

ATMEL SAM9G45 ARM9 Board User Guide

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Catalog

CHAPTER 1 OVERVIEW.....	5
1.1 The Microcontroller Introduction.....	5
1.2 The Development Board Introduction.....	5
1.3 Hardware resources list	5
1.4 Software resources list.....	6
CHAPTER 2 GETTING STARTED.....	7
2.1 Check listing.....	7
2.2 Documents Description	7
2.3 Version Information.....	7
2.4 Hardware resource requirements.....	7
2.5 Preparations.....	8
2.6 How to use the factory program.....	8
2.6.1 <i>Configure Eboot</i>	8
2.6.2 <i>Touchscreen calibration</i>	11
2.6.3 <i>How to use flash disk</i>	12
2.6.4 <i>How to use SD Card</i>	12
2.6.5 <i>How to use Windows Media Player to play a mp3 file</i>	12
2.6.6 <i>10M Ethernet test</i>	12
2.6.7 <i>Use ActiveSync to communicate with PC</i>	14
2.7 How to recovery the factory program	14
2.7.1 <i>Install SAM-BA</i>	14
2.7.2 <i>Downlaod FirstBoot</i>	15
2.7.3 <i>Download Eboot</i>	17
2.7.4 <i>Download Windows CE 6.0 kernel Image</i>	17
CHAPTER 3 ATMEL SAM9G45 ARM9 BOARD INTRODUCTION.....	19
3.1 Board Interface Overview	19
3.2 Jumpers Settings.....	19
3.3 Hardware Interface Introduction	20
3.3.1 <i>JTAG</i>	20
3.3.2 <i>Micro SD Card</i>	20
3.3.3 <i>SD/MMC Card</i>	20
3.3.4 <i>Ethernet</i>	20
3.3.5 <i>Audio</i>	20
3.3.6 <i>DEBUG</i>	20
3.3.7 <i>LCD & Touch Screen Controller</i>	20
3.3.8 <i>Mini USB Port</i>	20
3.3.9 <i>EEPROM</i>	20
3.3.10 <i>User Buttons</i>	21
3.3.11 <i>LED</i>	21
CHAPTER 4 SOFTWARE RESOURCES INTRODUCTION.....	22

4.1 Audio test	22
4.2 LCD test	23
4.3 touchscreen test	23
4.4 NandFlash test	23
4.5 NorFlash test	24
4.6 DDRAM test	24
4.7 filesystem test	25
4.8 Dataflash test	25
4.9 Twi eeprom test	26
4.10 RTT test	26
4.11 RTC test	27
4.12 Twi test	27
4.13 screensaver test	28
4.14 Emac test	28
4.15 Emac uip helloworld test	29
4.16 EMAC Uip Telnetd test	30
4.17 EMAC Uip Web Server test	31
4.18 SDMMC test	32
4.19 SD Card test	32
4.20 FATFS SD Card test	33
4.21 USB Device Core test	34
4.22 USB Device Hid Transfer test	34
4.23 USB Device CDC Serial test	35
4.24 USB Device Hid Keyboard test	35
CHAPTER 5 SOFTWARE DEVELOPMENT AND EXAMPLES.....	37
5.1 MDK Introduction	37
5.2 Compiler routine	37
5.2.1 Open a routine	37
5.2.2 Compiler the routine	37
5.3 Debug the routine using ULINK2	39
5.4 Download the application using ISP	41
APPENDIX A: AFTER-SALE SERVICE.....	45

Chapter 1 Overview

1.1 The Microcontroller Introduction

The ARM926EJ-S based AT91SAM9G45 features the frequently demanded combination of user interface functionality and high data rate connectivity, including LCD Controller, resistive touchscreen, camera interface, audio, Ethernet 10/100 and high speed USB and SDIO. With the processor running at 400MHz and multiple 100+ Mbps data rate peripherals, the AT91SAM9G45 has the performance and bandwidth to the network or local storage media to provide an adequate user experience.

The AT91SAM9G45 supports the latest generation of DDR2 and NAND Flash memory interfaces for program and data storage. An internal 133 MHz multi-layer bus architecture associated with 37 DMA channels, a dual external bus interface and distributed memory including a 64-Kbyte SRAM which can be configured as a tightly coupled memory (TCM) sustains the high bandwidth required by the processor and the high speed peripherals.

The I/Os support 1.8V or 3.3V operation, which are independently configurable for the memory interface and peripheral I/Os. This feature completely eliminates the need for any external level shifters. In addition it supports 0.8 ball pitch package for low cost PCB manufacturing.

The AT91SAM9G45 power management controller features efficient clock gating and a battery backup section minimizing power consumption in active and standby modes.

1.2 The Development Board Introduction

The ATMEL SAM9G45 ARM9 Board is an ARM embedded evaluation board produced by Embest, integrate the ATMEL ARM926EJ-S-based processor AT91SAM9G45, operating at 400MHz frequency, and can support WinCE and Linux. The board has 256MB NandFlash, 1MB NorFlash, 512KB EEPROM, 4 MB DataFlash and 128 MB DDR2 SDRAM. The board features USB Host, Mini USB, SD Card interface, Ethernet interface, Audio interface.

1.3 Hardware resources list

- AT91SAM9G45 ARM 32-bit CPU, 400MHz maximum frequency
- An internal 64KB SRAM
- An internal 64KB ROM
- An external 256MB NandFlash
- An external 1MB NorFlash
- An external 4MB DataFlash
- 2 external 64MB DDR2 SDRAM
- 2 user buttons
- 4 UARTs
- A wakeup button
- A reset button
- A RTC with backup battery
- A MICRO Audio input
- A PHONE Audio output
- LCD interface
- A Micro SD card connector
- A SD/MMC connector
- A DBGU debug port
- A USB Host interface
- A Mini USB interface
- 3 LEDs
- A 10/100M Ethernet interface
- A JTAG debug interface(10pin)

- 60 expand pins
- Power Supply: DC power

1.4 Software resources list

Project Name	Function Description
audio	Read a Wav file from the SD Card and play it
lcd	Display the two pre-loaded pictures in the LCD
Touchscreen	Test and calibrate the touchscreen
nandflash	Test the NandFlash
norflash	Test the NorFlash
fatfs	Create a FAT file system in the DDRAM
filesystem	It supplies sample code of common operations of a file system through a RAM Disk based file system
dataflash	Test DataFlash
twi_eeprom	Access EEPROM using TWI
rtt	Describe how to use RTT
rtc	Describe how to use RTC
twi	Describe the TWI's status in slave mode
dma_screensave	Simulate LCD screen save
emac	This project uses the Ethernet MAC (EMAC) and the on-board Ethernet transceiver available on the evaluation board
emac_uip_helloworld	This example makes the device responds to telnet connections on port 1000
emac_uip_telnetd	This project implements telnet command-line application on the board.
emac_uip_webserver	This project implements web server application on the board
sdmmc	Describe how to read or write the SD/MMC card.
sdcard	Initialize the Micro SD card.
fatfs_sdcard	Describe how to use the FAT file system in a Micro SD card
usb_device_core	This project help you to be familiar with the USB Framework that is used for rapid development of USB-compliant class drivers such as USB Communication Device class (CDC)
usb_device_hid_transfer	The USB HID Transfer Project will help you to get familiar with the USB Device Port (UDP) and PIO interface on AT91SAM9G45 microcontrollers
usb_device_cdc_serial	Describe how to use USB CDC.
usb_device_hid_keyboard	The USB HID Keyboard Project will help you to get familiar with the USB Device Port(UDP) and PIO interface on AT91SAM microcontrollers

Chapter 2 Getting Started

2.1 Check listing

- 1) One ATMEL SAM9G45 ARM9 Board
- 2) One RS-232 Serial Cable
- 3) One Ethernet Cable
- 4) One USB cable
- 5) One DB9-DIP10 Serial Cable
- 6) One DB9-DIP10 Serial Cable
- 7) One 4.3" TFT LCD Panel with touchscreen
- 8) One CD-ROM

2.2 Documents Description

File name / Item	Description	Attribute
WinCE User Manual	Descript how to download and use WinCE	 376KB
Linux User Manual	Descript how to download and use Linux	 212KB
SAM9G45 UserManualV1.0.pdf	The first version of the User Manual	 813KB
SAM9G45 Board Schematic.pdf	Development board schematic	 281KB
AT91SAM9G45 Datasheet.pdf	Datasheet of AT91SAM9G45	 1.15MB
AT91SAM9G45 Reference Manual.pdf	Reference Manual of AT91SAM9G45	 17.6MB
Other PDF documents	Introduce other modules in the board, such as Audio, NandFlash...	 6.36MB

2.3 Version Information

- The version of the development tools: MDK4.01
- The version of the SAM-BA: SAM-BA V2.9

2.4 Hardware resource requirements

When we test SAM9G45 ARM9 Board, PC recommended the following configuration:

- 2.0GHz (or higher) of the CPU
- 512M RAM
- 2 USB interfaces
- A serial interface
- Windows XP operating system
- KEIL Integrated Development Environment installed

2.5 Preparations

- Jumper Settings: Jumper use the default sets, no need to change.
- Serial Connection: Connect com of board and the com of PC through serial port cable.
- LCD Connection: The LCD screen inserted in the LCD interface of board.
- USB Connection: Using USB cable, one end plugged into the Mini USB port on the board, the other end connected to PC.
- SD Card Connection: Connect SD to SD socket on the board.
- Micro SD Card Connection: Connect Micro SD card to Micro SD socket on the board.
- JTAG Debugger Connection: One end connected to JTAG interface on the board, the other end connected to PC (nee to use JTAG Adapter).
- Serial Port Receive Settings: In the PC, run HyperTerminal serial communication program, select the serial port used and set the following parameters (to set status: Baud rate (115200), data bits (8 bits), stop bits (1 bit), parity bit (no), data flow control (no)).
- Network Connection: Through the crossover cable provided connect J5 interface on the board and the network interface of PC side.

2.6 How to use the factory program

The factory program in the ATMEL SAM9G45 Development Board is Windows CE 6.0. Before the first time to run WinCE, you should configure Eboot, and then you can operate WinCE with touchscreen. Firstly configure Eboot.

2.6.1 Configure Eboot

Open HyperTerminal. Reset the ATMEL SAM9G45 Development Board, HyperTerminal will display:

```
INFO : Low Level Init : OK
INFO : DDRam init : OK
Init Nand flash
Load CE-BOOT from Flash to DDRAM
DirectRead lasted 1 ms for 0x62 bytes (timer granularity is 400)
```

```
Press [ENTER] to launch image stored in flash or [SPACE] to cancel.
Initiating image launch in 1 seconds_
```

Press **SPACE**, HyperTerminal will display:

```

0) Mac address ..... (02:02:09:04:05:05)
1) Ip address ..... (192.168.111.115)
2) Subnet Mask address .. (255.255.255.0)
3) DHCP ..... (Enabled)
4) Boot delay (seconds).. (5)
5) Frequency settings
6) Download device..... (Ethernet)
7) Debug device..... (Ethernet (EMACB))
8) Download image to..... (SDRAM)
9) Download new image at startup

```

```

l) Launch flash resident image now
d) Download from Ethernet now
s) Save configuration now
r) Restore default configuration and save now
n) Image flash menu
>

```

Then configure Eboot.

(1) **1**) and **2**) are used to configure the board's IP and Subnet (Note: this IP must be in a same Subnet with you PC), here IP is 192.168.2.115, as follows:

```

0) Mac address ..... (02:02:09:04:05:05)
1) Ip address ..... (192.168.2.115)
2) Subnet Mask address .. (255.255.255.0)
3) DHCP ..... (Enabled)
4) Boot delay (seconds).. (5)
5) Frequency settings
6) Download device..... (Ethernet)
7) Debug device..... (Ethernet (EMACB))
8) Download image to..... (SDRAM)
9) Download new image at startup

```

```

l) Launch flash resident image now
d) Download from Ethernet now
s) Save configuration now
r) Restore default configuration and save now
n) Image flash menu
>_

```

(2) Then choose **3**) to disable DHCP, as follows:

- 0) Mac address (02:02:09:04:05:05)
- 1) Ip address (192.168.2.115)
- 2) Subnet Mask address .. (255.255.255.0)
- 3) DHCP (Disabled)
- 4) Boot delay (seconds).. (5)
- 5) Frequency settings
- 6) Download device..... (Ethernet)
- 7) Debug device..... (Ethernet (EMACB))
- 8) Download image to..... (SDRAM)
- 9) Download new image at startup

- l) Launch flash resident image now
 - d) Download from Ethernet now
 - s) Save configuration now
 - r) Restore default configuration and save now
 - n) Image flash menu
- >_

(3) Then choose 9), as follows:

- 0) Mac address (02:02:09:04:05:05)
- 1) Ip address (192.168.2.115)
- 2) Subnet Mask address .. (255.255.255.0)
- 3) DHCP (Disabled)
- 4) Boot delay (seconds).. (5)
- 5) Frequency settings
- 6) Download device..... (Ethernet)
- 7) Debug device..... (Ethernet (EMACB))
- 8) Download image to..... (SDRAM)
- 9) Launch existing flash resident image at startup

- l) Launch flash resident image now
 - d) Download from Ethernet now
 - s) Save configuration now
 - r) Restore default configuration and save now
 - n) Image flash menu
- >_

(4) Then choose n), it will display some information, as follows:

Image Flash Menu :

- 1) Erase all sectors
 - 2) Enter manually the image parameters
 - 3) Quit...
- >

Then choose 2) to configure Flash, as follows:

Physical Start Address : (0x80059000) : 0x8006c000
Starting ip : (0x8005a000) : 0x8006d000
Total ROM size : (0x75144c) : 0x01dce8c8_

Then choose 3) to quit the configuration, it will come back to the main menu, as follows:

```

0) Mac address ..... (02:02:09:04:05:05)
1) Ip address ..... (192.168.2.115)
2) Subnet Mask address .. (255.255.255.0)
3) DHCP ..... (Disabled)
4) Boot delay (seconds).. (5)
5) Frequency settings
6) Download device..... (Ethernet)
7) Debug device..... (Ethernet (EMACB))
8) Download image to..... (SDRAM)
9) Launch existing flash resident image at startup

l) Launch flash resident image now
d) Download from Ethernet now
s) Save configuration now
r) Restore default configuration and save now
n) Image flash menu
>_

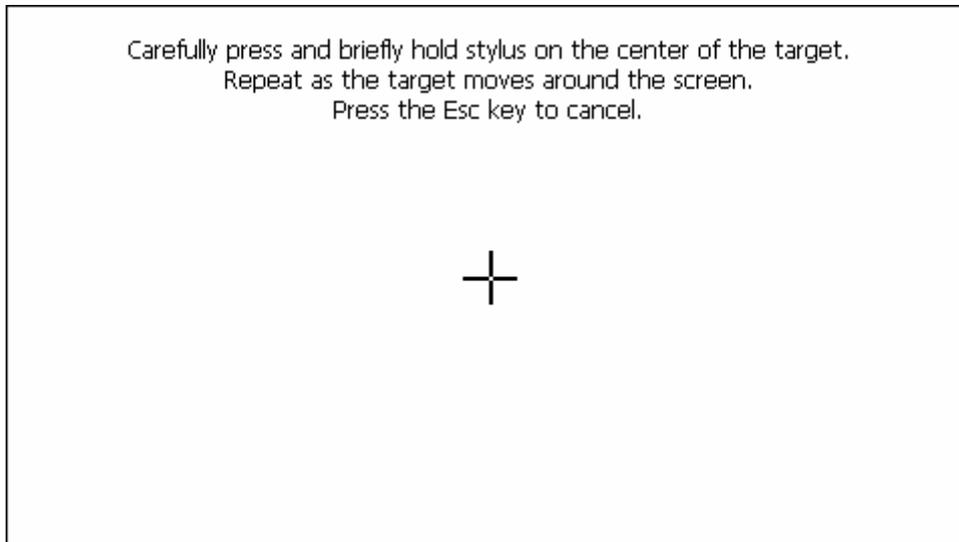
```

(5) Choose **s**) to save the configuration, then reset the board. You will come into WinCE.

