GadgetPC
Single Board Computer

System Installation Guide

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BiPOM Electronics, Inc.

1. Overview

Thank you for your purchase of the GadgetPC Single Board Computer.
GadgetPC is a powerful computer board that is capable of running high-level operating systems such as Linux.

This document is for advanced users who want to learn about upgrading the boot loader to run the Linux system.

2. **Software Setup**

When GadgetPC is first powered, it goes through a boot sequence and executes various components in the following order:

    ROM boot loader (built-in ROM)
    AT91BootStrap (DataFlash)
    U-boot (DataFlash)
    Linux kernel (uimage file under USB FAT root)
    RAMDISK (gpcfs.gz file under USB FAT root)

ROM boot loader is built into the AT91SAM9260 microcontroller and cannot be changed. As soon as the board is powered the ROM boot loader starts. It downloads and runs an application (AT91BootStrap) from external storage media (DataFlash) into internal SRAM. AT91BootStrap has been developed by BiPOM Electronics specifically for GadgetPC.

AT91BootStrap is responsible for initializing hardware such as DataFlash, SDRAM, digital outputs, and USART0 serial port.

AT91BootStrap downloads to SDRAM and passes control to U-Boot which is a powerful boot loader that resides also in DataFlash. U-Boot performs many low-level tasks such as detecting USB hardware, reading Linux image from external USB flash drive, uncompressing Linux image to SDRAM, and passing control to Linux image in SDRAM.

U-Boot is open source system that may be upgraded from time to time by BiPOM Electronics for additional functionality. U-Boot can be upgraded by the user as described in this document.

Linux kernel and RootFS (RAMDISK) are the two main and largest components of the operating system. These are also the easiest to upgrade since they reside on an external USB flash drive. Linux and RootFS (RAMDISK) upgrades are provided by BiPOM Electronics. However, users may also build their own Linux kernel, copy to USB flash Drive and boot from their own Linux kernel.

When Linux kernel is started, it will mount RAMDISK as RootFS.
Then Linux scripts will try to mount USB flash drive automatically.
If the USB flash drive is installed to any port, it will be detected and mounted to /mnt/usb.
If the new disk drive is mounted, an external command file /mnt/usb/user.sh will be executed.
This file can provide extra initialization of the system
    - add new users;
    - change passwords;
    - insert drivers;
    - run servers;
    - etc.

For users wishing to use the GadgetPC hardware ("bare metal") outside of the Linux environment, there is also a section that describes how to build and download your C programs to GadgetPC.

2.1. Download and install AT91 In-system Programmer from

http://www.atmel.com/dyn/resources/prod_documents/Install%20AT91-ISP%20v1.12.exe

This installation includes SAM-BA V2.8 package. After installation, SAM-BA may ask you to reboot your computer. Please reboot if instructed to do so.

**2.2.** Download GadgetPC Support Package for SAM-BA 2.8
(http://www.bipom.com/files/gadgetpc/gadgetpc_samba2_8.zip) from Software section under http://www.bipom.com/products/us/2899678.html and unzip to a temporary file on your computer.

Copy all the unzipped files and folders to C:\Program Files\ATMEL Corporation\AT91-ISP v1.12\SAM-BA v2.8\lib

Note: C:\Program Files\ATMEL Corporation\AT91-ISP v1.12\SAM-BA v2.8\lib\boards.tcl has to be replaced with BiPOM version of "boards.tcl" from the zip file.

GadgetPC folder with its files has to be under C:\Program Files\ATMEL Corporation\AT91-ISP v1.12\SAM-BA v2.8\lib

Please see the screenshot below:
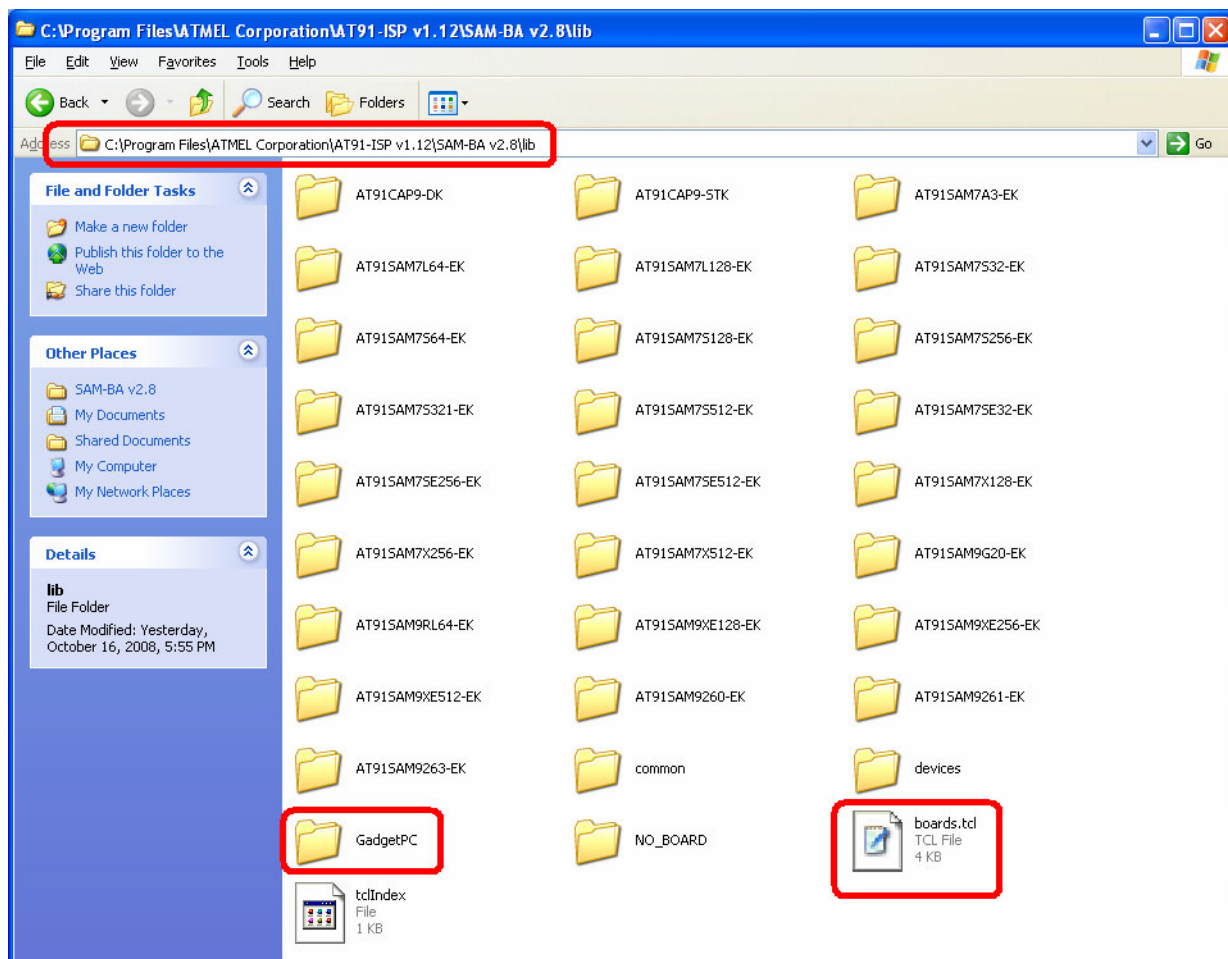
3. Hardware Setup.

This chapter explains in details how to enter the board into SAM-BA boot mode to access sub-systems of GadgetPC using SAM-BA utility from ATMEL (www.atmel.com)

GadgetPC features:

- Atmel AT91SAM9260 ARM9 microcontroller
- 32MB MT48LC16M16A2P-75:D SDRAM
- 8MB AT45DB642D DataFlash
- 4-port USB HUB (TUSB2046BIRHBR) that provides 4 USB 2.0 Full Speed (12 Mbits per second) host ports
- USB 2.0 Full Speed (12 Mbits per second) Device Port
- On-board 3.3 Volt and 1.8 Volt regulators.
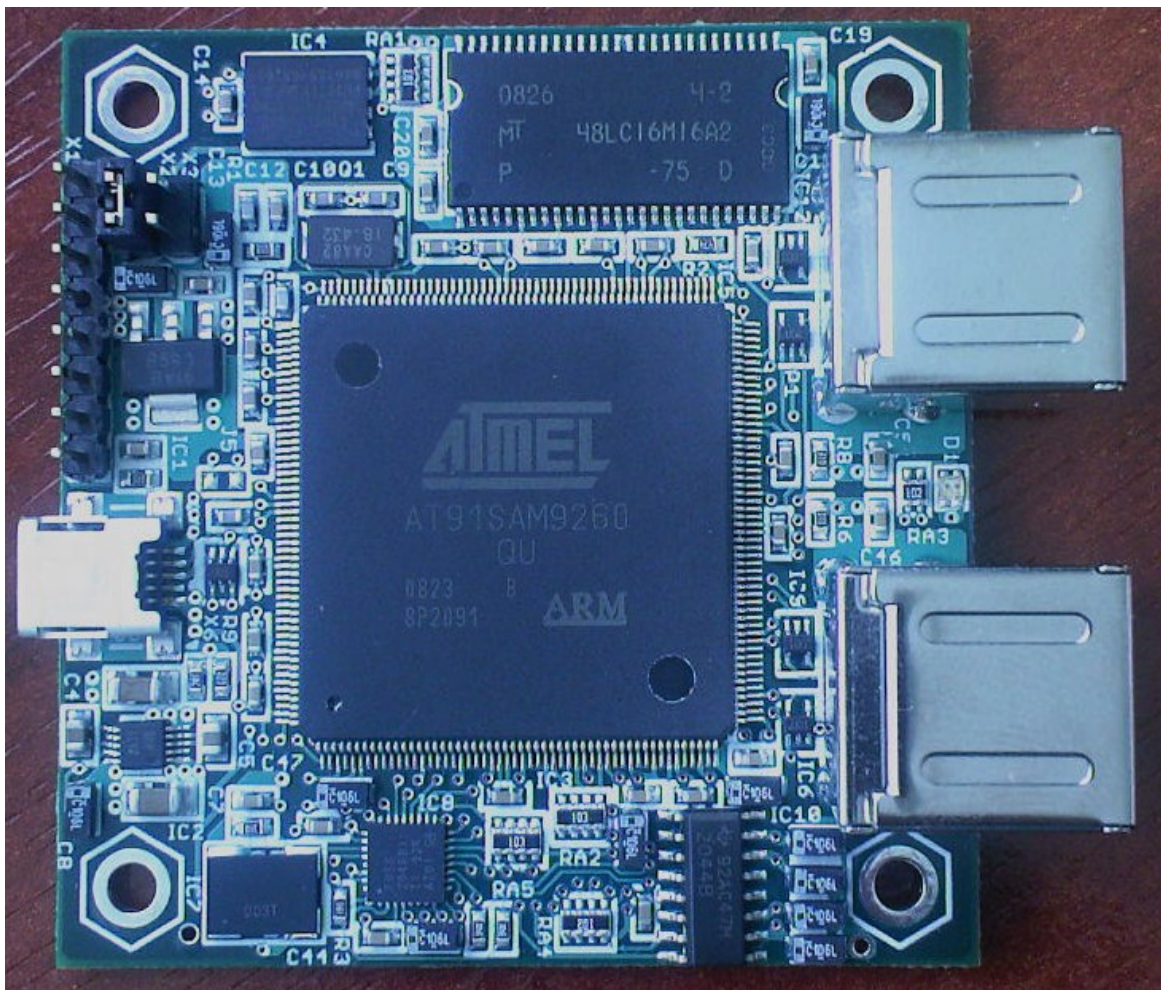
More information on AT91SAM9260 and AT45DB642D-CNU can be obtained from
www.atmel.com

More information on MT48LC16M16A2P-75:D TR can be obtained from www.micron.com

More information on TUSB2046BIRHBR can be obtained from www.ti.com

3.1. Remove X2 jumper:

Note: X2 jumper enables / disables DataFlash interface. When X2 is open the ROM boot loader can't download and run At91BootStrap loader. ROM boot in case no valid program is detected in external DataFlash supports USB Device Port. So it is possible to change DataFlash content interacting with the board using SAM-BA utility.

**3.2.** Connect one end of the USB cable to GadgetPC Device port:
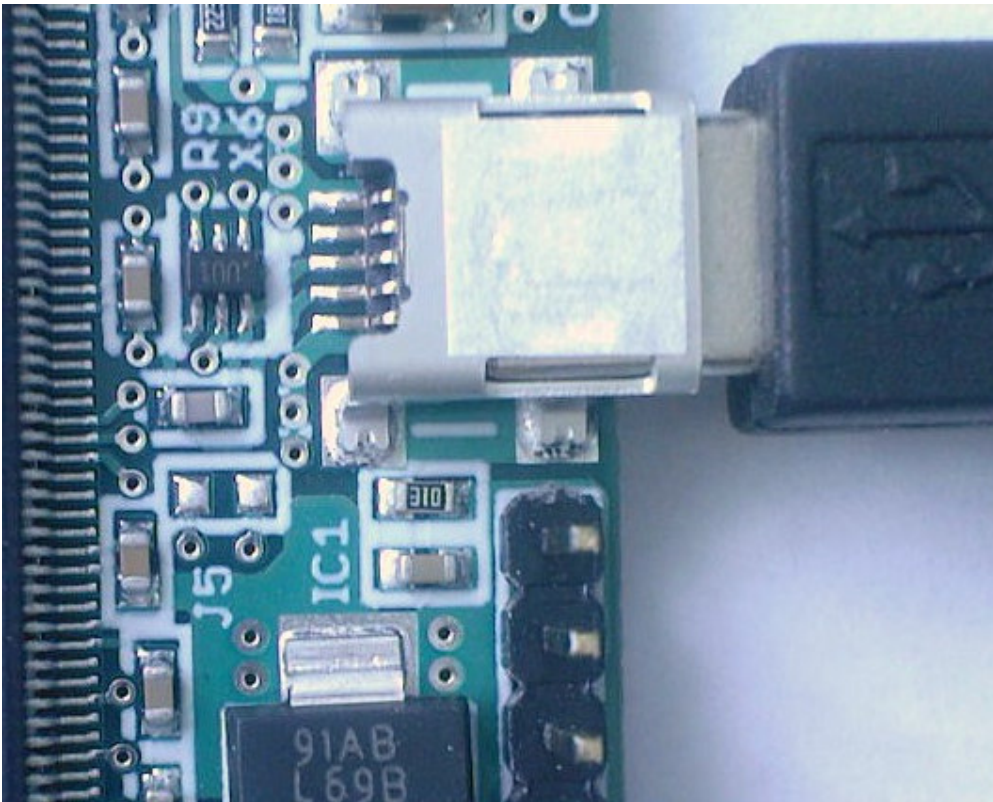
3.3. GadgetPC provides USART0 (default console) pins on an 8-pin single-row header that matches the corresponding 8 pins (from 1 to 8) of 12-pin header of RS232 to TTL Converter. It is necessary to connect the headers to each other using a flat cable. Install a J9 jumper to the RS232 to TTL Converter.
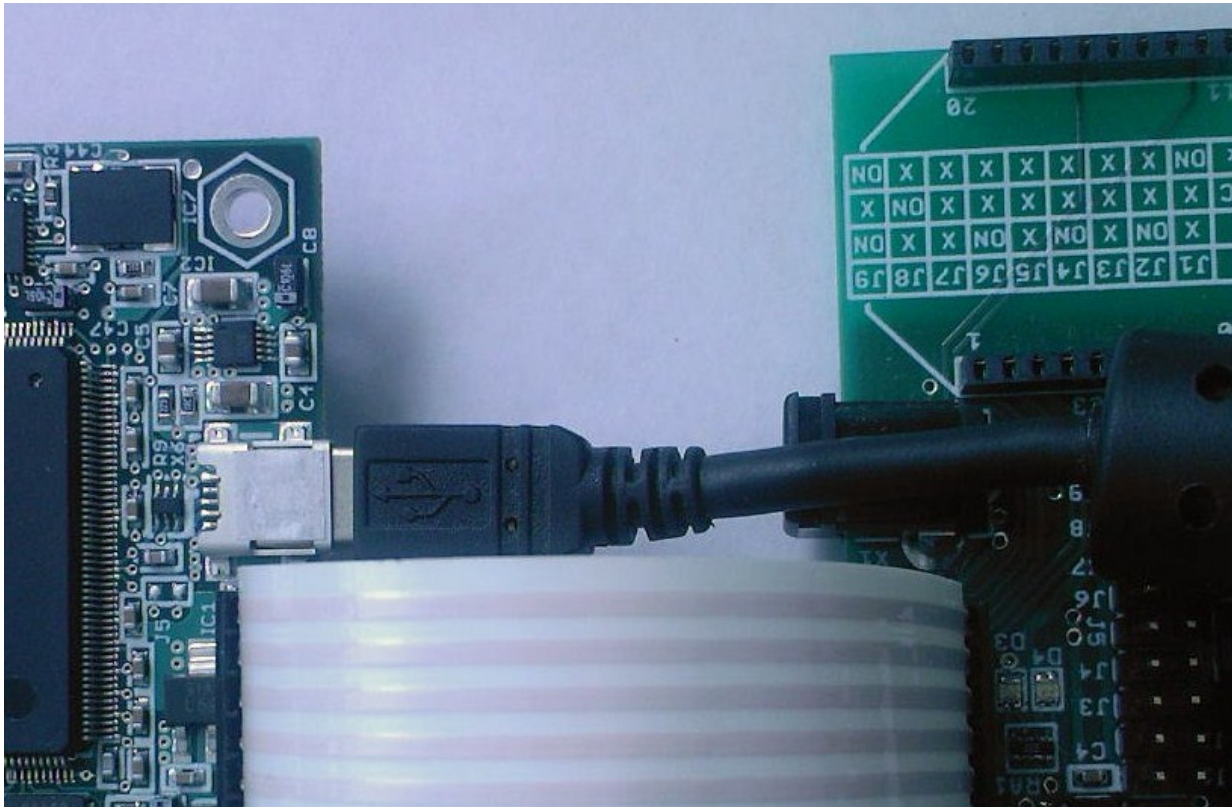
**3.4.** Connect one end of a serial cable to an available serial (COM) port on your PC.
3.5. Connect the other end of the serial cable to the "RS232 to TTL" converter.
3.6. Connect the other end of the USB cable to any USB HOST port of a PC. The board will be detected immediately:
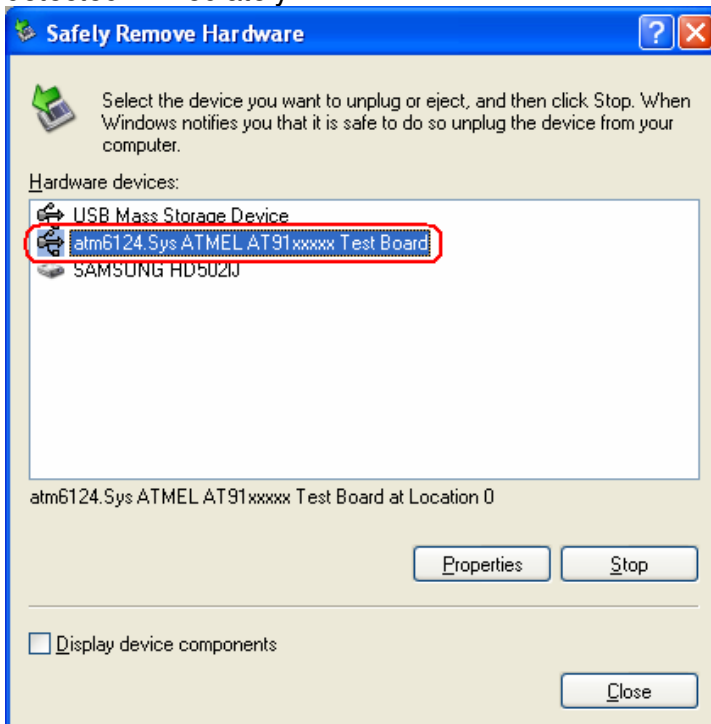
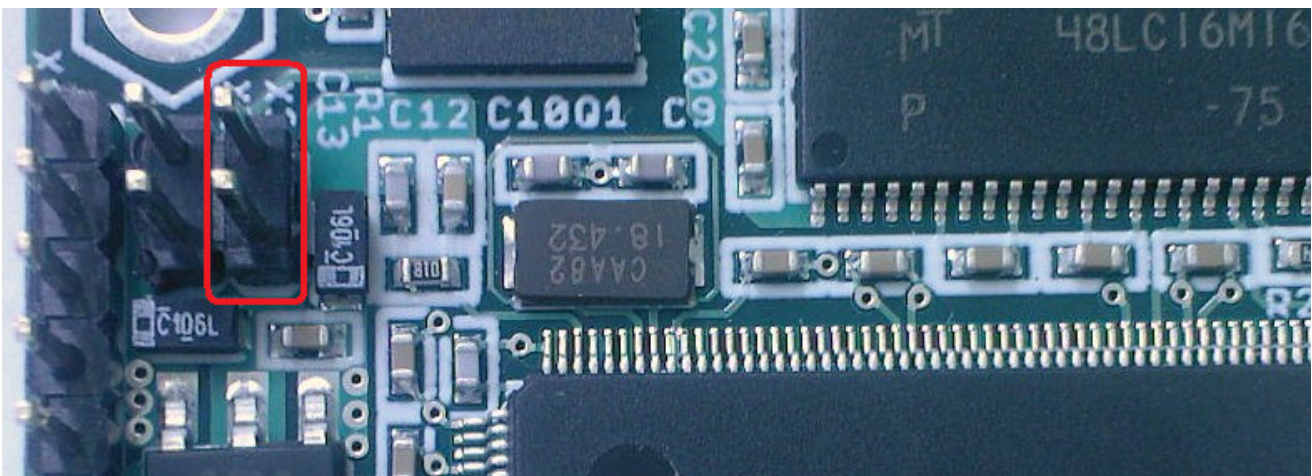*Note: If you face any problems with this step please read "4. Known issues of USB driver"*

