

MINI-MAX/ARM9260-E

Single Board Computer

System Installation Guide

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1. Overview

Thank you for your purchase of the MINI-MAX/ARM9 series Single Board Computer. MINI-MAX/ARM9260-E is a powerful computer board that is capable of running high-level operating systems such as Linux.

This document is is for advanced users who want to learn about upgrading the boot loader, restoring MINI-MAX/ARM9260-E to factory setup or to prepare MINI-MAX/ARM9260-E for an Operating System such as Debian that is different than the standard ARM9 Linux. Users who are planning to use MINI-MAX/ARM9260-E in standard configuration (with ARM9 Linux & Linux Control Panel) can skip this document.

2. Software Setup

When MINI-MAX/ARM9260-E 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 AT91SAM9260B-CU 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 MINI-MAX/ARM9.

AT91BootStrap is responsible for initializing hardware such as DataFlash, SDRAM, digital outputs, LCD controller, and RS232 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 the 'logo' file to show the splash screen, 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 MINI-MAX/ARM9260-E hardware ("bare metal") outside of the Linux environment, there is also a section that describes how to build and download your C programs to MINI-MAX/ARM9260-E.

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.

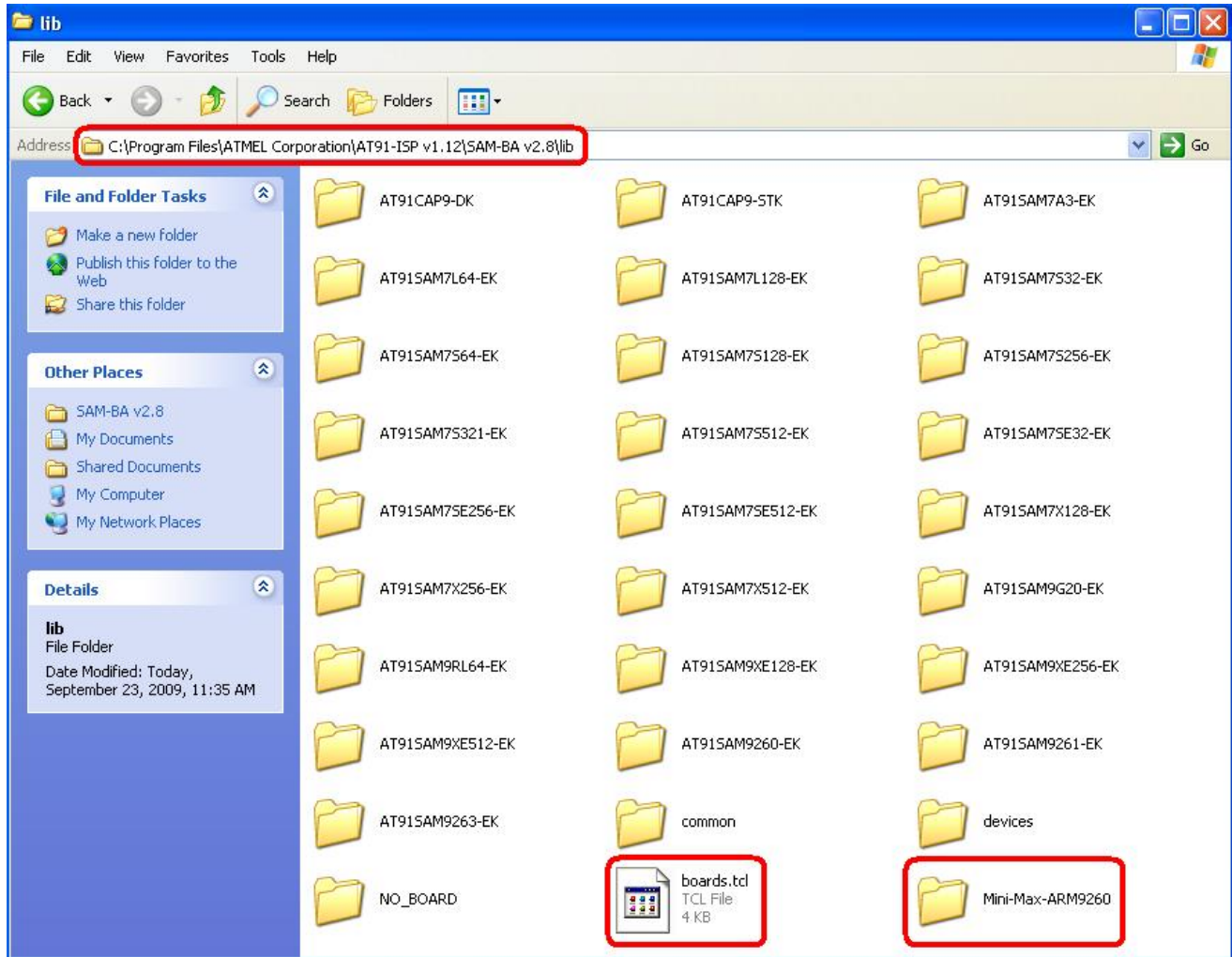
2.2. Download MINI-MAX/ARM9260-E Support Package for SAM-BA 2.8 (http://www.bipom.com/files/mmarm9260e/mmarm9_samba2_8.zip) from Software section under <http://www.bipom.com/products/us/2900044.html> and unzip to a temporary file on your computer.