Then we can use WinCE6.0 to test network, flash disk, SD card, or play mp3, or use some service applications, as follows:

2.6.2 Touchscreen calibration

After power on the board, you can see the calibration interface, as follows. You can press the cross to calibrate the touchscreen. If the calibration is successful, you can enter into the WinCE interface, or you should calibrate again.



WinCE6.0's interface:



2.6.3 How to use flash disk

Use flash disk in WinCE is similar to use it in standard Windows OS. When startup the WinCE, insert the flash disk into the USB Host, at this time the board will power on the flash disk, and the LED in flash disk will blink, and the WinCE will load the flash disk after a few seconds. Then you can double click the “My Device” icon in the desktop, open the explorer you will see a new folder, this is you flash disk.

2.6.4 How to use SD Card

There are two SD Card slots in the SAM9G45 Board, one is SD/MMC Card slot, and the other is Micro SD Card slot, but WinCE only supports Micro SD Card. And now WinCE does not support Micro SD Card plug and play. Insert Micro SD Card into the SD slot in the back of the board, then you can see the Storage Card folder in the explorer. Open this folder, you can read or write the Micro SD Card.

2.6.5 How to use Windows Media Player to play a mp3 file

Firstly insert the headphone to the PHONE interface in the board, and then insert a SD Card which has stored an mp3 file into the slot. Then in WinCE you can open this mp3 file and use Windows Media Player to play it, and you can listen to the music from the headphone.

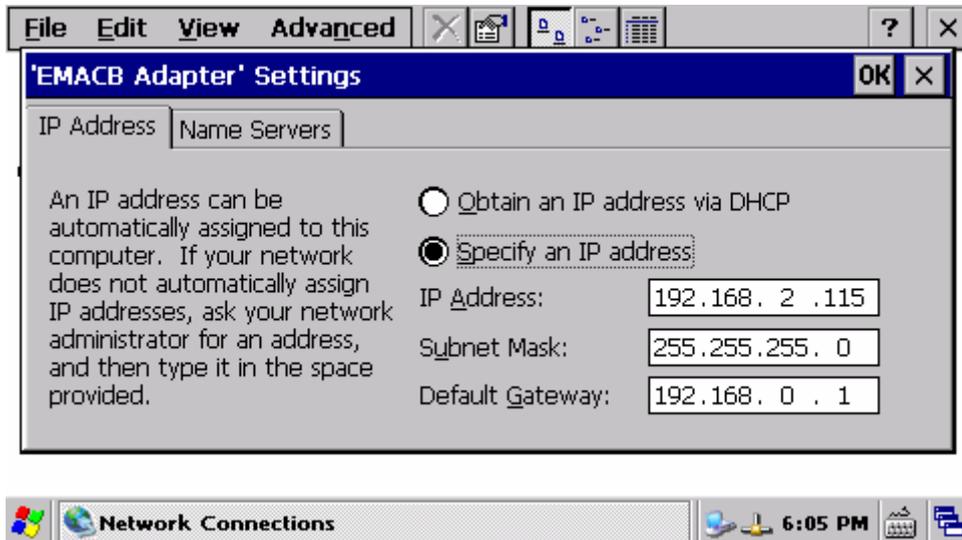
Windows Media Player also can play WMV video files, and the way is same as the mp3 files, you should just double click it.

2.6.6 10M Ethernet test

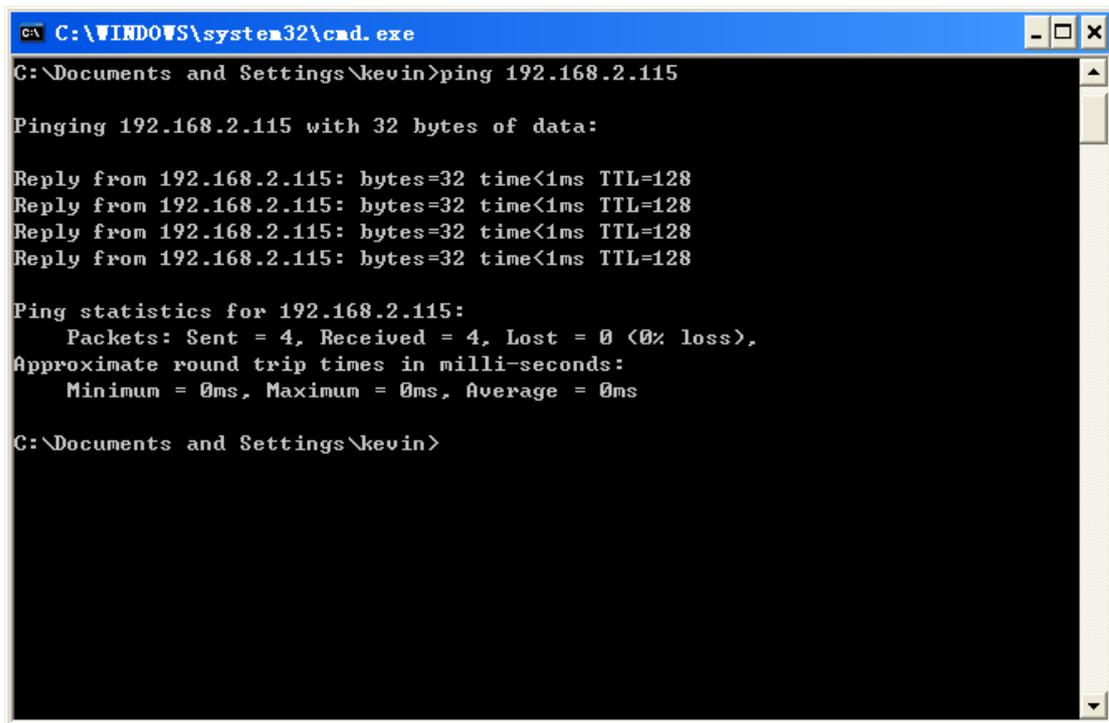
First connect the board and PC with a cross-ruling (or connect the board to a Switch using a straight-through Ethernet cable). Then click “My Device->Control Panel->Network and Dial-up Connections”, open this interface:



Double click EMACB1 to open settings interface, the default settings are as follows, and you can configure it according to you network.



Use ping command in PC to test the network.



```

C:\WINDOWS\system32\cmd.exe
C:\Documents and Settings\kevin>ping 192.168.2.115

Pinging 192.168.2.115 with 32 bytes of data:

Reply from 192.168.2.115: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.2.115:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Documents and Settings\kevin>
  
```

2.6.7 Use ActiveSync to communicate with PC

Use the ActiveSync provided by Microsoft, you can make synchronous communication between the board and PC, and you can transfer files easily or do remote debug.

1) Install Activesync.

In 04-tools\Activesync directory you can see Activesync.msi file, double click it to install.

2) Transfer files between the board and PC with ActiveSync

After install ActiveSync, connect the board with PC using a USB line, and then reset the board. After WinCE startups, you can see a pop-up dialog in PC and the ActiveSync in the right bottom of the task bar turns to green.

Then you can see the Windows Mobile in "My Computer". Open Windows Mobile, you can see all the files of the board. Now you can read files from the board, or copy files to the board.

2.7 How to recovery the factory program

We will descript how to download Windows CE 6.0 to the SAM9G45 ARM9 Board.

Note: The WinCE images are in 02-Images\WinCE Image directory.

The steps to install wince:

- (1) Install SAM-BA
- (2) Download FirstBoot
- (3) Download Eboot
- (4) Download Windows CE 6.0 kernel image

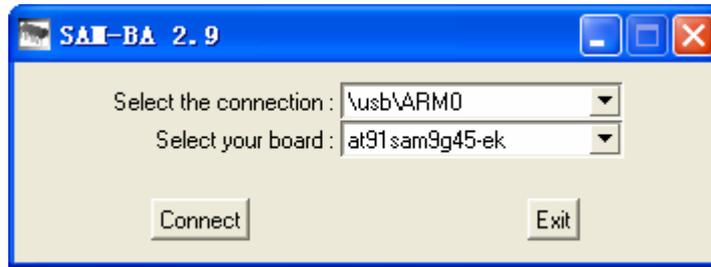
The detailed steps are as follows.

2.7.1 Install SAM-BA

1) Install SAM-BA in \04-tools\SAM-BA directory.

2) Link the DBGU port in the board with the COM port in the PC with cross serial line, and link the Mini USB port and the PC's USB port with the USB line. Then power up the board. Open HyperTerminal (to

set status: Baud rate (115200), data bits (8 bits), stop bits (1 bit), parity bit (no), data flow control (no)).
 3) Click "Start" -> "All Program" -> ATMEL Corporation -> AT91-ISP v1.13 -> SAM-BA v2.9, open SAM-BA. Then pop-up the Dialog as follows:

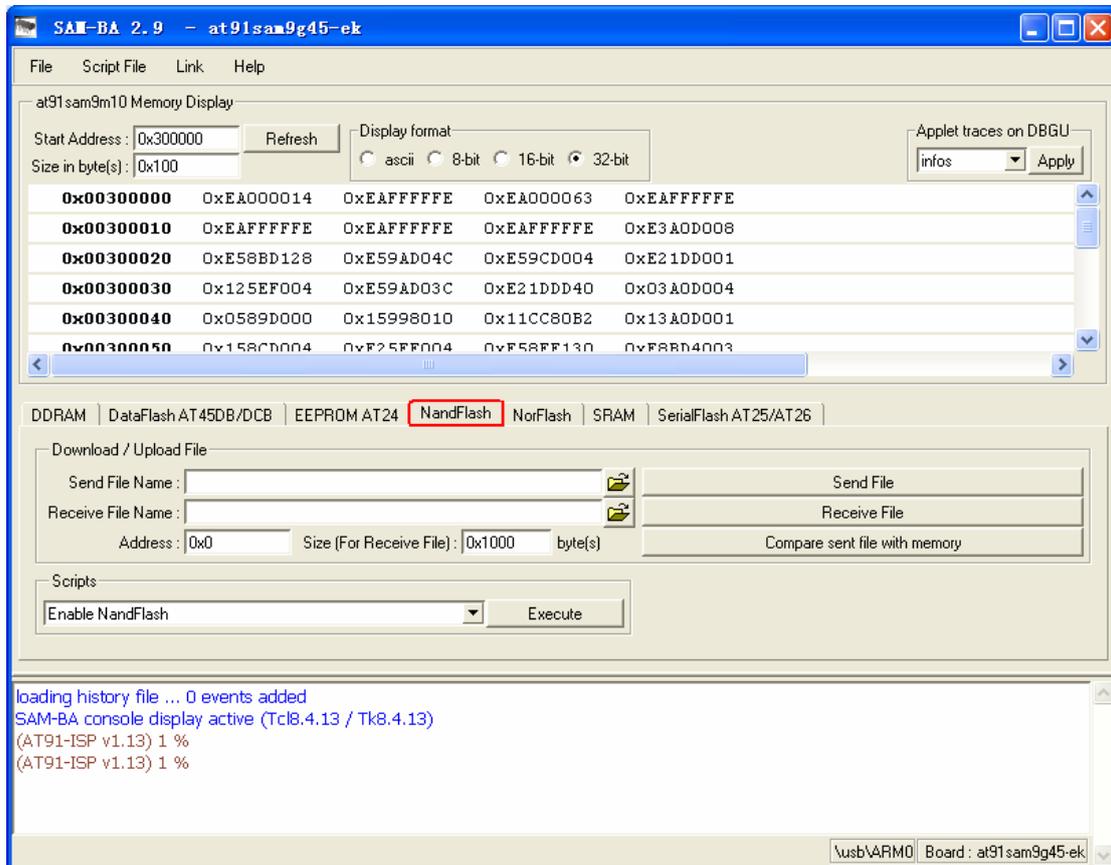


Note: If you has downloaded WinCE images to the board, you should clear the data in NandFlash, or SAM-BA can't connect to the board. The way to clear NandFlash: firstly press USER2 key, then press NRST key until the HyperTerminal displays the information:

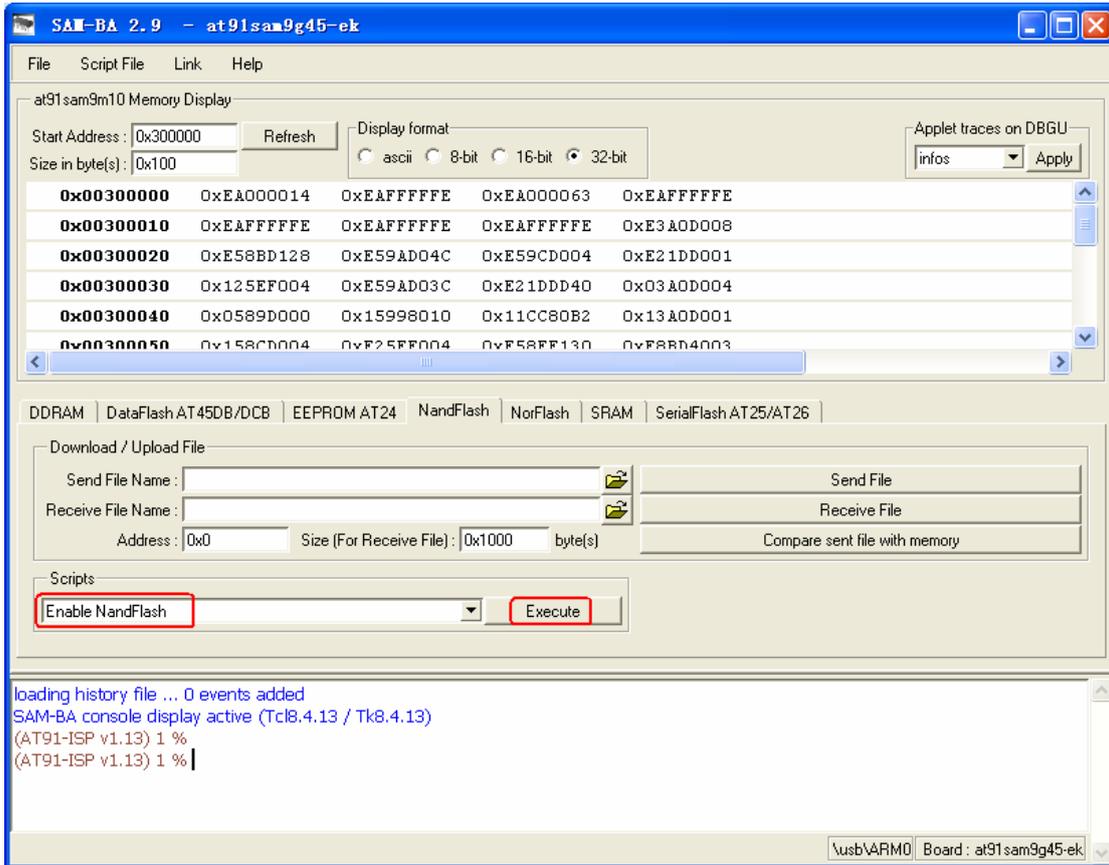
```
INFO : Low Level Init : OK
INFO : DDRam init : OK
Init Nand flash
BP5 is pressed, erasing FirstBoot on NandFlash CS3
Nand Flash CS3
Please reboot
```

2.7.2 Downlaod FirstBoot

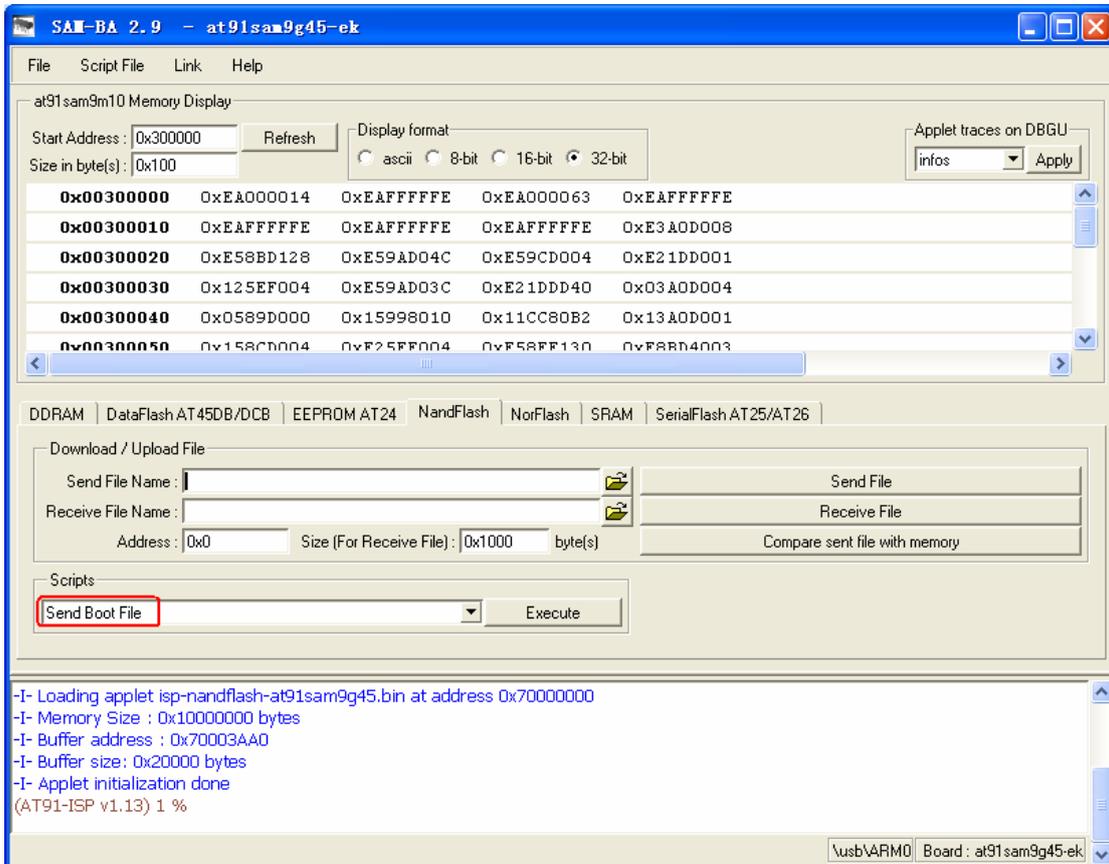
1) Click then "Connect" button, then pop-up a Window, and Click the NandFlash TAB in it, as follows:



2) Choose 'Enable NandFlash' in Scripts list box, then click **Execute** to enable NandFlash, as follows:



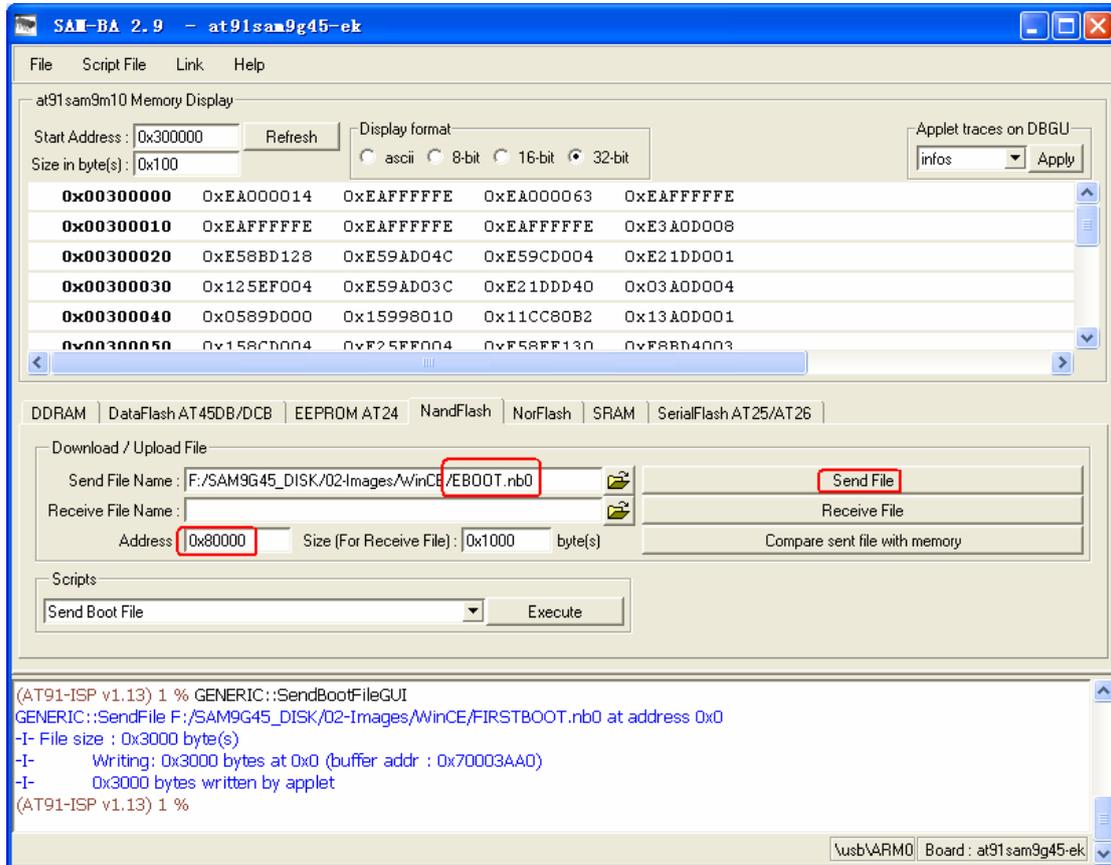
3) Choose 'Send Boot File' in Scripts list box, as follows:



4) Click "Execute" button, then choose the FIRSTBOOT.nb0 in 02-Images\WinCE Image directory to send.

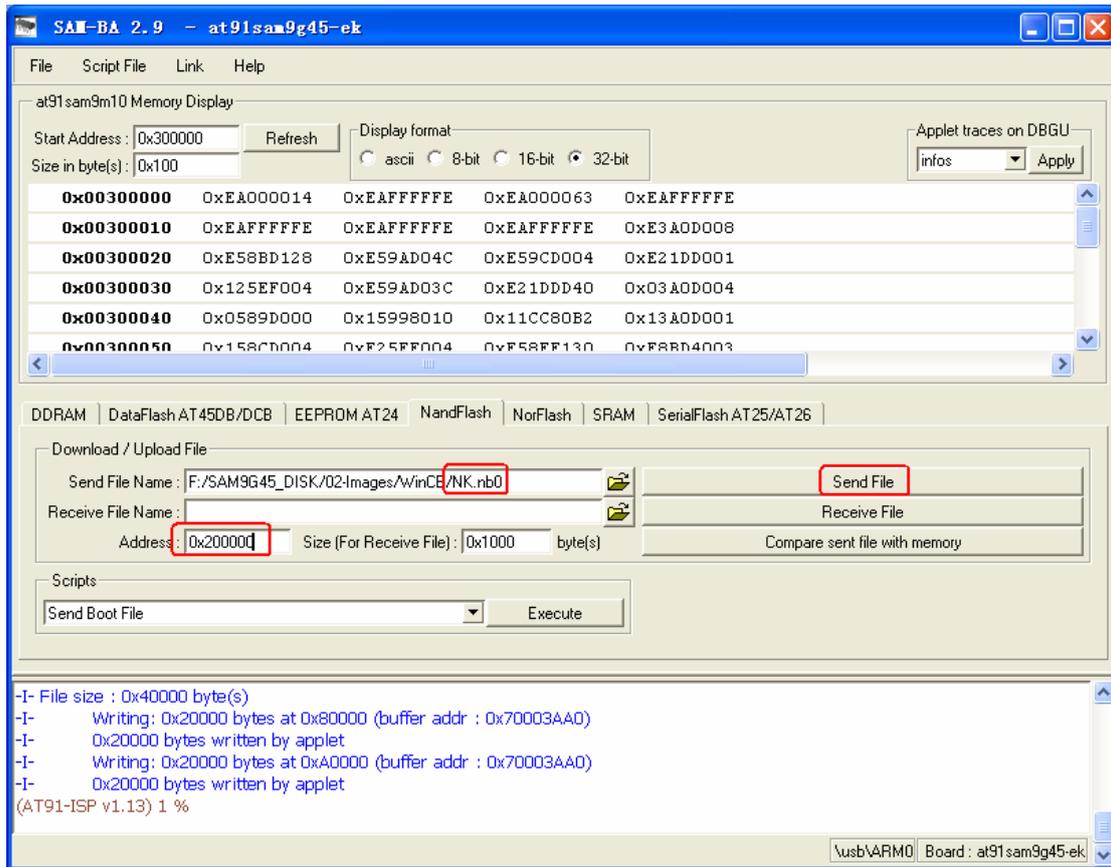
2.7.3 Download Eboot

1) Choose EBOOT.nb0 in **Send File Name** Text in 02-Images\WinCE Image directory, input 0x80000 in **Address** Text, as follows, then Click **Send File**.



2.7.4 Download Windows CE 6.0 kernel Image

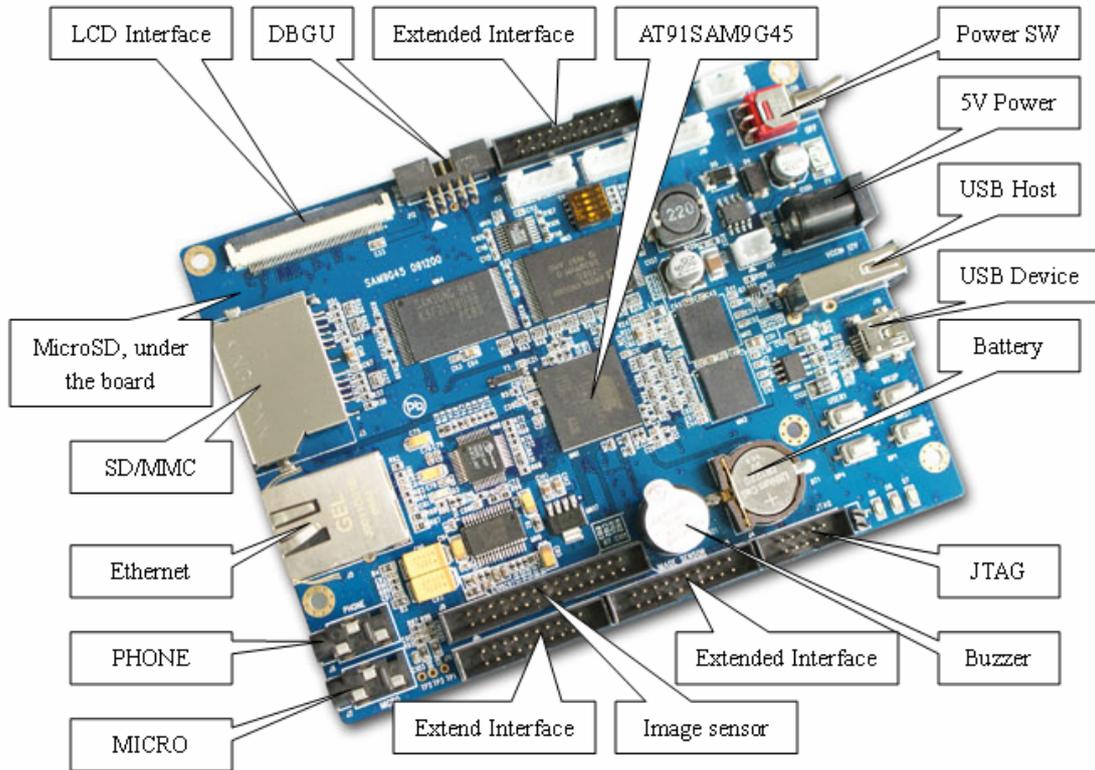
1) Choose NK.nb0 in **Send File Name** Text in 02-Images\WinCE Image directory, input 0x200000 in **Address** Text, as follows, then Click **Send File**.