3.7. If the board is detected, install the X2 jumper back to the board:
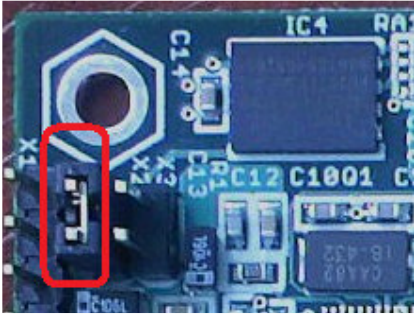
Note: Be very careful installing the jumper. The board is powered. If something gets wrong, the board can be permanently damaged.

The best thing is to use some switch instead of the jumper. So you can manipulate with X2 pins without any problems even if the board is powered.

Note. The board provides the X3 jumper as well.
When the jumper is installed the DataFlash chip is write-protected.

4. Known issues of USB driver

If the board is detected you may skip this chapter.

If you face any problems with the board detection (3.6. step) please try to install the USB driver manually.
For example, on some Windows PC's, GadgetPC may be recognized as "GPS Camera" by Windows. This is probably because there are some GPS Cameras that are using the same ATMEL microcontroller as GadgetPC.

To resolve this try the following:
- select System under Windows Control Panel;
- select Device Manager under Hardware tab;
- expand the Ports devices by clicking on the + sign to the left of "Ports". You will see a view similar to the following:
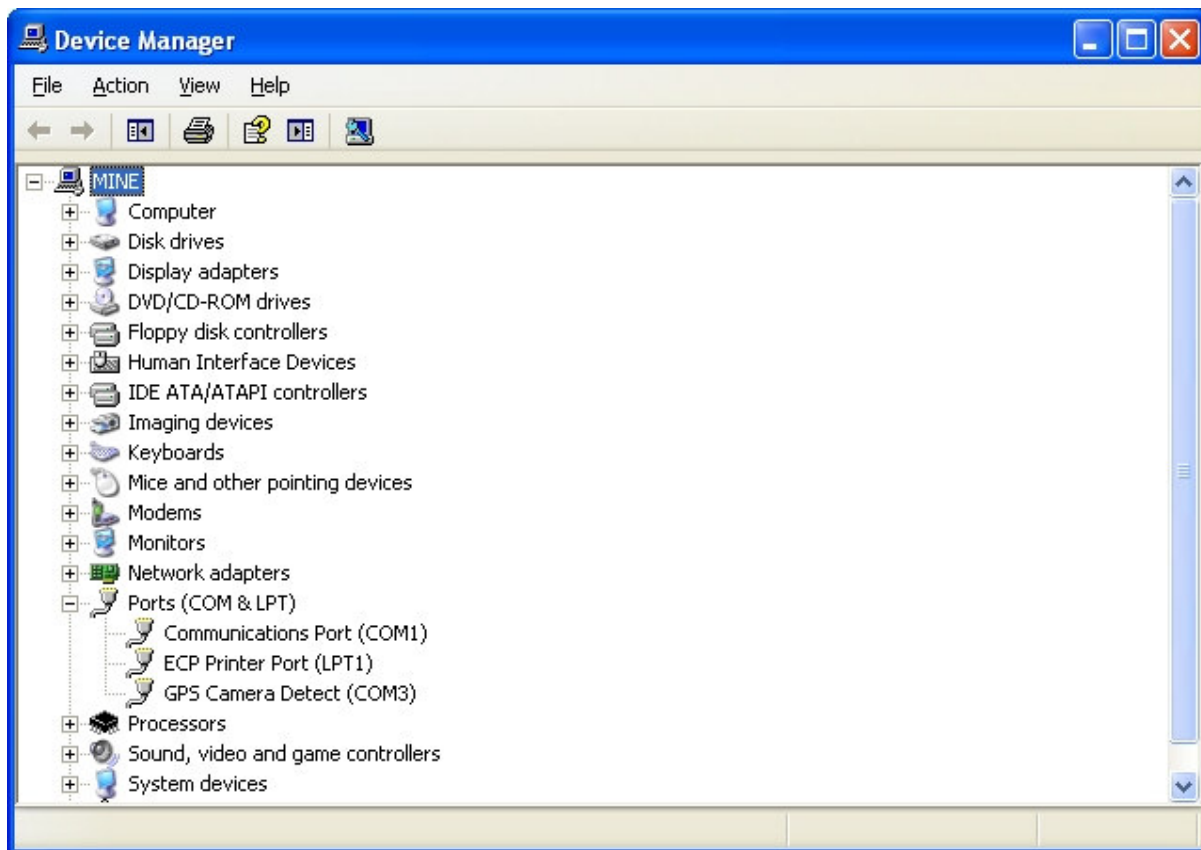
Please note that GadgetPC appears as GPS Camera under Ports (COM&LPT).

