?familyid=BF0DC0E3-8575-4860-A8E3-290ADF242678&displaylang=en

3. Windows Embedded CE 6.0 R2

http://www.microsoft.com/downloads/details.aspx?FamilyID=f41fc7c1-f0f4-4fd6-9366-b61e0ab59565&displaylang=en

4. Windows Embedded CE 6.0 R3

http://download.microsoft.com/download/F/5/2/F5296720-250A-4055-991C-0CEA5DE11436/CE6R3.iso

5. WinCEPB60-091231-Product-Update-Rollup-Armv4I.msi

http://download.microsoft.com/download/E/D/7/ED779010-1B2E-4ACA-BF9F-9F1D0EF8052B/WinCEPB60-091231-Product-Update-Rollup-Armv4I.msi

6. Viewers for Windows Embedded CE 6.0 R3

http://download.microsoft.com/download/3/3/8/3383B6CE-F70A-4A2C-873A-8C67D3CF55F6/WesttekFileViewers6.exe

7. Windows Mobile 6 Professional SDK Refresh.msi

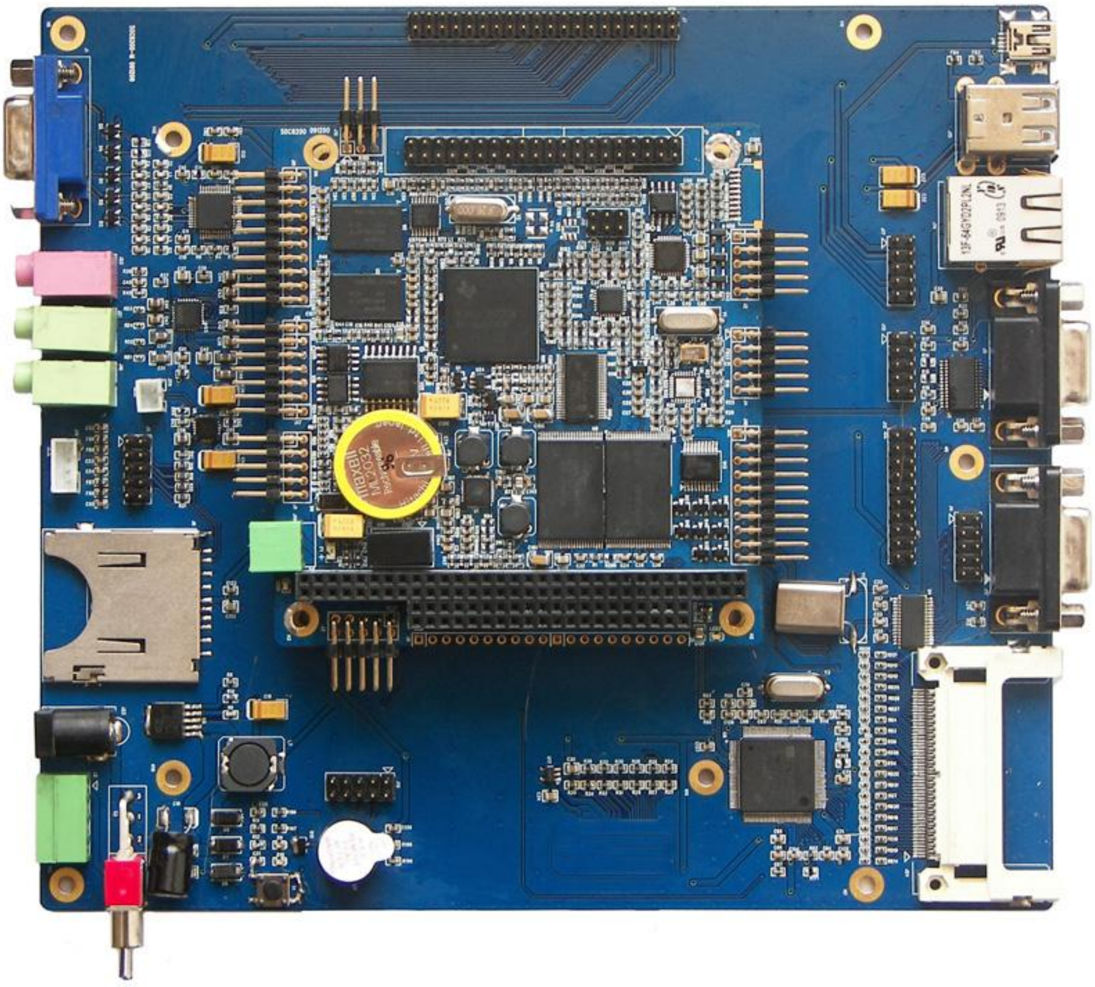
http://download.microsoft.com/download/f/2/3/f232f773-7edc-4300-be07-d3b76a5b3a91/Windows%20Mobile%206%20Professional%20SDK%20Refresh.msi

8. Windows Embedded CE 6.0 USB Camera Driver.msi

http://download.microsoft.com/download/f/a/1/fa1aaef1-6ae3-4cf3-ab95-b01d3e428403/Windows%20Embedded%20CE%206.0%20USB%20Camera%20Driver.msi

Appendix VI Expansion Board

The customer can evaluate the AM3517 via SOC8200 expansion board(SOC8200-M), to experience the AM3517 processor. The customer can use **single board computer** and **function Interface board** to add the product functions, thus reducing product development cycles, achieve faster time to market.