After download WinCE kernel image, reset SAM9G45 ARM9 Board. Then configure Eboot according to step 2.6.1. After do this work, you can use Windows CE 6.0.

Chapter 3 ATMEL SAM9G45 ARM9 Board Introduction

3.1 Board Interface Overview



J1	LCD interface	J15	USART2 interface
J2	Micro SD card slot	J16	USART0 interface
J3	SD/MMC slot	J17	USART3 interface
J4	JTAG interface	J18	Mini USB
J5	RJ45 ETHERNET interface	J19	Power switch
J6	PHONE output interface	J20	5V power
J7	MICRO input interface	JP1	BMS jumper choose
J8	20-pin expend interface	D6	Power indicator light
J9	20-pin expend interface	D7	User LED
J10	20-pin expend interface	D8	User LED
J11	20-pin expend interface	BP1	Reset button
J12	DBGU interface	BP2	Wakeup button
J13	USART1 interface	BP3	USER1 button
J14	USB Host	BP4	USER2 button

3.2 Jumpers Settings

ID	Name	Default Settings	Note
JP1	BOOT0	Open	Choose Start-up mode from NandFlash flash or

3.3 Hardware Interface Introduction

3.3.1 JTAG

A standard 10-pin JTAG connector is implemented on the SAM9G45 ARM9 Board, you can use the provided Adapter to connect with any ARM JTAG Emulator, such as ULINIK2, JLink...

3.3.2 Micro SD Card

A Mini SD Card Interface is implemented on this Board; it can only be used by Mini SD Card.

3.3.3 SD/MMC Card

In addition to the Mini SD Card, the Board also supports SD/MMC cards.

3.3.4 Ethernet

A Physical Layer Transceiver DP83848J and an integrated RJ45 interface are implemented in this Board, and it supports both 10BASE-T and 100BASE-TX Ethernet protocol, which ensures compatibility and interoperability with all other standard based Ethernet solutions.

3.3.5 Audio

The SAM9G45 Development Board includes a WM8731 chip which integrates a low-power stereo audio codec chip. WM8731 offers the user the unique ability to independently program the ADC and DAC sample rates from a single clock source. The WM8731 is designed specifically for portable MP3 audio and speech players and recorders.

In this Board, we use TWI to transport control command to WM8731, and use SSC to send or receive data from WM8731.

3.3.6 DEBUG

SAM9G45 development board provide a 10-pin UART debug interface, we can convert it to 9-pin common RS-232 interface with the provided Adapter. This DBGU port can be used for communication and trace purposes. It offers an ideal channel for ISP downloading.

3.3.7 LCD & Touch Screen Controller

SAM9G45 ARM9 Board provides a 320*240 size TFT LCD with a Touch Screen Controller.

3.3.8 Mini USB Port

A USB Mini AB interface is implemented to transport USB data, and it also supports USB-OTG full speed.

3.3.9 EEPROM

A 512KB EEPROM is connected to the TWI0 bus in SAM9G45 ARM9 Board. We can serial access this EEPROM through TWI0.

3.3.10 User Buttons

This Board provides two user button, USER1 and USER2, they respectively connect with PB7 and PB6 pins.

3.3.11 LED

SAM9G45 ARM9 Board provides 3 LEDs D6, D7 and D8, they respectively connect with PD30, PD31 and PD0 IO pins, D6 indicates the Power, D7 and D8 can be used for user output.

Chapter 4 Software Resources Introduction

4.1 Audio test

- Source code location: 03-software\Examples\01_audio
- Test description: The routine describes how to get the wav file from a Micro SD Card, and then output it through PHONE. NOTE: before testing you should cope the sample.wav in the 01_audio directory to the root directory of a Micro SD Card, then insert this Micro SD Card to the board. And you also should insert a earphone to the PHONE interface.
- Test phenomenon: Download the program to target board. Open PC HyperTerminal and push NRST button, you will see the phenomenon below:

```
-- Basic Audio Project 1.7 --
-- AT91SAM9G45-EK
-- Compiled: Jan 18 2010 17:14:14 --
-I- Please connect a SD card ...
-I- SD card connection detected
-I- Init media Sdcard
-I- MEDSdcard init
-I- DMAD_Initialize channel 0
-I- Card Type 1, CSD_STRUCTURE 0
-I- SD/MMC TRANS SPEED 25000 KBit/s
-I- SD 4-BITS BUS
-I- SD/MMC TRANS SPEED 25000 KBit/s
-I- SD/MMC card initialization successful
-I- Card size: 121 MB
-I- Mount disk 0
-I- File Found!
```

Wave file header information

```
-----
- Chunk ID          = 0x46464952
- Chunk Size        = 6801444
- Format             = 0x45564157
- SubChunk ID       = 0x20746D66
- Subchunk1 Size    = 16
- Audio Format       = 0x0001
- Num. Channels      = 2
- Sample Rate       = 24000
- Byte Rate         = 96000
- Block Align       = 4
- Bits Per Sample   = 16
- Subchunk2 ID      = 0x61746164
- Subchunk2 Size    = 6801408
```

Press a key to return to the menu ...

Then, you press any keys, HyperTerminal will display:

-I- PCM Load to 70100100, size 6801408

Menu :

P: Play the WAV file

D: Display the information of the WAV file

Then, you press 'P', you will listen to a music from the earphone.

- Reference manual: XWM8731EDS.pdf, AT91SAM9G45 Reference Manual.pdf

4.2 LCD test

- Source code location:03-software\Examples\02_lcd
- Test description: This routine will display the two pre-loaded pictures on the LCD. Before testing you should respectively download the image1_rgb.raw image2_rgb.raw in the 02_lcd directory to the address 0x70100000 and 0x70200000 of the DDRAM with SAM-BA.
- Test phenomenon: Download the program to target board. Open PC HyperTerminal and push NRST button. The application displays two preloaded images on the board LCD, alternating between each image every other second.
- Reference manual: AT91SAM9G45 Reference Manual.pdf (LCDC part)

4.3 touchscreen test

- Source code location:03-software\Examples\03_touchscreen
- Test description: This routine will calibrate the touchscreen.
- Test phenomenon: Download the program to the target board. Press NRST button, LCD displays:

LCD calibration

Touch the dots to calibrate the screen

Then the LCD will display five red points successively, you can press these points to calibrate the touchscreen. If your calibration is successful, the LCD will display:

-I- Calibration successful !

Or else, the LCD will display:

-E- Error too big ! Retry...

You should calibrate again.

- Reference manual: AT91SAM9G45 Reference Manual.pdf (TSADCC part)

4.4 NandFlash test

- Source code location:03-software\Examples\04_nandflash
- Test description: The routine display some information about the NandFlash in the board, then read, write, erase to test NandFlash.
- Test phenomenon: Download the program to target board. Open PC HyperTerminal and push NRST button. Firstly it will display the NandFlash's ID, Bus width, block numbers, block size. Then read, write, erase to test NandFlash. HyperTerminal displays:

-- Basic NandFlash Project 1.7 --

-- AT91SAM9G45-EK

-- Compiled: Jan 11 2010 11:29:19--

```

-l- Nandflash ID is 0x9510DAEC
-l-      Nandflash driver initialized
-l- Size of the whole device in bytes: 0x10000000
-l- Size in bytes of one single block of a device: 0x20000
-l- Number of blocks in the entire device: 0x800
-l- Size of the data area of a page in bytes: 0x800
-l- Number of pages in the entire device: 0x40
-l- Bus width: 0x8
-l- SkipBlockNandFlash_EraseBlock: Block is BAD
-l- Skip bad block      44:
-l- Test in progress on block:      95
-l- Test passed

```

- Reference manual: AT91SAM9G45 Reference Manual. PDF (SMC part)

4.5 NorFlash test

- Source code location:03-software\Examples\05_norflash
- Test description: The routine display some information about the NorFlash in the board, then read, write, erase to test NorFlash.
- Test phenomenon: After download to the board, you will see in Hypertrm:

```

-- Basic NorFlash Project 1.7 --    53
-- AT91SAM9G45-EK
-- Compiled: Jan 28 2010 09:08:01 --
NorFlash Manu ID = 0x1, Device ID = 0x225b
Nor Flash is erasing...
Nor Flash is writing...
Nor Flash is reading...
Nor Flash operation success!

```

- Reference manual: AT91SAM9G45 Reference Manual. PDF (SMC part)

4.6 DDRAM test

- Source code location:03-software\Examples\06_fatfs
- Test description: This routine describes how to use DDRAM. Firstly it creates and mounts a file system of FAT format in the DDR2 SDRAM, then creates a file in this file system.
- Test phenomenon: Download the program to target board. Open PC HyperTerminal and push NRST button, you will see the phenomenon below:

```

-- Basic FatFS Full Version with External RAM Project 1.7 --
-- AT91SAM9G45-EK
-- Compiled: Jan 11 2010 11:48:19—
-l- MEDDdram init
-l- DDRAM initialized
-l- Mount disk 0
-l- Format disk 0
-l- Please wait a moment during formating...
-l- Format disk finished!

```

```
-I- Create a file : '0:Basic.bin'
-I- Write file
-I- ByteWritten=512
-I- f_write ok: ByteWritten=512
-I- Close file
-I- Open file: 0:Basic.bin
-I- Read file
-I- Close file
-I- File data OK !
-I- Test passed !
```

- Reference manual: AT91SAM9G45 Reference Manual.pdf (External Memories part)

4.7 filesystem test

- Source code location:03-software\Examples\07_filesystem
- Test description: It supplies sample code of common operations of a file system through a RAM Disk based file system.
- Test phenomenon: Download the program to target board. Open PC HyperTerminal and push NRST button, you will see the phenomenon below.

```
-- Basic File System Project 1.7 --
-- AT91SAM9G45-EK
-- Compiled: Jan 11 2010 17:05:06—
*** Using EFSL ***
```

```
--- File System Test (EFSL) ---
1. FS Mount : PASS
2. Creat file test.bin : OK
3. Write 4194304 bytes: Done, Speed 5363 KB/s
4. Copy file test.bin to copy.bin: Done, Speed 2728 KB/s
5. Verify file copy.bin: OK, Speed 1518 KB/s
6. Read file test.bin: OK, Speed 5577 KB/s
```

```
-----
F to change File System Type
R to run the test again
-----
```

- Reference manual: AT91SAM9G45 Reference Manual.pdf (External Memories part)

4.8 Dataflash test

- Source code location:03-software\Examples\08_dataflash
- Test description: The demonstration program tests the dataflash present on the evaluation kit by erasing and writing each one of its pages.
- Test phenomenon: Download the program to target board. Open PC HyperTerminal and push RESET button, you will see the phenomenon below.

```
-- Basic Dataflash Project 1.7 --
-- AT91SAM9G45-EK
```

```
-- Compiled: Jan 19 2010 21:13:58 --
-I- Initializing the SPI and AT45 drivers
-I- At45 enabled
-I- SPI interrupt enabled
-I- Waiting for a dataflash to be connected ...
-I- AT45DB321D detected
-I- Device identifier: 0x0001271F
-I- Test in progress on page:    219
-I- Test passed.
```

- Reference manual: AT91SAM9G45 Reference Manual.pdf

4.9 Twi eeprom test

- Source code location: 03-software\Examples\09_twi_eeprom
- Test description: This software performs simple tests on the first and second page of the EEPROM.
- Test phenomenon: Connect TWD (SDA) for the 2 boards: pin 8 of connector J17, Connect TWCK(SCL) for the 2 boards: pin 7 of connector J17, Connect GND for the 2 boards: pin 30 of connector J17, Add a pull up of 2,2KOhms on TWD and TWCK (pin 1 of J17 is 3,3V). Download the program to target board. Open PC HyperTerminal and push RESET button, you will see the phenomenon below.

```
-- Basic TWI EEPROM Project 1.7 --
-- AT91SAM9G45-EK
-- Compiled: Jan 12 2010 20:50:27 --
-I- Filling page #0 with zeroes ...
-I- Filling page #1 with zeroes ...
-I- Read/write on page #0 (polling mode)
-I- 0 comparison error(s) found
-I- Read/write on page #1 (IRQ mode)
-I- Callback fired !
-I- Callback fired !
-I- 0 comparison error(s) found
-I- Callback fired !
```

- Reference manual: AT91SAM9G45 Reference Manual.pdf, SAM9G45 Board Schematic.pdf

4.10 RTT test

- Source code location: 03-software\Examples\10_rtt
- Test description: This example enables the user to set an alarm and watch it being triggered when the timer reaches the corresponding value.
- Test phenomenon: This program displays a timer count and a menu on the DBGU, enabling the user to choose between several options. Download the program to target board. Open PC HyperTerminal and push RESET button, you will see the phenomenon below.

```
Start AT91Bootstrap...
-- Basic RTT Project 1.7 --
-- AT91SAM9G45-EK
```

```
-- Compiled: Jan  9 2010 17:47:26 --
Time: 2
Menu:
r - Reset timer
s - Set alarm
Choice?
```

You can choose 'r' to reset or choose 's' to set alarm. If you choose 's' and enter 8, it may display "!!! ALARM !!!" when time get to 8. Phenomenon is as follows.

```
Time: 8
!!! ALARM !!!
Menu:
r - Reset timer
s - Set alarm
c - Clear alarm notification
Choice?
```

You may choose 'c' to clear message "!!! ALARM !!!".

- Reference manual: AT91SAM9G45 Reference Manual.pdf

4.11 RTC test

- Source code location: 03-software\Examples\11_rtc
- Test description: This basic example shows how to use the Real-Time Clock (RTC) peripheral available on the newest Atmel AT91 microcontrollers.
- Test phenomenon: Download the program to target board. Open PC HyperTerminal and push RESET button, you will see the phenomenon below.

```
-- Basic RTC Project 1.7 --
-- AT91SAM9G45-EK
-- Compiled: Jan 11 2010 15:58:15 --
```

```
Menu:
t - Set time
d - Set date
i - Set time alarm
m - Set date alarm
q - Quit!
```

```
[Time/Date: 00:08:35, 01/14/2010 Thu ][Alarm status:]
```

Setting the time, date and time alarm is done by using Menu option "t", "d", the display is updated accordingly.