To correct this and make the GadgetPC appear as a USB device, make the following steps:
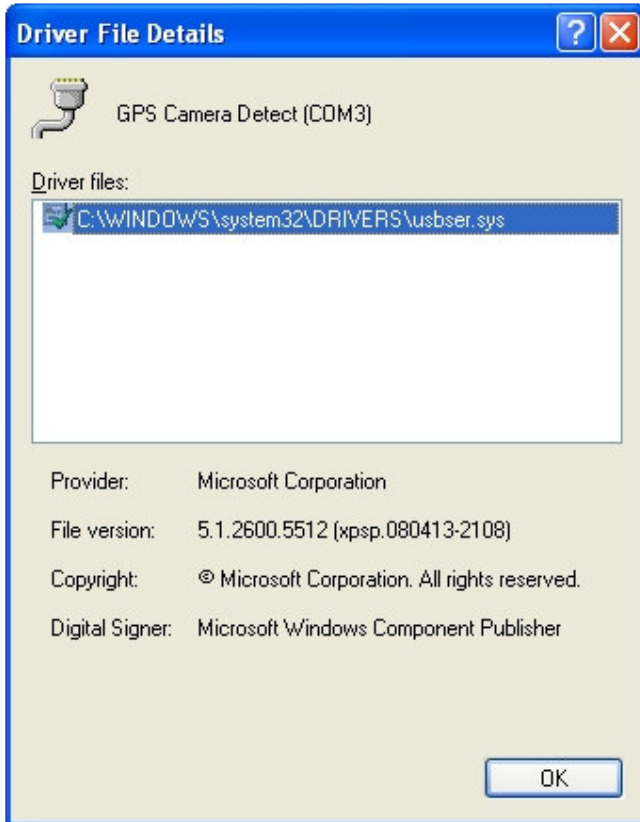
4.1. Right click on GPS Camera Detect… and this will bring up the menu:
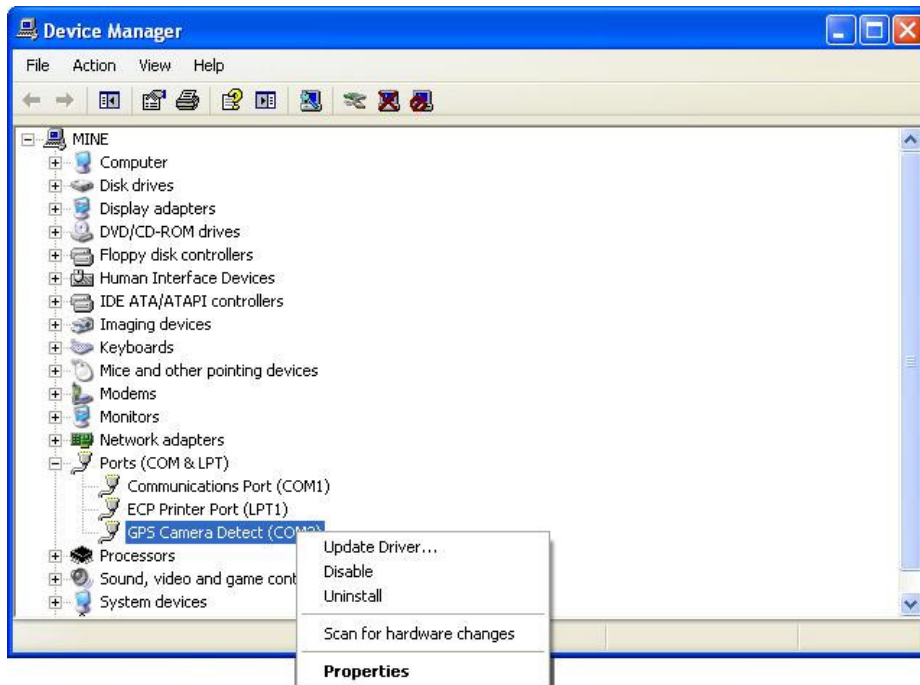
4.2. Select Properties from the menu.

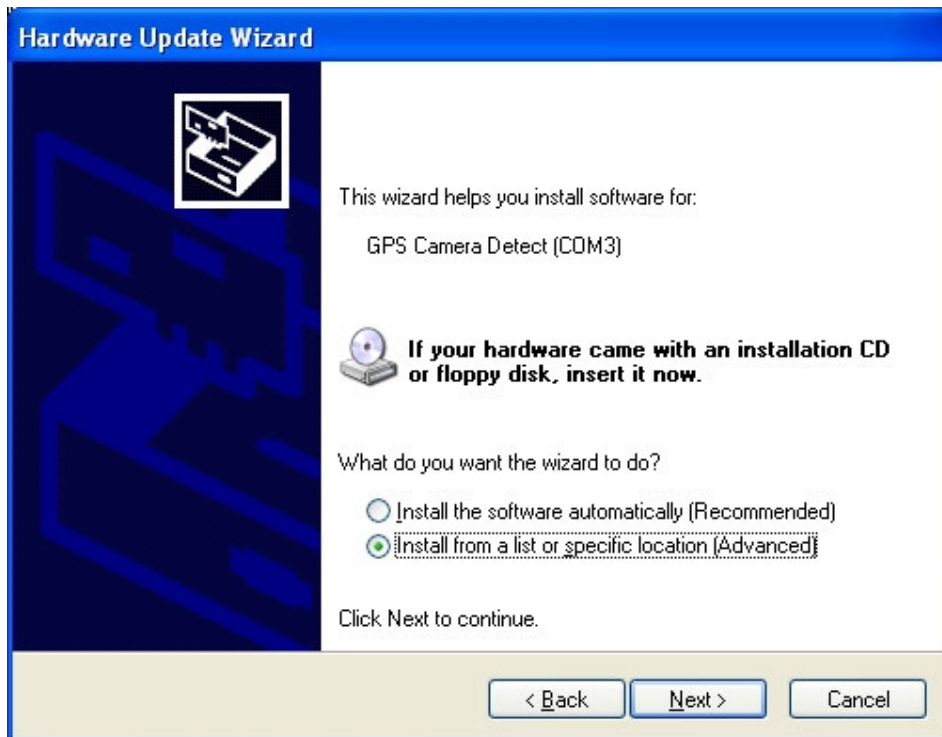**4.3.** Click on Driver tab and click the Driver Details button:

usbser.sys is shown as the driver for GadgetPC. This is incorrect. We will correct this. Click OK.

**4.4**. Click the Update Driver button.

4.5. Select "No, not this time". Click Next:

Hardware Update Wizard

Welcome to the Hardware Update Wizard

Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission).
Read our privacy policy

Can Windows connect to Windows Update to search for software?

- ○ Yes, this time only
- ○ Yes, now and every time I connect a device
- ⦿ No, not this time

Click Next to continue.

< Back   Next >   Cancel

4.6. Select "Install from a list or specific location (Advanced). Click Next:

Hardware Update Wizard

This wizard helps you install software for:

GPS Camera Detect (COM3)

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.