SOC8200-M evaluation suite

Expand floor resources:

Audio/video interface:

·the audio input interface

·stereo audio output interface

·15 PIN standard VGA interface

·Buzzer, output

Transport interface:

·1 road, 5 lines serial connectors, RS232 level, DB9 male head

·1 road, 9 line, RS232 serial port level, DB9 male head

·1 road, 9 line, TTL level, serial port 2 * 5 (2.54 mm) row needles interface

·2 road, USB 2.0 HOST connectors, High-school, 480 Mbps

·1 road, USB 2.0 Device connectors, High-school, 480 Mbps

·1 road, 10/100 Ethernet interface, RJ45 connector (with transformer and LED lights)

·10 bit Camera interface

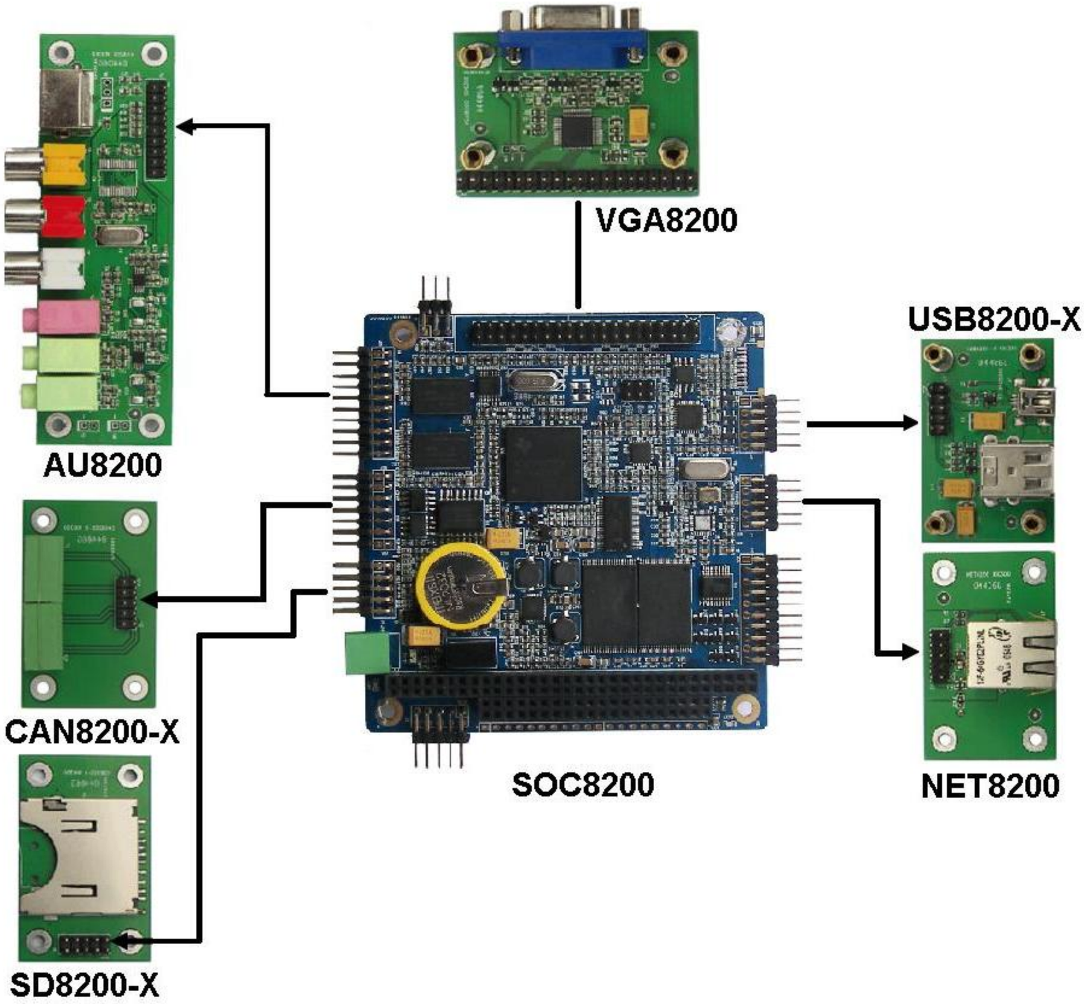
·Reset button,

·CF card interface

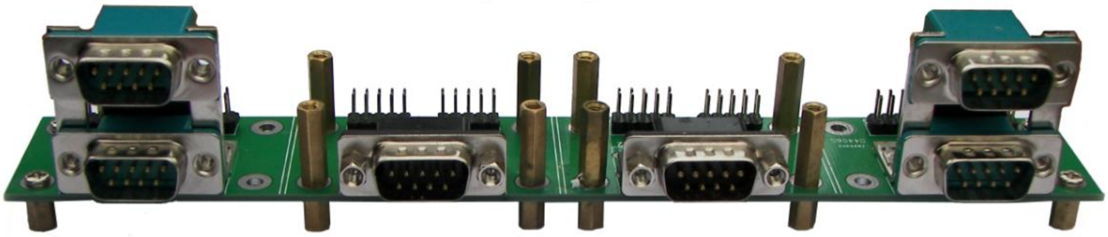
·SD/MMC interface

Appendix VII Interface Board

For the convenience of our customers rapid customization product, TianMo introduced based on SOC8200 motherboard interface board, is mainly will each function modular,
Each module can be through the copper column set up to, and then through the line connected to SOC8200 motherboard.



There is ECOM-4 / ECOM-8 (shown below Fig),need to connect the E100 communication board to use .



The interface board not retail, 100PCS minimum.

Technical support & Warranty Service

Embest Info&Tech Co.,LTD., established in March of 2000, is a global provider of embedded hardware and software. Embest aims to help customers reduce time to market with improved quality by providing the most effective total solutions for the embedded industry. In the rapidly growing market of high end embedded systems, Embest provides comprehensive services to specify, develop and produce products and help customers to implement innovative technology and product features. Progressing from prototyping to the final product within a short time frame and thus shorten the time to market, and to achieve the lowest production costs possible. Embest insists on a simple business model: to offer customers high-performance, low-cost products with best quality and service. The cotent below is the matters need attention for our products technical support and warranty service:

Technical support service

Embest provide one year free technical support service for all products from Embest. Technical support service covers:

- Embest embedded platform products software/hardware materials
- Assist customers compile and run the source code we offer.
- Solve the problems accurs on embeded software/hardware platform if users follow the instructions in the documentation we offer.
- Judge whether the product failure exists.

Special explanation, the situations listed below are not included in the range of our free technical support service, and Embest will handle the situation with discretion:

- Software/Hardware issues user meet during the self-develop process
- Issues happen when users compile/run the embedded OS which is tailored by users themselves.
- User’s own applications.
- Problems happen during the modification of our software source code

Maintenance service clause

1. The products except LCD, which are not used properly, will take the warranty since the day of the sale:

PCB: Provide 12 months free maintenance service.

2. The situations listed below are not included in the range of our free maintenance service, Embest will charge the service fees with discretion:

A. Can’t provide valid Proof-of-Purchase, the identification label is tour up or illegible, the identification label is altered or doesn’t accord with the actual products;
B. Don’t follow the instruction of the manual in order to damage the product;
C. Due to the natural disasters (unexpect matters), or natural attrition of the components, or unexpect matters leads the defects of appearance/function;
D. Due to the power supply, bump, leaking of the roof, pets, moist, impurities into the boards, all those reasons which lead the defects of appearance/function;
E. User unauthorized weld or dismantle parts leads the product’s bad condition, or let other people or institution which are not authorized by Embest to dismantle, repair, change the product leads the product bad connection or defects of apperance/function;
F. User unauthorized install the software, system or incorrect cofiguration or computer virus leads the defects;
G. Purchase the products through unauthorized channel;
H. Those commitment which is committed by other institutions should be responsible by the institutions, Embest has nothing to do with that;

3. During the warranty period, the delievery fee which delivery to Embest should be coverd by user, Embest will pay for the return delivery fee to users when the product is repaired. If the warranty period is expired, all the delievery fees will be charged by users.

4. When the boards needs repair, please contact technical support department.

Note: Those products are returned without the permission of our technician, we will not take any responsibility for them.

Note: Embest do not supply maintenance service to LCDs. We suggest the customer first check the LCD after get the goods. In case the LCD can not run or no display, customer should inform Embest within 7 business days from the moment get the goods.

Basic notice to protect and maintenance LCD

- Do not use finger nails or hard sharp object to touch the surface of the LCD, otherwise user can’t enjoy the above service.

- Embest recommend user to purchase a piece of special wiper to wipe the LCD after long time use, please avoid clean the surface with fingers or hands to leave fingerprint.

- Do not clean the surface of the screen with chemicals, otherwise user can not enjoy above service.

Value Added Services

We will provide following value added services:

- Provided services of driver develop base on Embest embedded platform, like serial port, USB interface devices, LCD screen.
- Provided the services of control system transplant, BSP drivers develop, API software develop.
- Other value added services like power adapter, LCD parts.
- Other OEM/ODM services.
- Technically training.

Please connect Embestl and get technical support:

- Support Tel:+86-755-25503401
- Fax:+86-755-25616057
- Pre-Sale consultation:market@embedinfo.com
- After-Sale consultation: support@embedinfo.com