- Reference manual: AT91SAM9G45 Reference Manual.pdf

4.12 Twi test

- Source code location: 03-software\Examples\12_twi
- Test description: This project demonstrates the TWI peripheral in slave mode. It mimics the behavior of a serial memory, enabling the TWI master to read and write.

data in its internal SRAM.

- Test phenomenon: Connect TWD (SDA) for the 2 boards: pin 8 of connector J17; Connect TWCK(SCL) for the 2 boards: pin 7 of connector J17; Connect GND for the 2 boards: pin 30 of connector J17; Add a pull up of 2,2KOhms on TWD and TWCK (pin 1 of J17 is 3,3V).

Download the program to target board. Open PC HyperTerminal and push NRST button, you will see the phenomenon below.

```
-- Basic TWI Slave Project 1.7 --
-- AT91SAM9G45-EK
-- Compiled: Jan 11 2010 15:58:15 --
-l- Configuring the TWI in slave mode
```

- Reference manual: AT91SAM9G45 Reference Manual.pdf, SAM9G45 Board Schematic.pdf

4.13 screensaver test

- Source code location: 03-software\Examples\13_dma_screensaver
- Test description: This routine simulates the LCD screen save. It shows how to use the DMA controller of AT91 microcontrollers to transfer picture from source memory to display memory.
- Test phenomenon: Download the program to target board. Open PC HyperTerminal and push NRST button. You will see EMBEST logo picture in the LCD, if we don't press the keypad in 3s, then the LCD will go into screen save status. If we press any keys, the LCD will exit the screen save status. After 3 seconds, it restarts to play screensaver.
- Reference manual: AT91SAM9G45 Reference Manual.pdf (LCDC 章节)

4.14 Emac test

- Source code location: 03-software\Examples\14_emac
- Test description: This project uses the Ethernet MAC (EMAC) and the on-board Ethernet transceiver available on the evaluation board. It enables the device to respond to a ping command sent by a host computer. Upon startup, the program will configure the EMAC with a default IP and MAC addresses and then ask the transceiver to auto-negotiate the best mode of operation. Once this is done, it will start monitoring incoming packets and processing them whenever appropriate. The basic will only answer to two kinds of packets: the ARP requests with its MAC address and ICMP ECHO request. To test that the board responds correctly to ping requests, type 'ping 192.168.2.19' command-line on a computer connected to the same network as the board..
- Test phenomenon: Build the program and download it inside the evaluation board. Connect an Ethernet cable between the evaluation board and the network. The board may be connected directly to a computer; in this case, make sure to use a cross/twisted wired cable such as the one provided with the evaluation kit. Open PC HyperTerminal and push RESET button. The program will then auto-negotiate the mode of operation and start receiving packets, displaying feedback on the DBGU. To display additional information, press any key in the terminal application.. Phenomenon is as follows.

```
Start AT91Bootstrap...
-- Basic EMAC Project 1.7 --
-- AT91SAM9G45-EK
-- Compiled: Jan 13 2010 09:54:58 --
```

```
-- MAC 0:45:56:78:9a:ac
-- IP 192.168.2.19
-l- ** Valid PHY Found: 3
-l- MACB_ResetPhy
-l- AutoNegotiate complete
P: Link detected
Press a key for statistics
=== EMAC Statistics ===
.tx_packets = 3
.tx_comp = 3
```

.....

To test that the board responds to ICMP ECHO requests, type the command 'ping 192.168.2.19' in a shell.

- Reference manual: AT91SAM9G45 Reference Manual.pdf,DM9161AEP.pdf

4.15 Emac uip helloworld test

- Source code location:03-software\Examples\15_emac_uip_helloworld
- Test description: This example makes the device responds to telnet connections on port 1000. If you don't want to use DHCP, please open file uip-conf.h and comment the line #define UIP_DHCP_on.
- Test phenomenon: Build the program and download it inside the evaluation board. Connect an Ethernet cable between the evaluation board and the network. The board may be connected directly to a computer; in this case, make sure to use a cross/twisted wired cable such as the one provided with the evaluation kit. Open PC HyperTerminal and push RESET button. You will see the phenomenon below.

```
Start AT91Bootstrap...
-- Basic EMAC uIP Project 1.7 --
-- AT91SAM9G45-EK
-- Compiled: Jan 13 2010 11:07:43 --
- MAC 0:45:56:78:9a:ac
- Host IP 192.168.2.19
- Router IP 192.168.2.1
- Net Mask 255.255.255.0
-l- ** Valid PHY Found: 3
-l- MACB_ResetPhy
-l- AutoNegotiate complete
P: Link detected
P: clock time initialize - TC0
P: APP Init ... hello-world
```

Open PC command-line, type the command 'telnet'. It may open the telnet window. After this,enter 'open 192.168.2.19 1000'.

```
Microsoft Telnet> open 192.168.2.19 1000_
```

If connecting success,it will display one short message' Hello. What is your name?'.
 Hello. What is your name?
 _

- Reference manual: AT91SAM9G45 Reference Manual.pdf,DM9161AEP.pdf

4.16 EMAC Uip Telnetd test

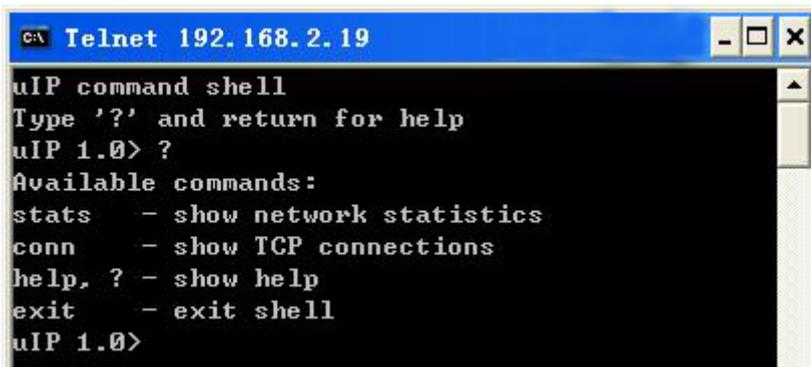
- Source code location: 03-software\Examples\16_emac_uip_telnetd
- Test description: This project implements telnet command-line application on the board. You can customize the shell commands and the corresponding command function in the program. This example achieves four commands' format.They are: 'Stats',show network statistics; 'conn', show TCP connections; 'help' or '?', show help; 'exit', exit shell. The corresponding command functions of 'help' and 'exit' are implemented. Others are the same to 'Help' command function.
- Test phenomenon: Build the program and download it inside the evaluation board. Connect an Ethernet cable between the evaluation board and the network. The board may be connected directly to a computer; in this case, make sure to use a cross/twisted wired cable such as the one provided with the evaluation kit. Open PC HyperTerminal and push RESET button. The debug information may be displayed in the terminal. You can input any key to display EMAC Statistic information. Phenomenon is as follows.

```

Start AT91Bootstrap...
-- Basic EMAC uIP Project 1.7 --
-- AT91SAM9G45-EK
-- Compiled: Jan 13 2010 11:45:22 --
- MAC 0:45:56:78:9a:ac
- Host IP 192.168.2.19
- Router IP 192.168.2.1
- Net Mask 255.255.255.0
-l- ** Valid PHY Found: 3
-l- MACB_ResetPhy
-l- AutoNegotiate complete
P: Link detected
P: clock time initialize - TC0
P: APP Init ... telnetd
=== EMAC Statistics ===
.tx_packets = 0
.tx_comp = 0
.tx_errors = 0
.collisions = 0
.tx_exhausts = 0
.....

```

Open PC command-line, type the command 'telnet'. It may open the telnet window. After this,enter 'open 192.168.2.19'. If connecting success,it will display tip message. Type the command '?',it will display the help information. See the figure below.



```

C:\ Telnet 192.168.2.19
uIP command shell
Type '?' and return for help
uIP 1.0> ?
Available commands:
stats  - show network statistics
conn   - show TCP connections
help, ? - show help
exit   - exit shell
uIP 1.0>
    
```

Type “exit” exit shell. Type others to display help information.

- Reference manual: AT91SAM9G45 Reference Manual.pdf,DM9161AEP.pdf

4.17 EMAC Uip Web Server test

- Source code location: 03-software\Examples\17_emac_uip_webserver
- Test description: This project implements webserver application on the board. You can configure uip,including MAC,Host IP, Router IP and Net Mask. This example enables the device to act as a web server,displaying network information through an HTML browser. If you don't want to use DHCP, please open file uip-conf.h and comment the line #define UIP_DHCP_on.
- Test phenomenon: Build the program and download it inside the evaluation board. Connect an Ethernet cable between the evaluation board and the network. The board may be connected directly to a computer; in this case, make sure to use a cross/twisted wired cable such as the one provided with the evaluation kit. Open PC HyperTerminal and push RESET button. The debug information may be displayed in the terminal. You can input any key to display EMAC Statistic information. Phenomenon is as follows.

```

Start AT91Bootstrap...
-- Basic EMAC uIP Project 1.7 --
-- AT91SAM9G45-EK
-- Compiled: Jan 13 2010 17:00:36 --
- MAC 0:45:56:78:9a:ac
- Host IP 192.168.2.19
- Router IP 192.168.2.1
- Net Mask 255.255.255.0
-l- ** Valid PHY Found: 3
-l- MACB_ResetPhy
-l- AutoNegotiate complete
P: Link detected
P: clock time initialize - TC0
P: APP Init ... webserver
=== EMAC Statistics ===
.tx_packets = 0
.tx_comp = 0
.tx_errors = 0
.collisions = 0
.....
    
```

Open PC web browser, type 'http://192.168.2.19' and press "Enter".The page generated by lwIP will appear.

- Reference manual: AT91SAM9G45 Reference Manual.pdf,DM9161AEP.pdf

4.18 SDMMC test

- Source code location:03-software\Examples\18_sdmmc
 Test description: This basic example shows how to read or write the SD/MMC Card. Before testing, you should insert a SD into the board. NOTE: insert the big SD Card slot, not the small.
- Test phenomenon: Download the program to target board. Open PC HyperTerminal and push NRST button, you will see the phenomenon below.

```

-- Basic SD/MMC MCI Mode Project xxx --
-- AT91SAM9G45-EK
-- Compiled: Jan 11 2010 15:58:15 --
-l- Cannot check if SD card is write-protected
-l- DMAD_Initialize channel 0
TC Start ... OK

=====
-l- Card Type 1, CSD_STRUCTURE 0
-l- SD 4-BITS BUS
-l- CMD6(1) arg 0x80FFFF01
-l- SD HS Not Supported
-l- SD/MMC TRANS SPEED 25000 KBit/s
-l- SD/MMC card initialization successful
-l- Card size: 483 MB, 990976 * 512B
...

```

Press Enter key, it will display help menu:

```

=====
# 0,1,2 : Block read test
# w,W   : Write block test(With data or 0)
# b,B   : eMMC boot mode or access boot partition change
# i,l   : Re-initialize card
# t     : Disk R/W/Verify test
# T     : Disk performance test
# p     : Change number of blocks in one access for test
# s     : Change MCI Clock for general test

```

- Reference manual: AT91SAM9G45 Reference Manual.pdf, SAM9G45 Board Schematic.pdf

4.19 SD Card test

- Source code location:03-software\Examples\19_sdcard
- Test description: This basic example shows how to operate the Micro SD Card. Before testing you should insert a Micro SD Card into the board.
- Test phenomenon: Download the program to target board. Open PC HyperTerminal and push RESET button, you will see the phenomenon below.

```

-- Basic FatFS Full Version with SDCard Project 1.7 --
-- AT91SAM9G45-EK
-- Compiled: Jan 15 2010 14:22:48 --
-I- Please connect a SD card ...
-I- SD card connection detected
-I- Init media Sdcard
-I- MEDSdcard init
-I- DMAD_Initialize channel 0
-I- Card Type 1, CSD_STRUCTURE 0
-I- SD/MMC TRANS SPEED 25000 KBit/s
-I- SD 4-BITS BUS
-I- CMD6(1) arg 0x80FFFF01
-I- SD HS Enable
-I- SD/MMC TRANS SPEED 50000 KBit/s
-I- SD/MMC card initialization successful
-I- Card size: 972 MB
-I- Mount disk 0
auto_mount_test-I- The disk is already formatted.
-I- Display files contained on the SDCard :
auto_mount_test0:/BASIC.bin
-I- Do you want to erase the sdcard to re-format disk ? (y/n)!

```

- Reference manual: AT91SAM9G45 Reference Manual.pdf, SAM9G45 Board Schematic.pdf

4.20 FATFS SD Card test

- Source code location: 03-software\Examples\20_fatfs_sdcard
- Test description: This basic example shows how to read or write Micro SD Card with the FAT file system. Before testing you should insert a Micro SD Card into the board.
- Test phenomenon: Download the program to target board. Open PC HyperTerminal and push RESET button, you will see the phenomenon below.

```

-- Basic FatFS Full Version with SDCard Project 1.7 --
-- AT91SAM9G45-EK
-- Compiled: Jan 15 2010 14:22:48 --
-I- Please connect a SD card ...
-I- SD card connection detected
-I- Init media Sdcard
-I- MEDSdcard init
-I- DMAD_Initialize channel 0
-I- Card Type 1, CSD_STRUCTURE 0
-I- SD/MMC TRANS SPEED 25000 KBit/s
-I- SD 4-BITS BUS
-I- CMD6(1) arg 0x80FFFF01
-I- SD HS Enable
-I- SD/MMC TRANS SPEED 50000 KBit/s
-I- SD/MMC card initialization successful
-I- Card size: 972 MB

```

```
-I- Mount disk 0
auto_mount_test-I- Format disk 0
-I- Please wait a moment during formatting...
-I- Format disk finished !
-I- Create a file : "0:Basic.bin"
-I- Write file
-I- ByteWritten=2064
```

- Reference manual: AT91SAM9G45 Reference Manual.pdf, SAM9G45 Board Schematic.pdf

4.21 USB Device Core test

- Source code location: 03-software\Examples\21_usb_device_core
- Test description: This project help you to be familiar with the USB Framework that is used for rapid development of USB-compliant class drivers such as USB CommunicationDevice class (CDC).You can find the inforamtion about Sample usage of USB Device Framework,USB enumerate sequence,the standard and class-specific descriptors and requests handling and the initialize sequence and usage of UDP interface.
- Test phenomenon: Download the program to target board. Connect board to PC using USB cable. Open PC HyperTerminal and push RESET button, you will see the phenomenon below.

```
Start AT91Bootstrap...
-- USB Device Core Project 1.7 --
-- AT91SAM9G45-EK
-- Compiled: Jan 11 2010 10:51:06 --
```

When connecting USB cable to windows, the LED blinks, and the host reports a new USB device attachment.