< Back   Next >   Cancel

4.7. Select "Don't search. I will choose the driver to install". Click Next.
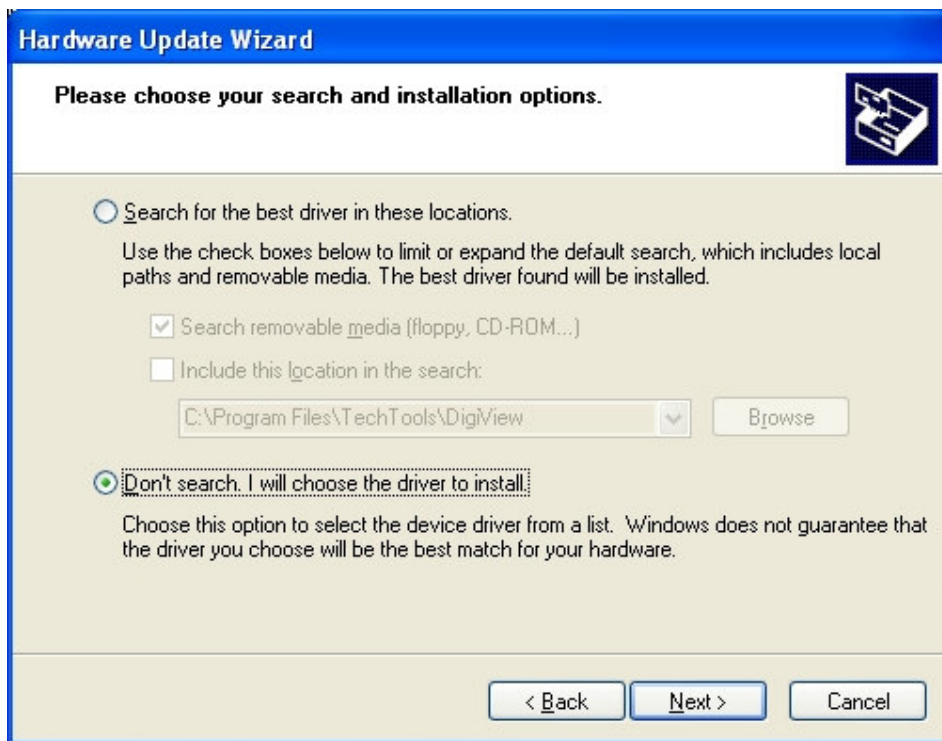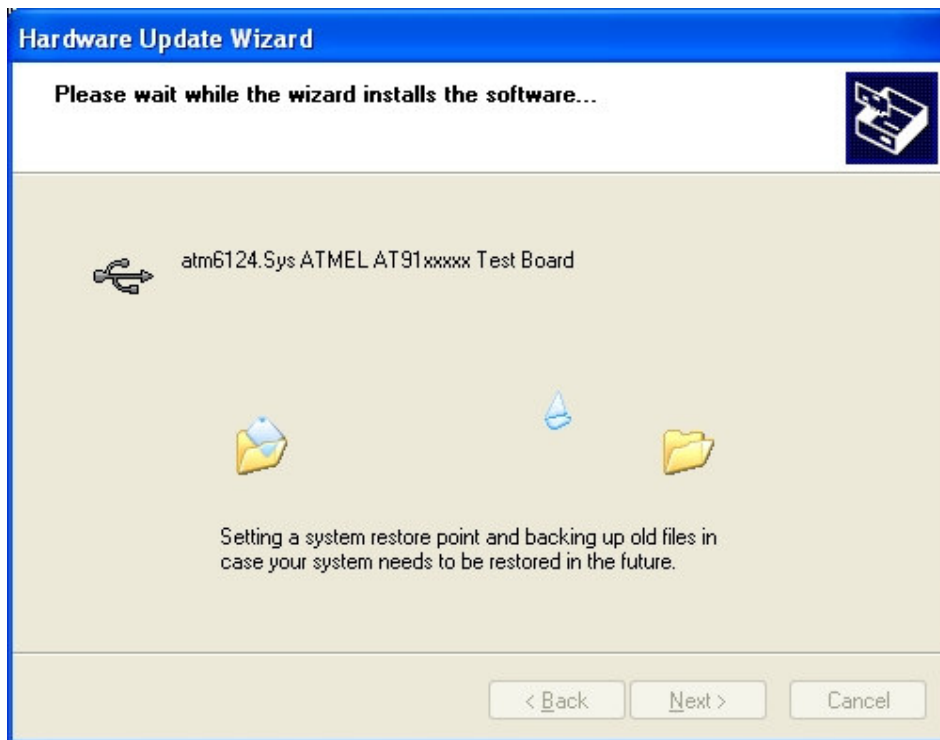

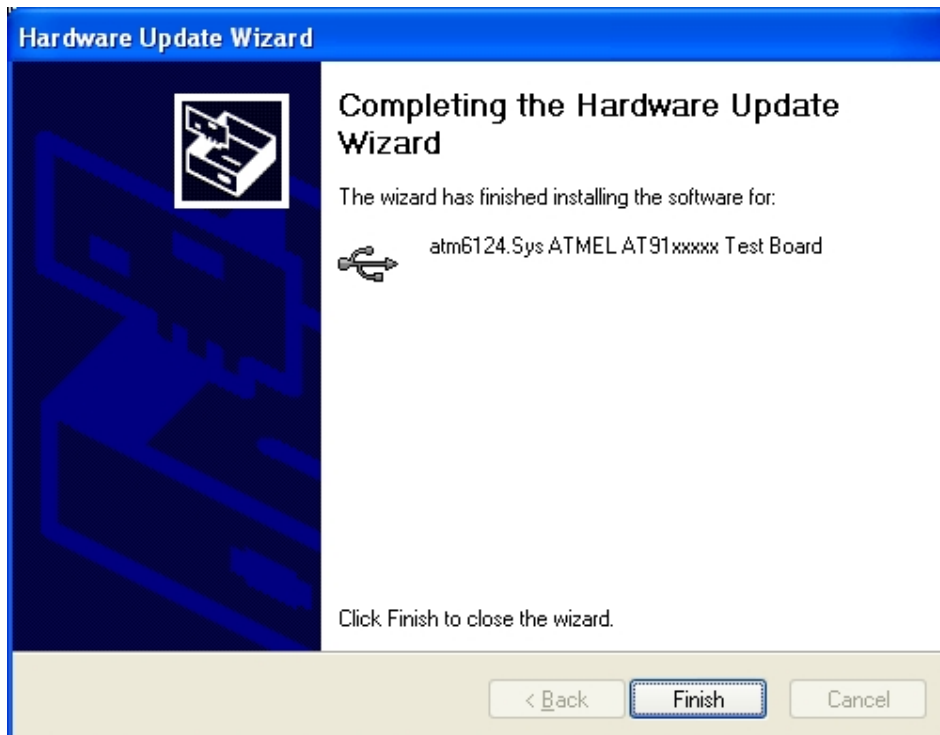**4.8.** You should now see the following view:
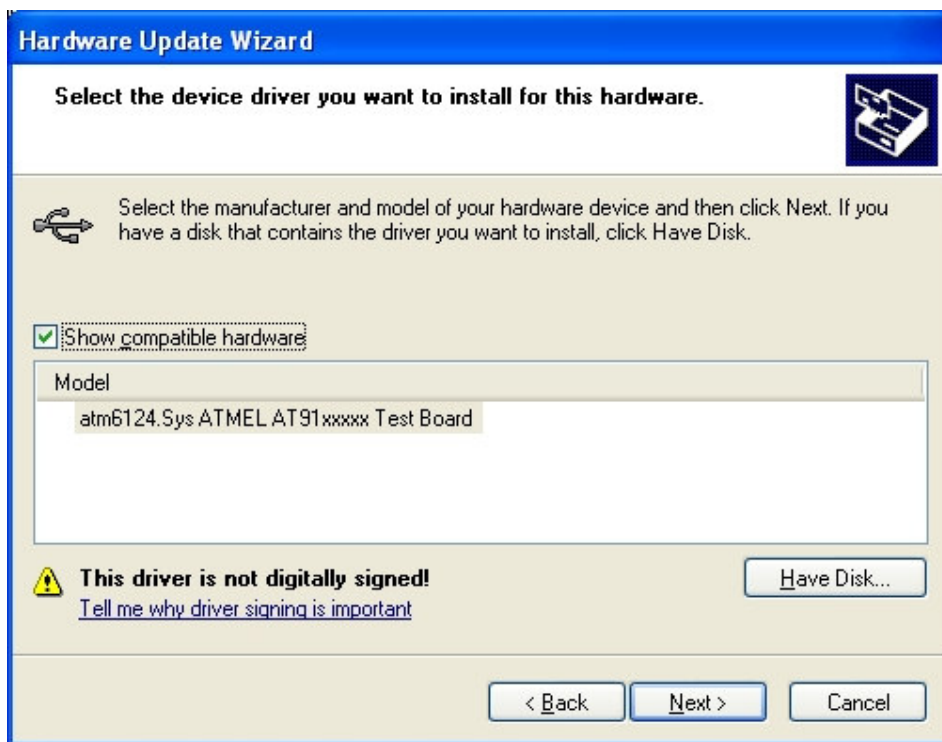
Move your mouse over **"atm6124.Sys ATMEL AT91xxxxx Test Board"** and click to select. Then click Next.

4.9. You should see the proper driver software being installed as follows:
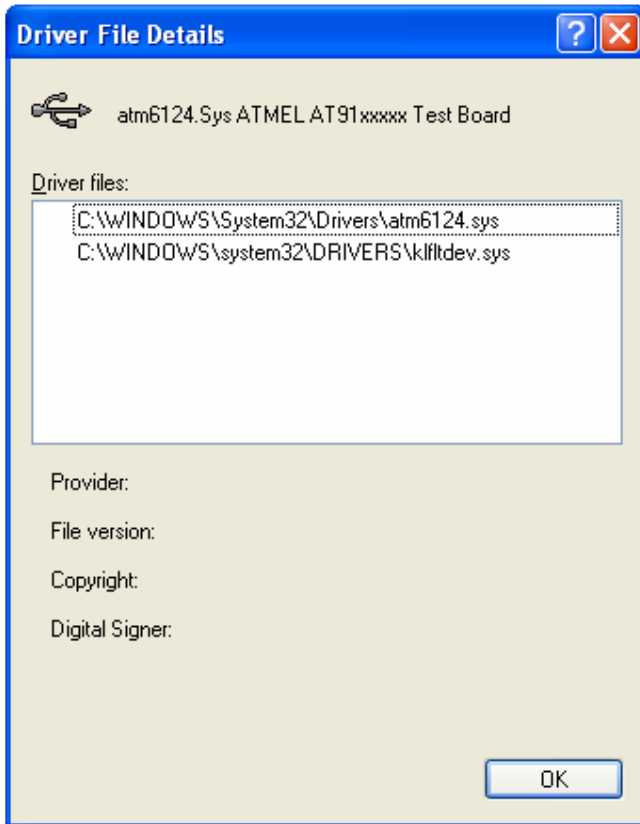

4.10. When the installation is completed, you will see the following:

Click Finish.

4.11. Go back to Device Manager. You should now see that GadgetPC has moved from under "Ports" section to under "Universal Serial Bus Controllers" section. The name may still be "GPS Camera Detect". This is harmless. As long as it appears under "Universal Serial Bus Controllers", it will work.

Note: Now the USB driver is installed properly.
Try to pass all steps of "Hardware Setup" to enter the board into SAM-BA boot mode.

5. Using GadgetPC without an operating system (SDRAM test)

If you plan to use GadgetPC with an operating system such as Linux only, you can skip this section.

Development software for GadgetPC includes ARM Development System and GNUARM C compiler. To download the developed firmware to GadgetPC, SAM-BA loader from ATMEL(www.atmel.com) is used.

Note: In order avoid any potential problems please install all software to their default locations.

5.1. Download and install the latest release of ARM development system based on Micro-IDE from
http://www.bipom.com/armdev.php

Micro-IDE is a Windows based Integrated Development Environment for micro-controller systems application development. Micro-IDE integrates essential components of software development including

- Multi File Editor with C/ASM language syntax coloring
- Integration with toolkits including command line compilers, assemblers and linkers
- Project Manager
- Tools: Terminal program, Calculator, ASCII Chart

5.2. Download and install GNUARM GCC Compiler from http://www.bipom.com/armdev.php

5.3. SDRAM Test

ARM development system provides SDRAM test. To run the test it is necessary to:

- Compile the existing example using ARM development system;
- Download the resulting GadgetPC_sdram.bin file to DataFlash;
- Connect the board output to Micro-IDE terminal.

5.3.1. To compile the existing GadgetPC_sdram example please go to
C:\bipom\devtools\GCC\AT91SAM9\Examples\SDRAM\GadgetPC_SDRAM folder.

5.3.2. Double-click *GadgetPC_sdram.prj*.
5.3.3. The Micro-IDE will be launched automatically

5.3.4. Press "Build All" icon button. It will compile the example building the *GadgetPC_sdram.bin*
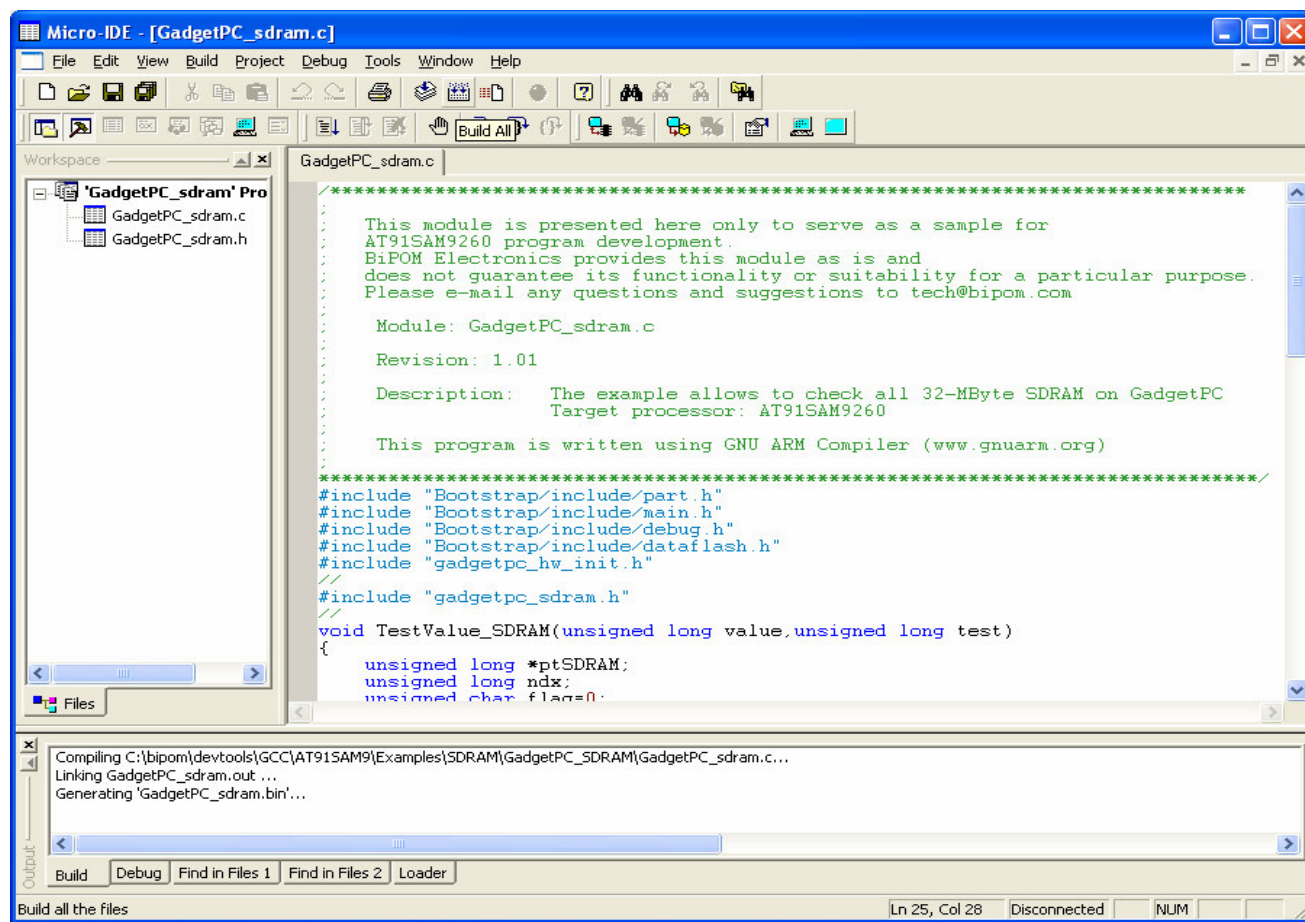

Note: The compiled example can be downloaded from
www.bipom.com/support/gadgetpc/GadgetPC_SDRAM.zip