- Reference manual: AT91SAM9G45 Reference Manual.pdf,SP2526A-2EN.pdf

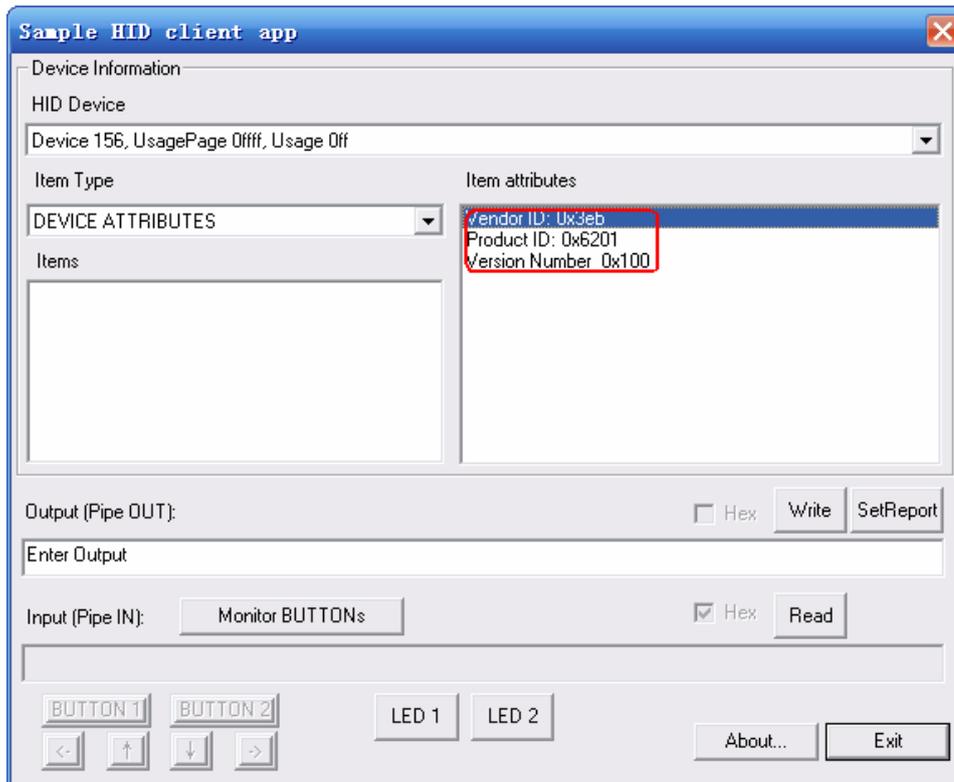
4.22 USB Device Hid Transfer test

- Source code location: 03-software\Examples\22_usb_device_hid_transfer
- Test description: The USB HID Transfer Project will help you to get familiar with the USB Device Port(UDP) and PIO interface on AT91SAM microcontrollers. Also it can help you to be familiar with the USB Framework that is used for rapid development of USB-compliant class drivers such as USB Humen Interface Device class (HID).
- Test phenomenon: Build the program and download it inside the evaluation board. Connect board to PC using USB cable. Open PC HyperTerminal and push RESET button, you will see the phenomenon below.

```
Start AT91Bootstrap...
-- USB Device HID Transfer Project 1.7 --
-- AT91SAM9G45-EK
-- Compiled: Jan 12 2010 17:30:14 --
-W- HIDDTransferDriver_RequestHandler: request 0x0A
-W- Sta 0x8085F400 [0] -W- _
```

When connecting USB cable to windows, the LED blinks. Then new "HID Transfer Device" appears in the hardware device list. You can use the PC program hidTest.exe to check the device information and run tests. Find the HID Device whose VID is 03EB and PID is 6201,

select item type and item to see its attributes. Type what you want to send in output edit box, use buttons on the right side to send. You can see data information in debug terminal. You can use the buttons above the input edit box to read data from device or monitor the data, then the data and the status of the buttons on the board is read and the gray buttons is up or down based on the buttons status on the board.



- Reference manual: AT91SAM9G45 Reference Manual.pdf,SP2526A-2EN.pdf

4.23 USB Device CDC Serial test

- Source code location: 03-software\Examples\23_usb_device_cdc_serial
- Test description: This routine is used to show the USB virtual serial port function.
- Test phenomenon: Download the program, press Reset key. PC will point out you should install a driver, we choose the driver from: 03-software\Examples\23_usb_device_cdc_serial\drive. After install the driver, open "computer manager" -> "Device manager", you will find "AT91 USB to Serial Converter (COM11)" in port(COM and LPT). Use a serial tool to open COM1 and COM11 at the same time, they are setting: Baud rate (115200), data bits (8 bits), stop bits (1 bit), parity bit (no), data flow control (no). Then you can send information from COM1 to COM11.
- Reference manual: AT91SAM9G45 Reference Manual.pdf,SP2526A-2EN.pdf.

4.24 USB Device Hid Keyboard test

- Source code location: 03-software\Examples\24_usb_device_hid_keyboard
- Test description: The USB HID Keyboard Project will help you to get familiar with the USB Device Port(UDP) and PIO interface on AT91SAM microcontrollers. Also it can help you to be familiar with the USB Framework that is used for rapid development of USB-compliant class drivers such as USB HumanInterface Device class (HID). In this project, you can use the

emulated keyboard to enter character to PC host, or control the Num Lock LED of the PC keyboard.

- Test phenomenon: Download the program to target board. Connect board to PC using USB cable. Open PC HyperTerminal and push RESET button, you will see the debug information in the terminal..

When connecting USB cable to windows, the LED blinks, and the host reports a new USB device attachment. Then new "HID Keyboard Device" appears in the hardware device list.

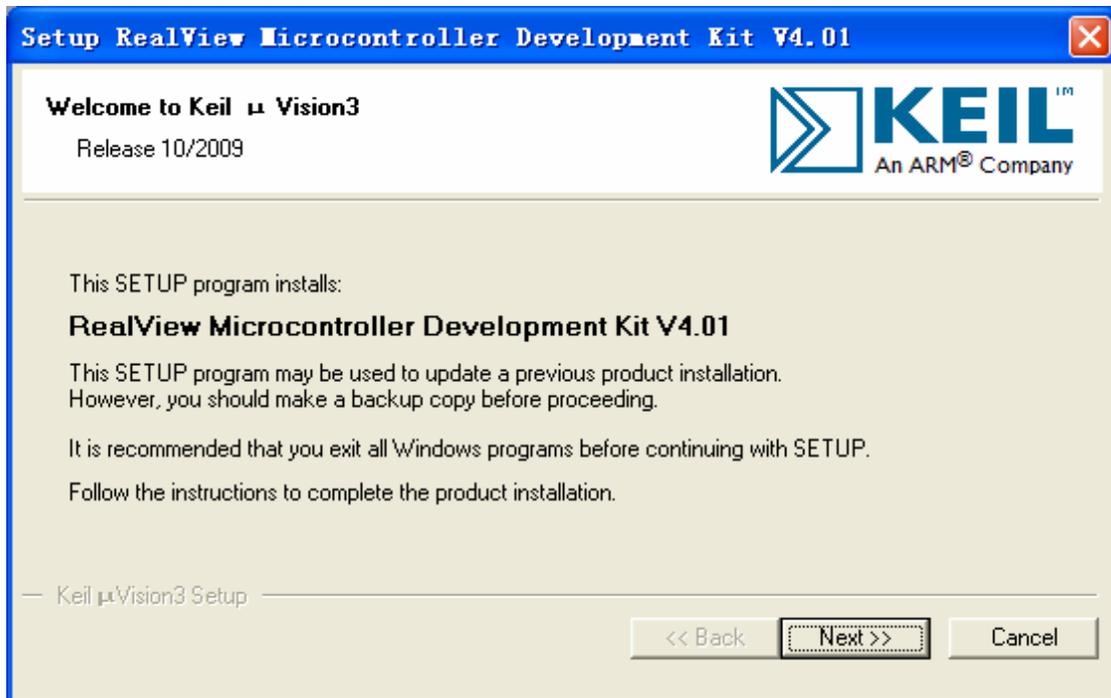
Once the device is connected and configured, pressing any of the board buttons should send 'a' to the host PC. Pressing num. lock should also make the third LED toggle its state (on/off).

- Reference manual: AT91SAM9G45 Reference Manual.pdf,SP2526A-2EN.pdf.

Chapter 5 Software development and examples

5.1 MDK Introduction

RealView MDK Development Suite is the latest software development tool of ARM Limited Corporation for Embedded Processors. MDK4.01 integrates the most advanced technology in this industry, including μ Vision4 IDE and RealView RVCT4.0 Compiler; RealView MDK supports ARM7, ARM9 and the latest Cortex-M3 Core Processor. It has a configuration wizard for startup code and integrates flash program module, powerful device simulation, performance analyzer and so on. You can obtain MDK software from the CD released with SAM9G45 Evaluation Board in the directory of 04-tools\Realview MDK4.01, or you can download the latest version from Keil website www.keil.com. Double click the installation file setup.exe; finish Keil μ Vision4 installation under the guidance of the installation wizard. The installation interface as follows:



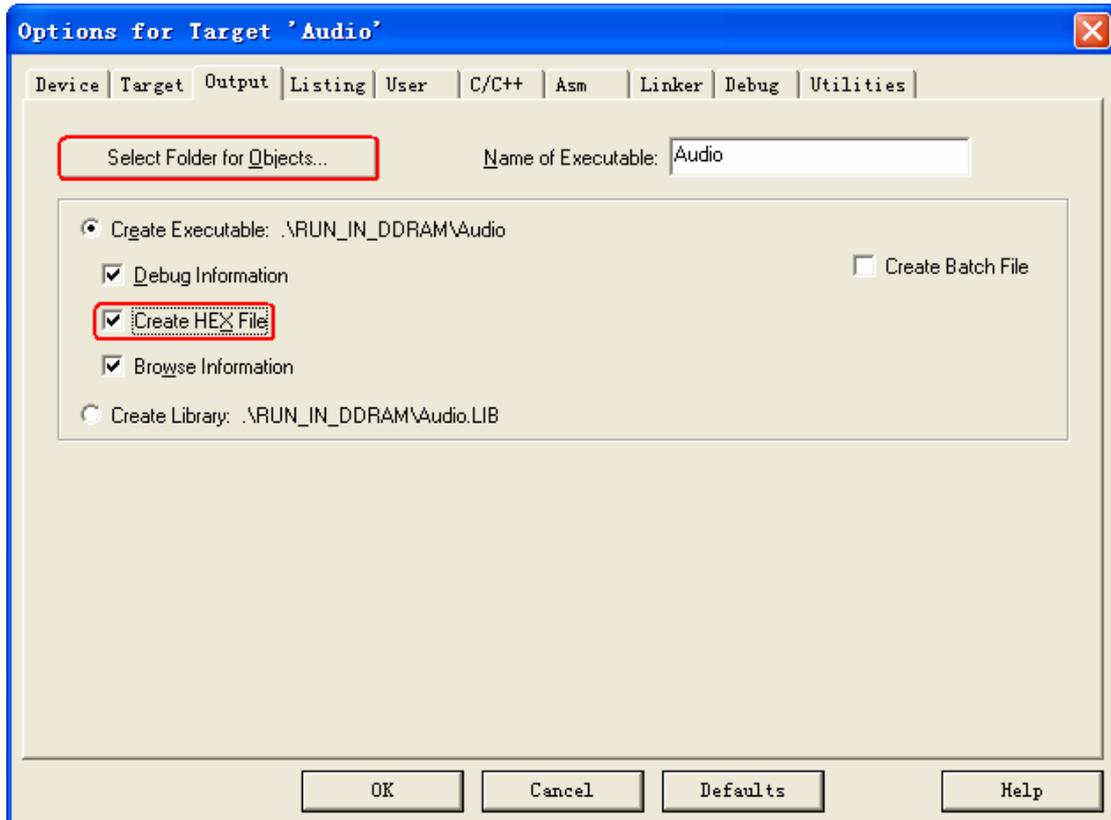
5.2 Compiler routine

5.2.1 Open a routine

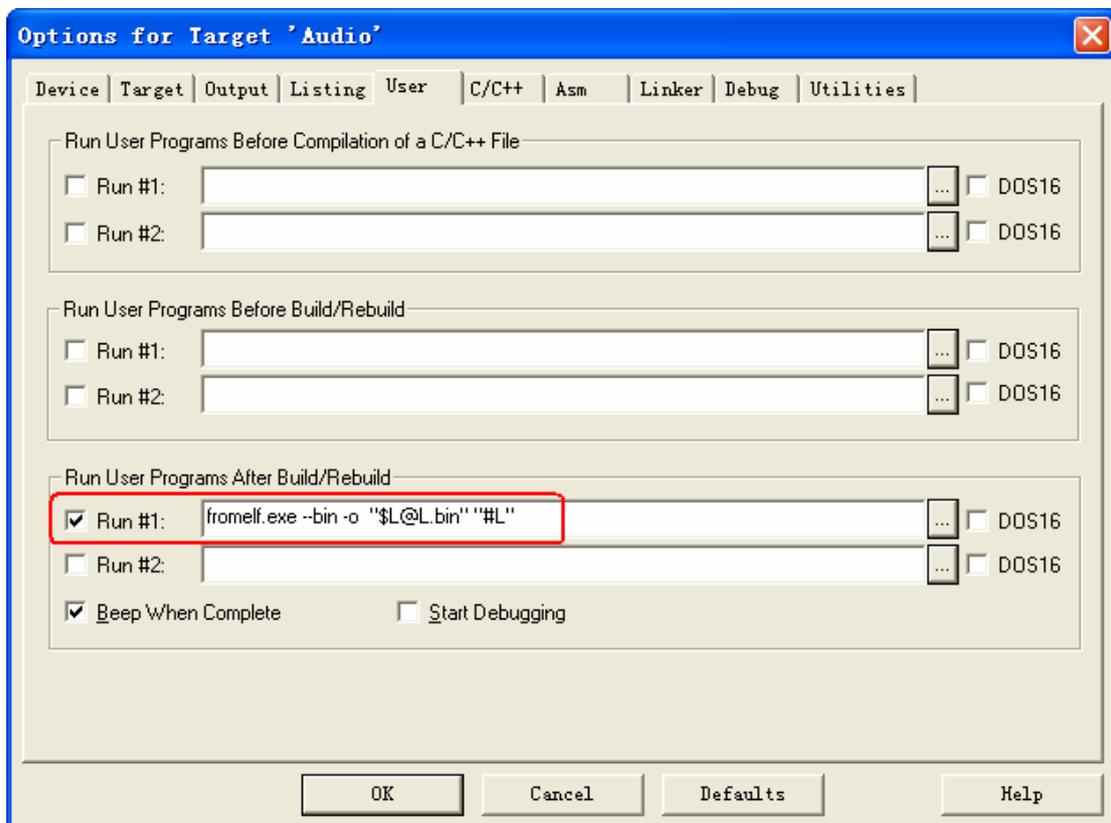
Enter in the folder of 03-software\Examples; Open the *.uvproj file in the project directory of one routine. For example: \03-software\Examples\01_audio\project\Audio.uvproj.