5.3.5. Run **C:\Program Files\ATMEL Corporation\AT91-ISP v1.12\SAM-BA v2.8\SAM-BA.exe**
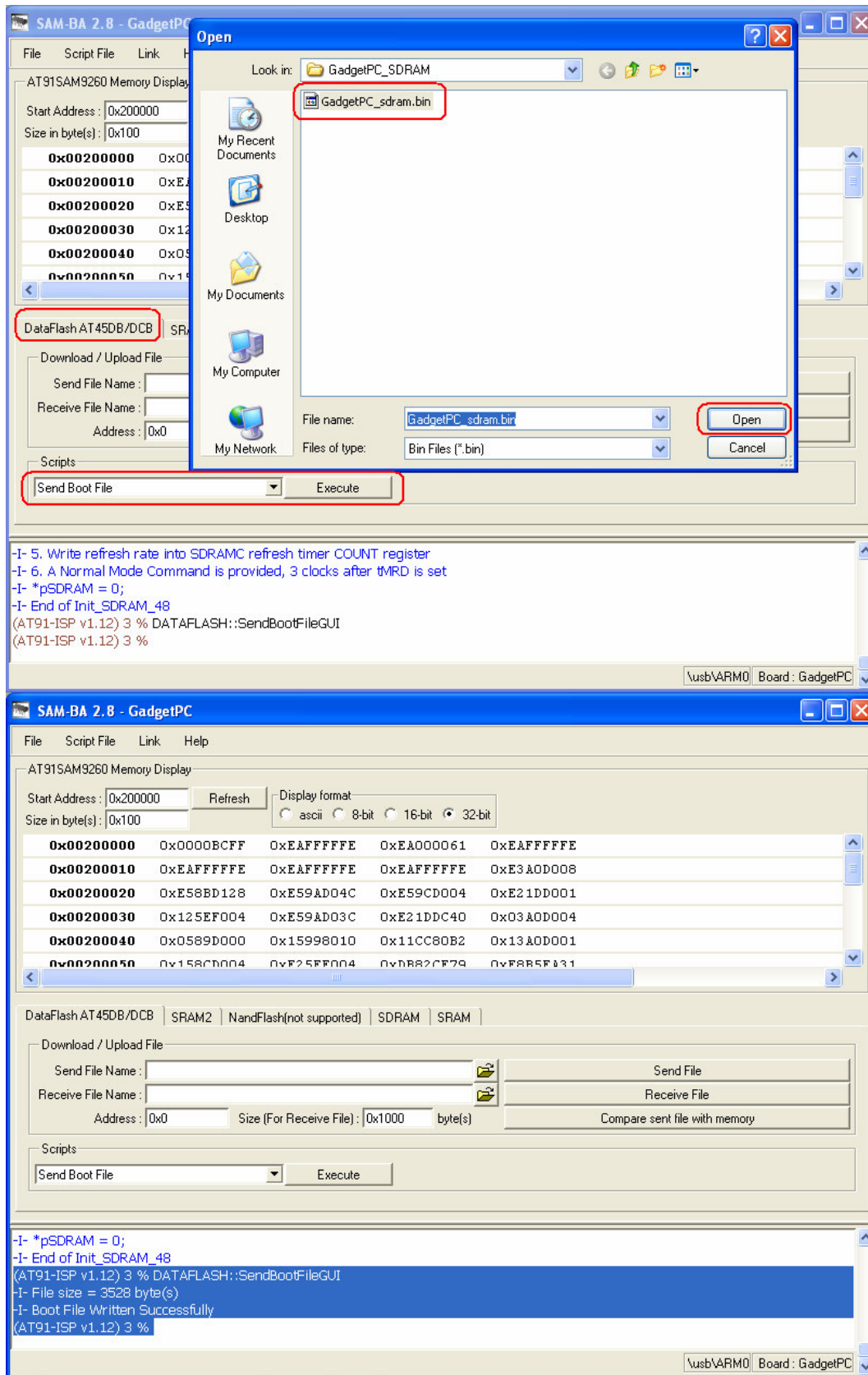Select "\usb\ARM0" and "GadgetPC" from pull-down lists and press "Connect"
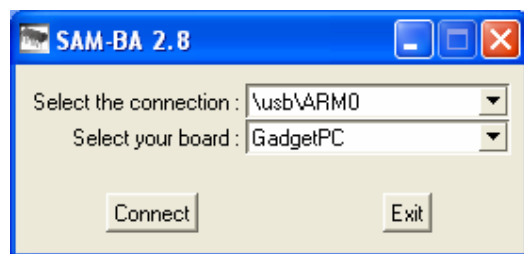
Note: If you face problems with this step please pass through all steps of "Hardware Setup" again.

5.3.6. Select "DataFlash AT45DB/DCB"/"Enable Dataflash on CS1" and press "Execute" button
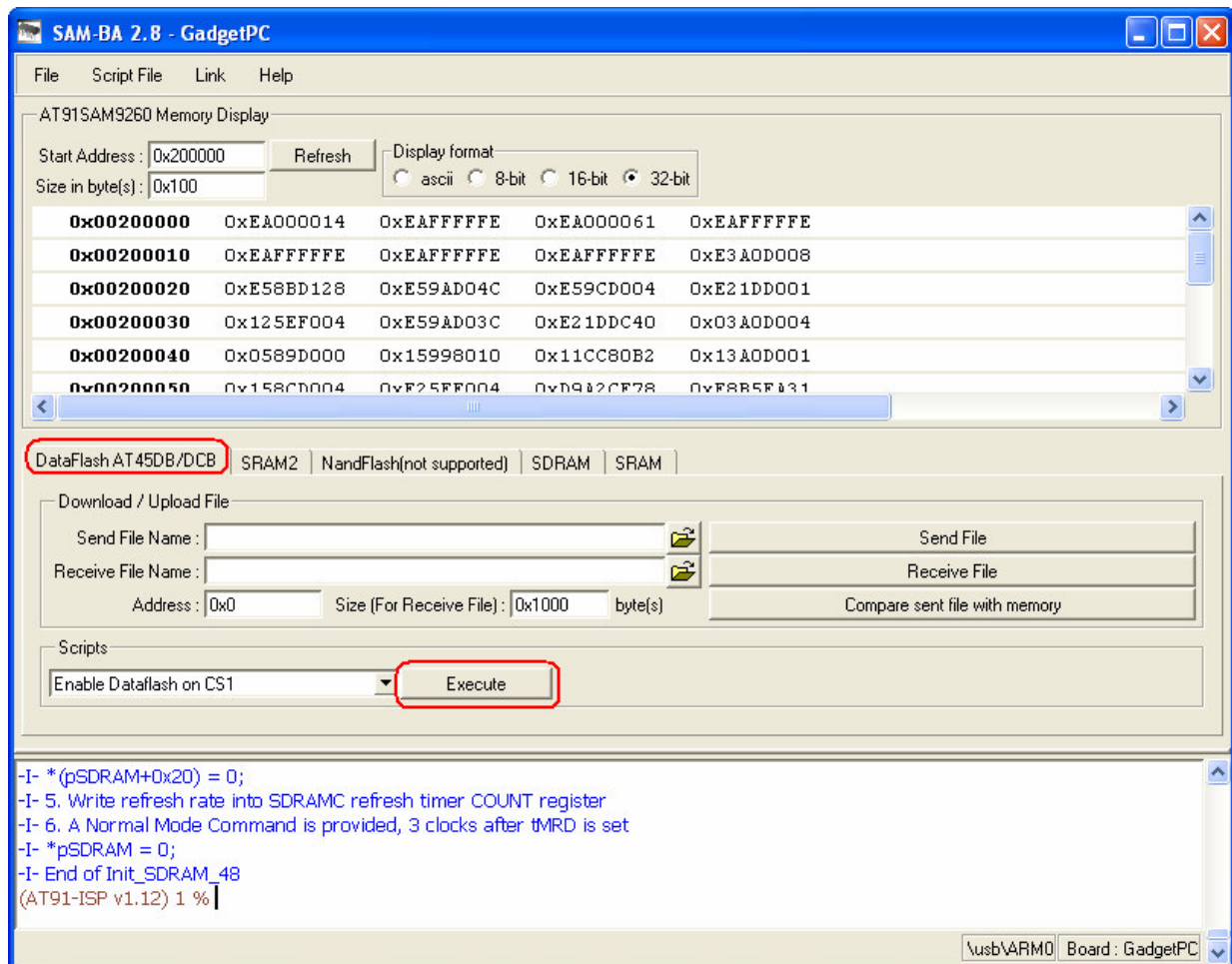
5.3.7. Please select "Send Boot File" and press "Execute". Then select *GadgetPC_sdram.bin* and press "Open"
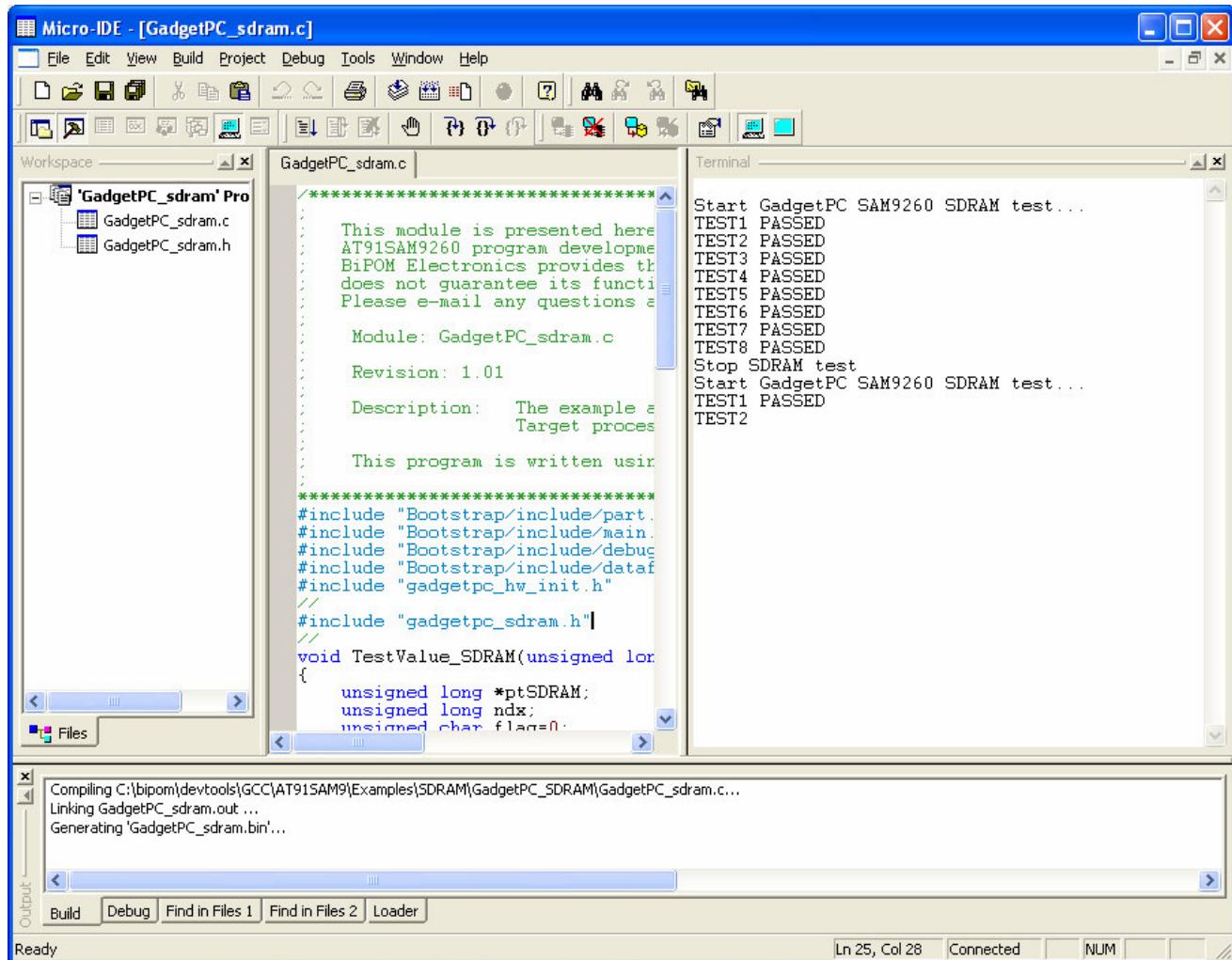

Close the SAM-BA window.

5.3.8. To connect the board output to Micro-IDE terminal please go to Tools->Options-Terminal of Micro-IDE.
Please configure the COM port to 115200 baud rate, 8 data bits, parity none, 1 stop bit.
Press "Connect" icon button on Micro-IDE toolbar.
Disconnect and reconnect the USB cable to start the SDRAM test.

Note: The board will not be detected as "ATMEL AT91xxxxx Test Board "anymore due to the new loaded SDRAM test firmware. It will always start with SDRAM test. In order to access the board using SAM-BA it is necessary to start from "Hardware Setup".

Note: if you see the message box like "No loader …" please uncheck all checkboxes under "Project Settings/General" of Micro-IDE
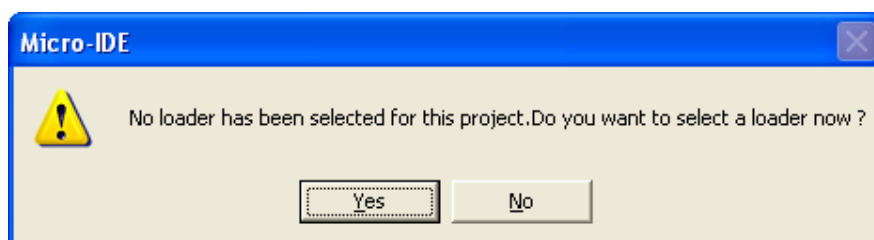
6. U-Boot loader on GadgetPC

6.1. Download and install GadgetPC Linux release from Software section under
http://www.bipom.com/products/us/2899678.html
The release provides all necessary components to configure and run Linux on GadgetPC:
- compressed Linux kernel (uImage file);
- compressed RAMDISK image (gpcfs.gz)
- utilities;
- drivers;
- user.sh command file

6.2. In order to install U-Boot loader to GadgetPC it is necessary to download
C:\bipom\devtools\GadgetPC\loader\ GadgetPC_USB_loader.bin file to the board using SAM-BA utility.
GadgetPC_USB_loader.bin is a complete image of loader that includes:
- At91BootStrap loader;
- U-boot loader.

6.2.1. Execute all steps of "Hardware setup" to enter the board into SAM-BA boot mode.
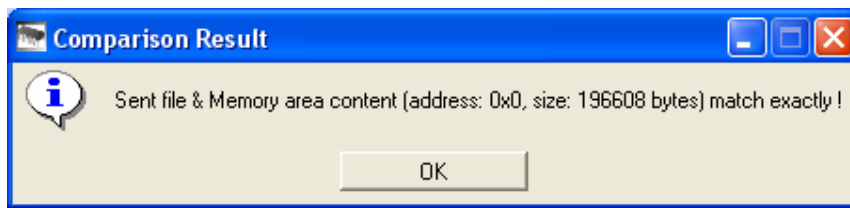**6.2.2.** Execute 5.3.5 and 5.3.6 steps to run SAM-BA utility to initialize DataFlash.
6.2.3. Please assign GadgetPC_USB_loader.bin to the "Send File Name Field", then press "Send File".
The "Please Wait…" message box will appear.
It will download the GadgetPC_USB_loader.bin file to the board in 17 seconds.
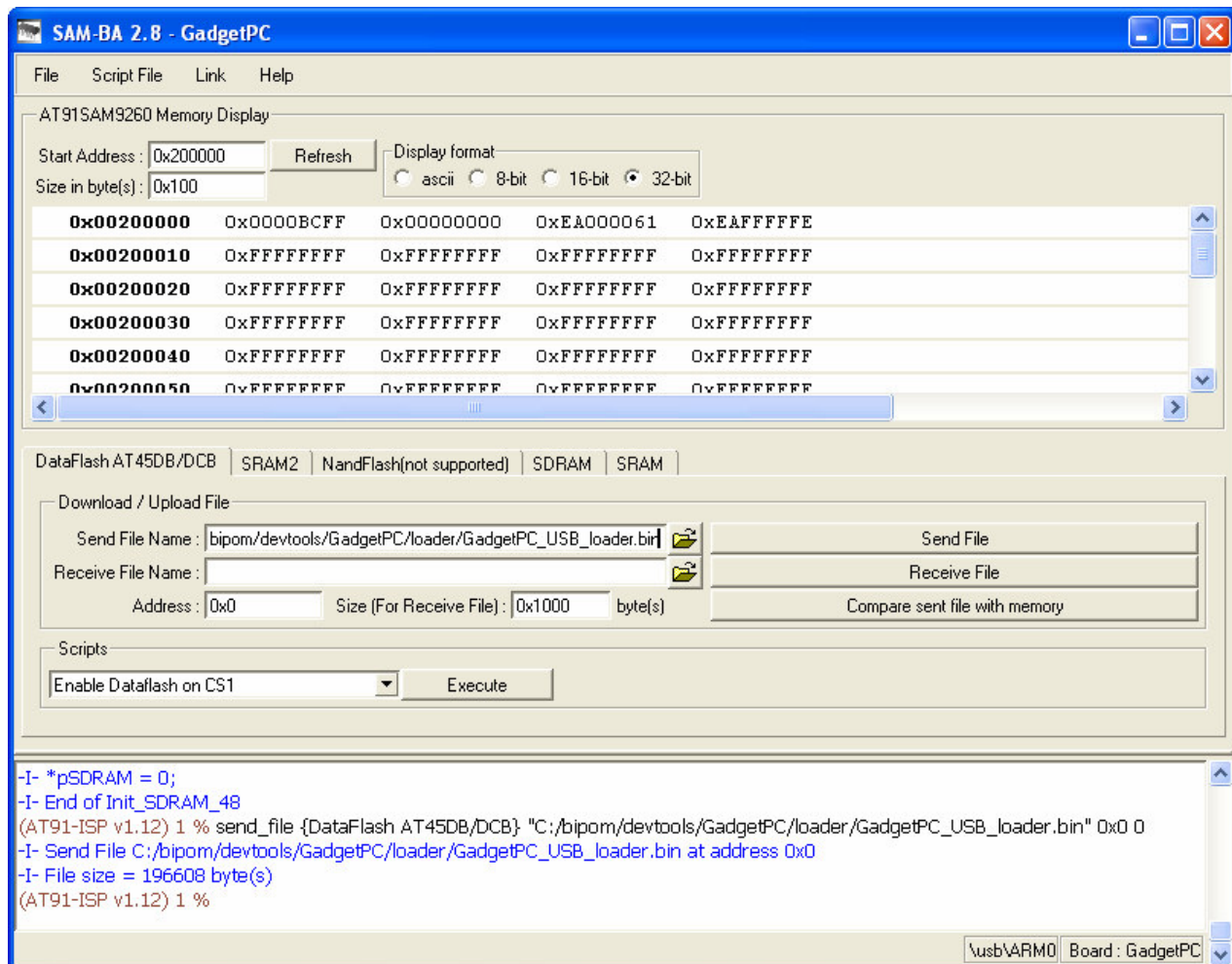
6.2.4. Click on "Compare sent file with memory"

6.3. Please read "**Quick Start Guide**" document to obtain information how to install Linux to GadgetPC.
http://www.bipom.com/web_documents/2899678.html