5.2.2 Compiler the routine

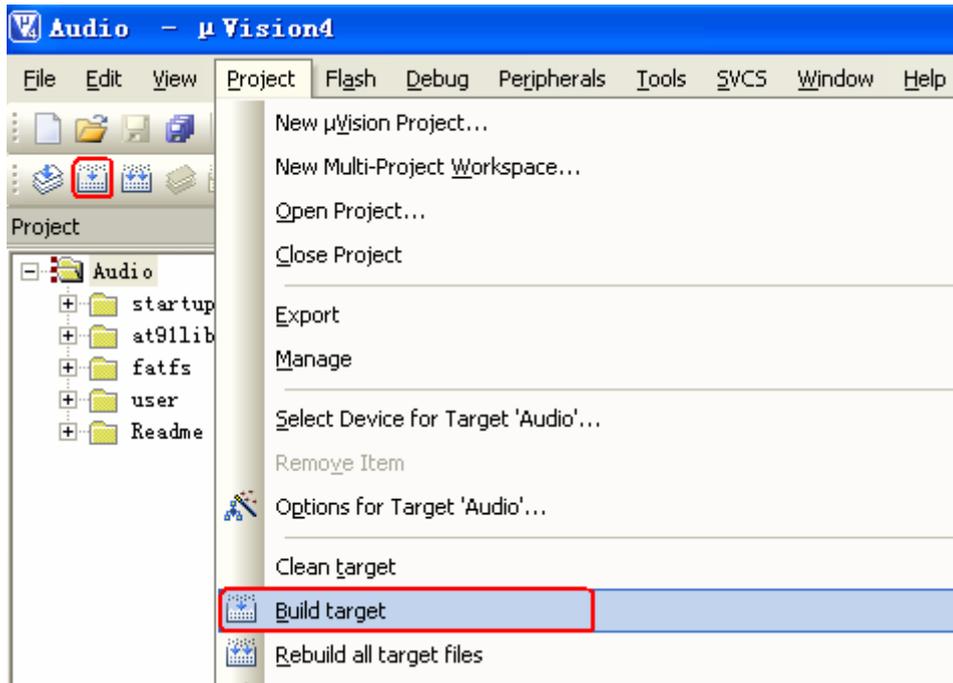
1) If you need the .hex format file, then you can configure MDK to build the hex file, Click Select Folder for Object... to specify the hex file's output directory. Or you can skip this step.



2) If you need the .bin format file, then you can configure MDK to build the bin file. Or you can skip this step.



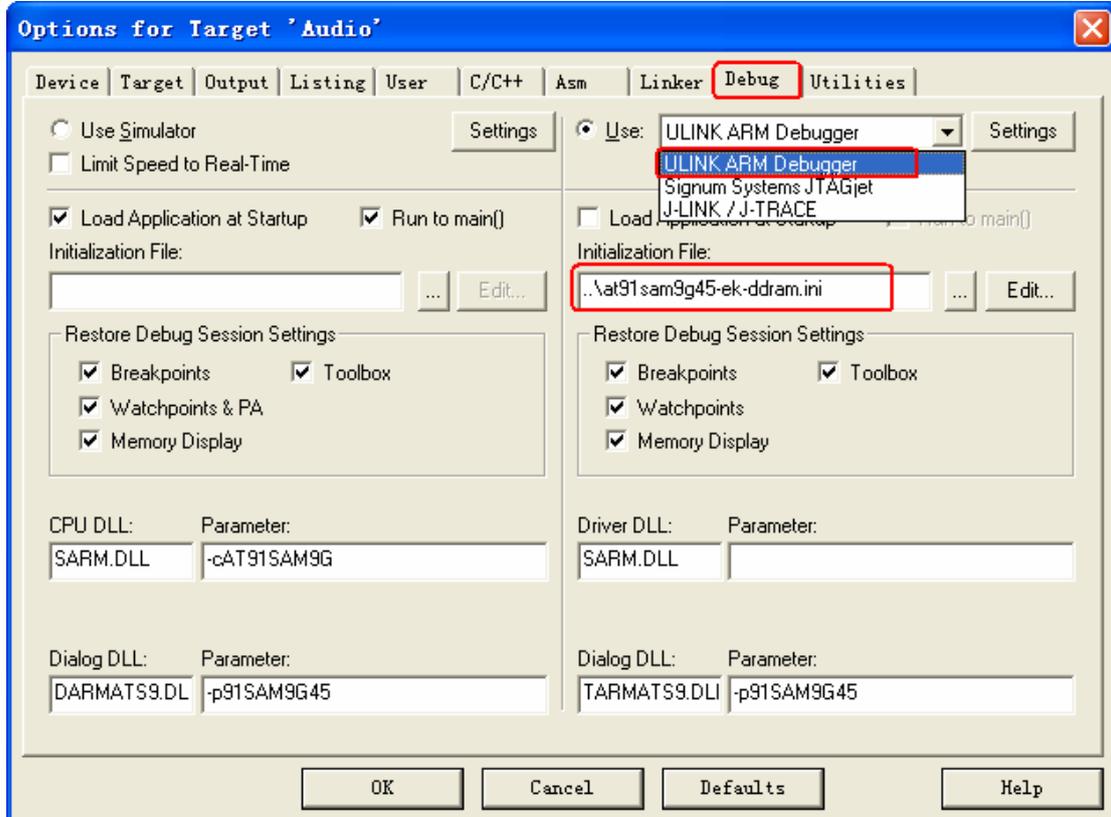
3) Click project->build, or click the shortcut button to build the routine.



5.3 Debug the routine using ULINK2

The precondition for the next steps is that you have bought or owned a corresponding hardware Emulator.

1) Choose Emulator and the initialization script.

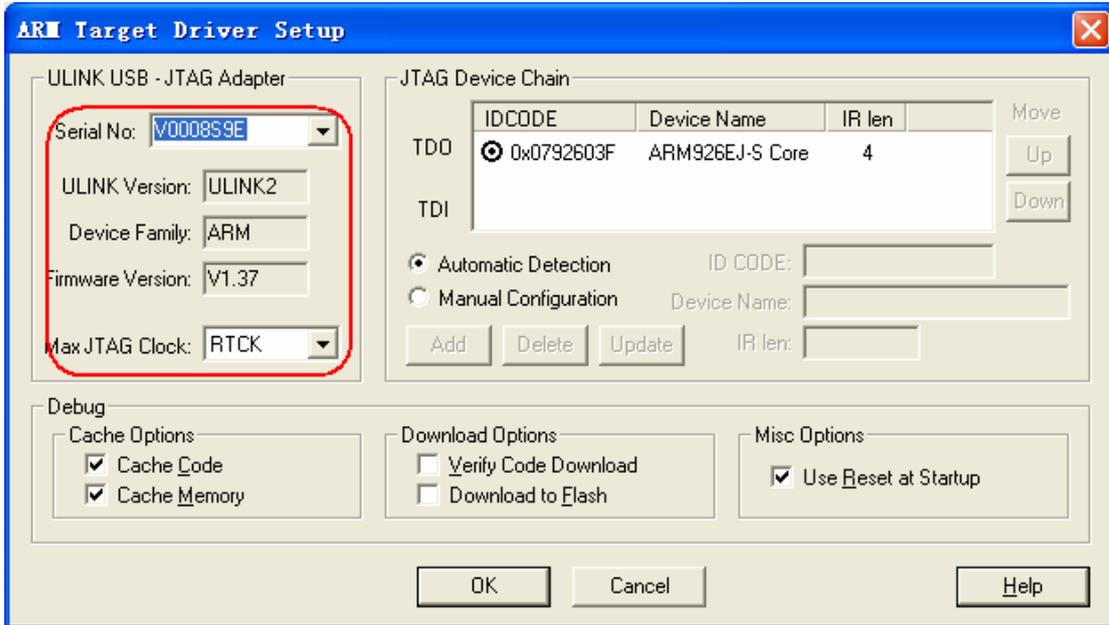


2) Check the ULINK2, optional.

When ULINK2 connects to the Development Board, if the RUN and COM indicator lights first change to blue and then go out and the USB indicator light has always been red, this proves that ULINK2 is no

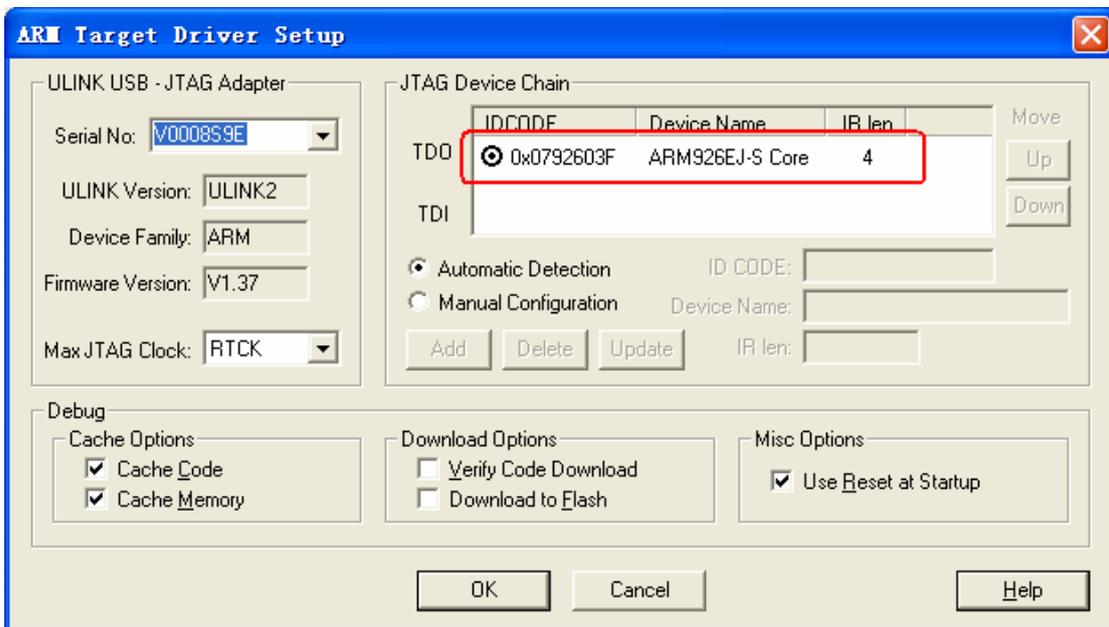
problem.

In addition, you can use the next way to check ULINK2. Click the Settings button in the Debug TAB, if the red marked part appears, it proves that ULINK2 is no problem.

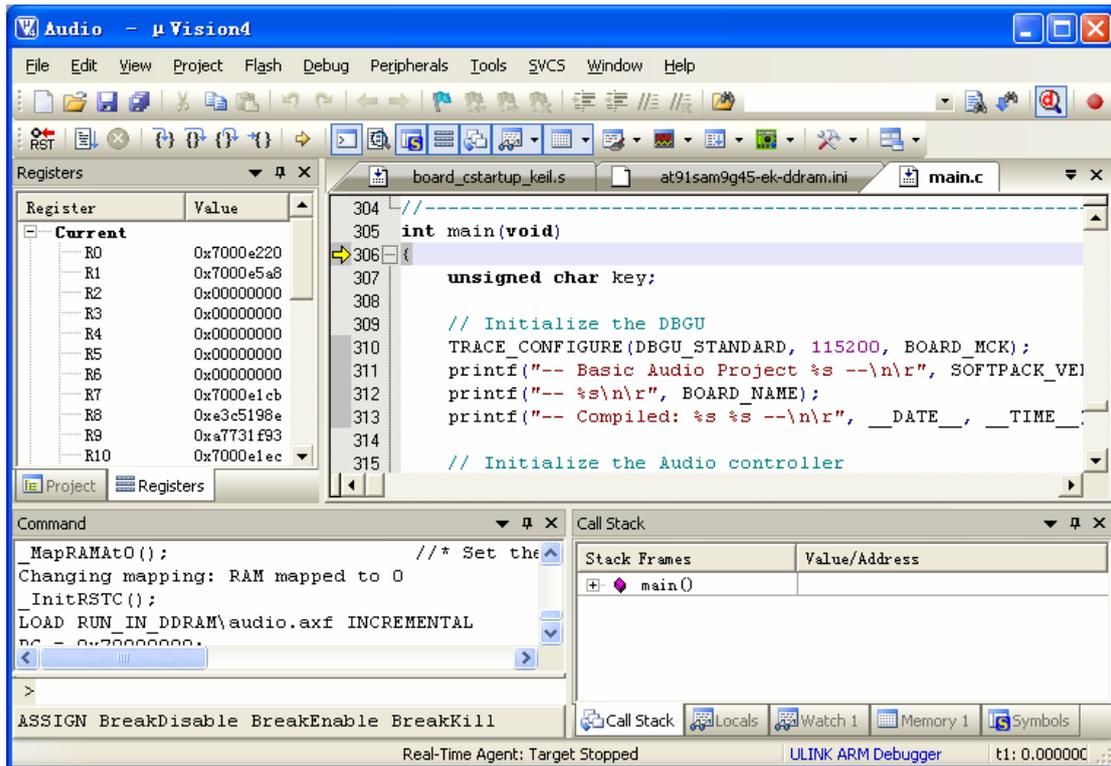


3) Check that whether ULINK2 can detect the development board or not, optional.

Click the Settings button in the Debug TAB, if the red marked part appears, it proves that ULINK2 has detected the development board.



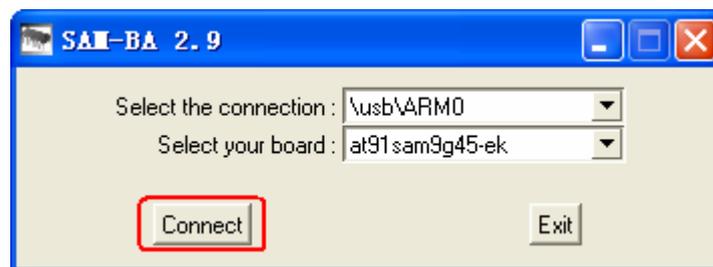
4) Start to Debug the routine by clicking shortcut button  or clicking Debug->Start/Stop Debug Session, the status of the debug as follows:



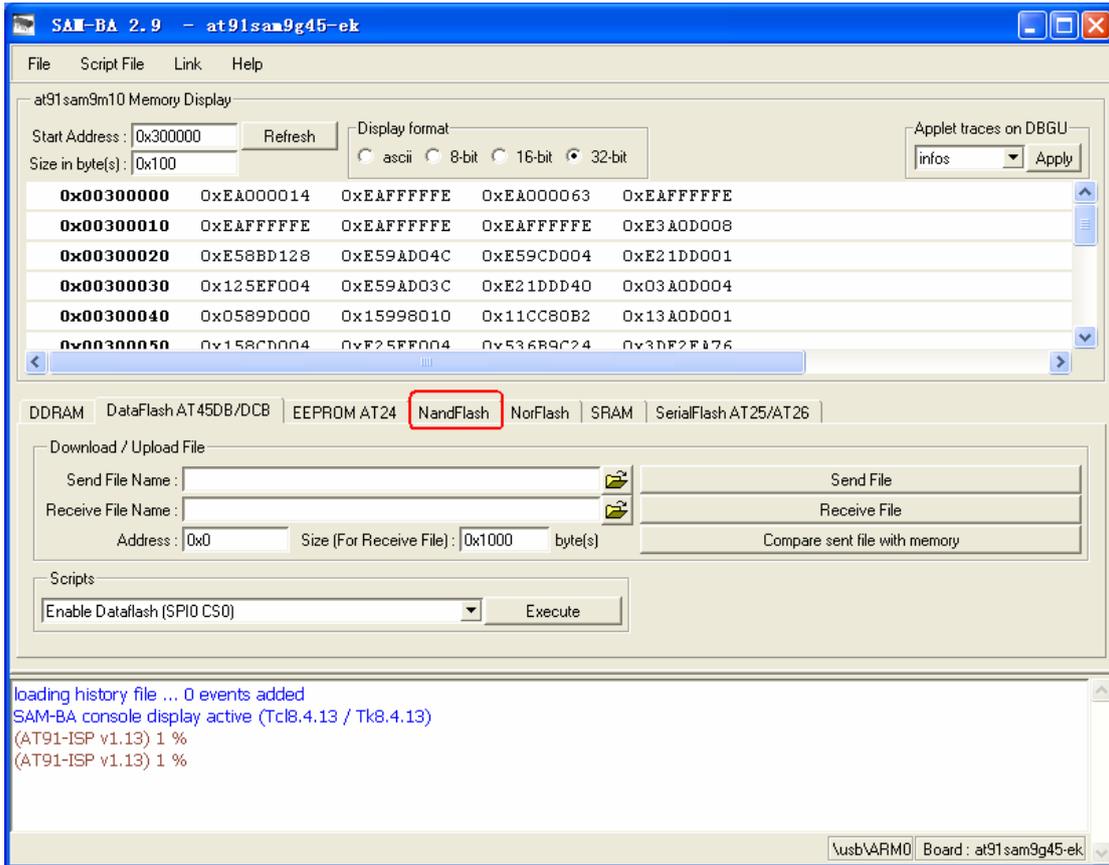
5.4 Download the application using ISP

Firstly you should install the AT91-ISP V1.13.exe in the \04-tools\SAM-BA directory, then download the application using ISP. The steps are:

- 1) The board power-up
- 2) Connect DBGU port of board and the com of PC through serial port cable.
- 3) USB Connection: Using USB cable, one end plugged into the Mini USB port on the board, the other end connected to PC.
- 4) Click "Start" -> "All programs" -> "ATMEL Corporation" -> "AT91-ISP V1.13" -> "SAM-BA v2.9", then open the SAM-BA, pop-up the below dialog:



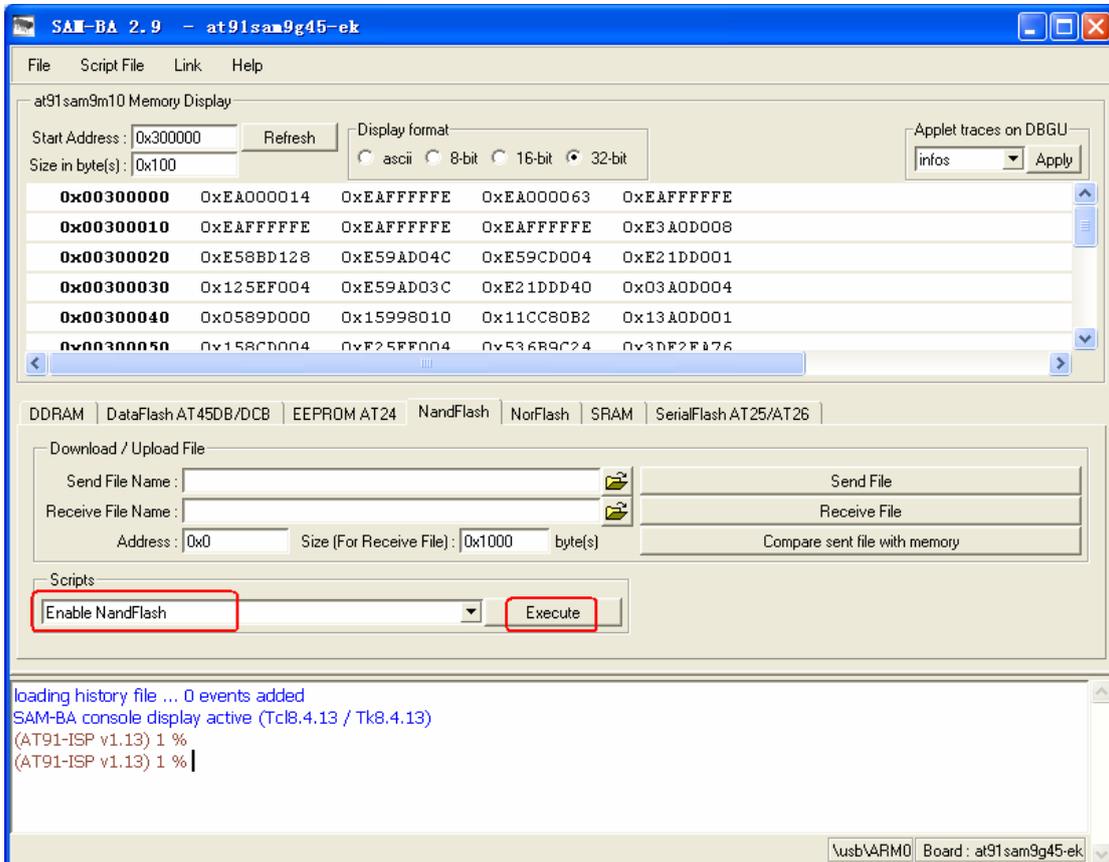
Then click 'Connect', it will display:



Now, we will start to download the application using SAM-BA.

① Enable the NandFlash

Click the NandFlash TAB in the last figure, it will display:

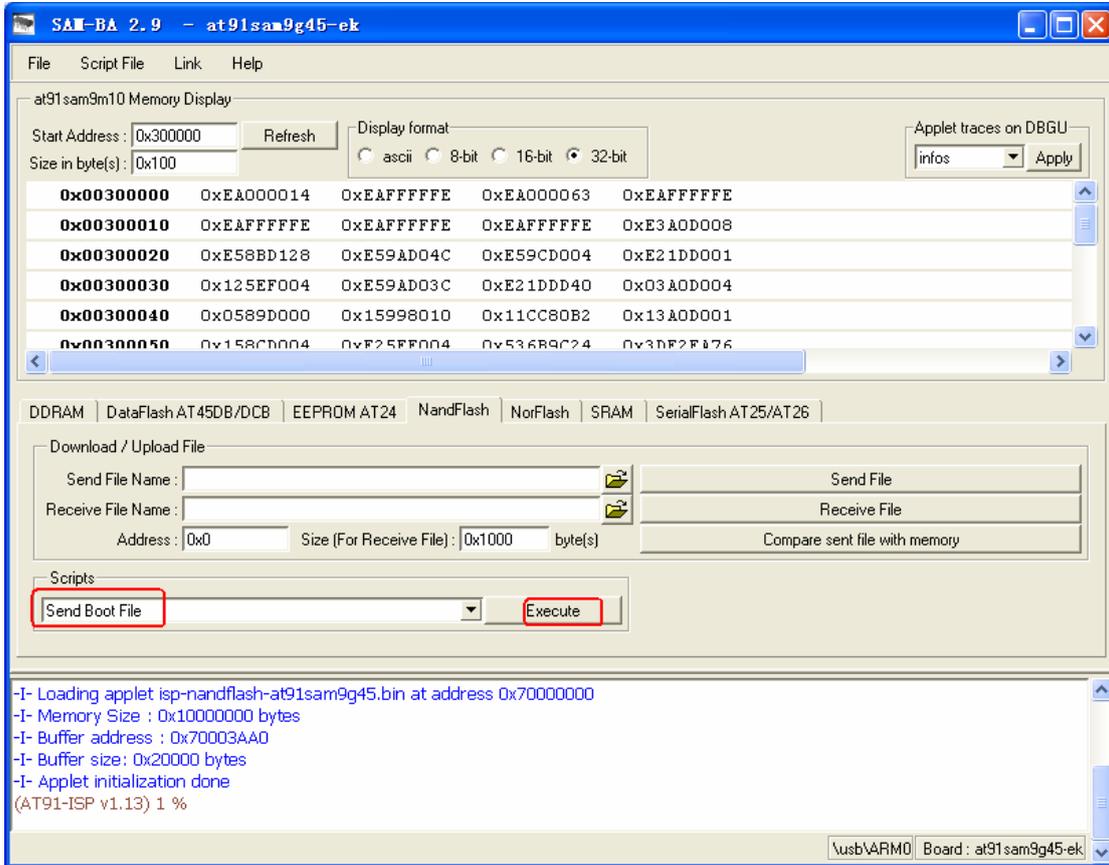


Choose 'Enable NandFlash' from the Scripts lists, then Press 'execute' to enable NandFlash.

② Download nandflash_at91sam9g45ekes.bin boot file in the SAM-BA directory.

NOTE: download nandflash_at91sam9g45ekes.bin is in order to boot the application. System will cope nandflash_at91sam9g45ekes.bin from NandFlash to DDRAM, then nandflash_at91sam9g45ekes.bin will copy 258KB content from 0x20000 address to DDRAM.

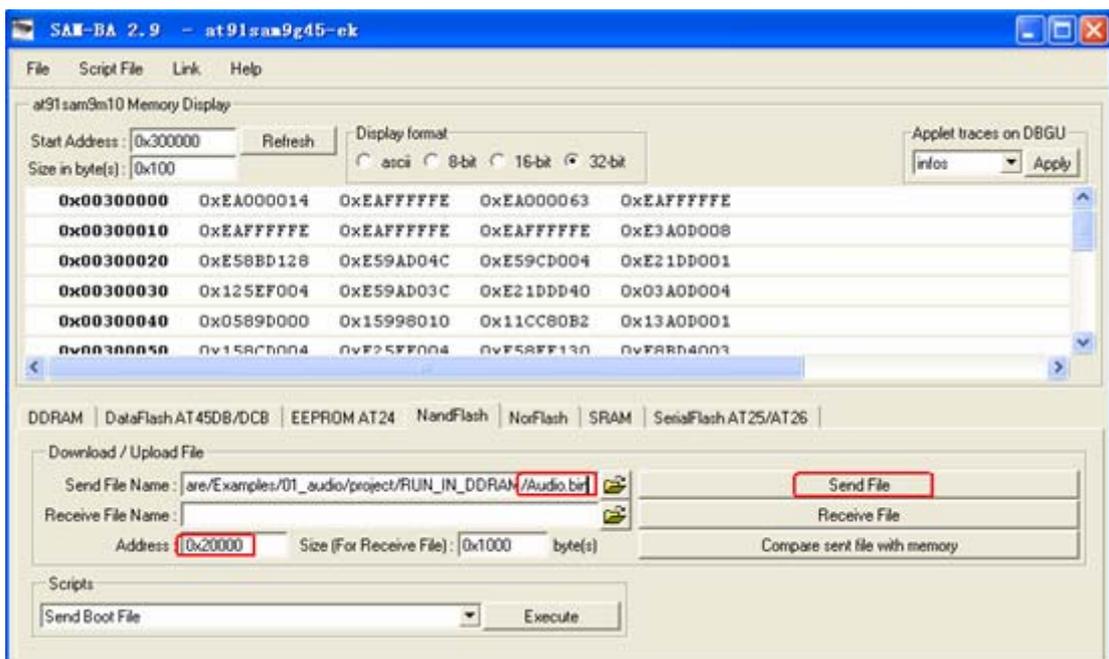
Choose 'Send Boot File' in the Scripts lists, as follow:



Click 'execute' button, choose nandflash_at91sam9g45ekes.bin from the open dialog.

③ Download your application, take Audio.bin for example.

Choose Audio.bin in the Send File Name, fill in 0x20000 in the Address textbox, as follow:



Then Click 'Send File' to download the Audio.bin.

5) After reset the board, the application will run.

NOTE: If you want to download the application to NandFlash again, you will firstly clean up the data in the NandFlash, or SAM-BA can not start up. The way to clean up the NandFlash: Press the USER2 button in the board, at the same time, press NRST button repeatedly until there is nothing display in the Serial Port.

Appendix A: After-sale Service

Embest is at your service, and we have special Technical Support Engineers to provide support and consultation in forms of telephone, E-mail and Fax.

- TEL: +86-755-25621715
- FAX: +86-755-25616057
- E-mail: support.en@embedinfo.com