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.

MINI-MAX/ARM9260-E 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:

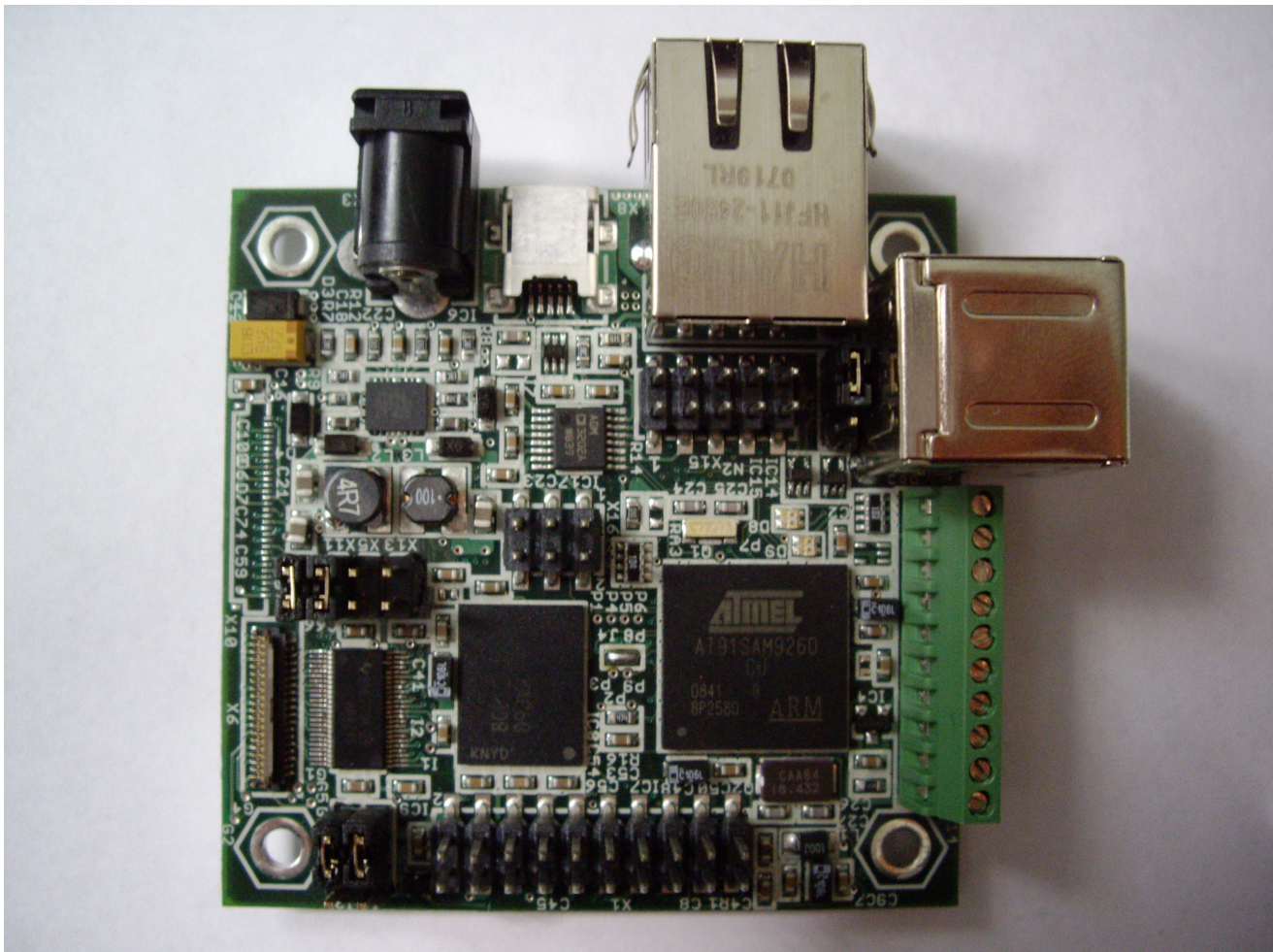


3. Hardware Setup.

This chapter explains in details how to enter the board into SAM-BA boot mode to access sub-systems of MINI-MAX/ARM9 using SAM-BA utility from ATMEL (www.atmel.com)

MINI-MAX/ARM9260-E features:

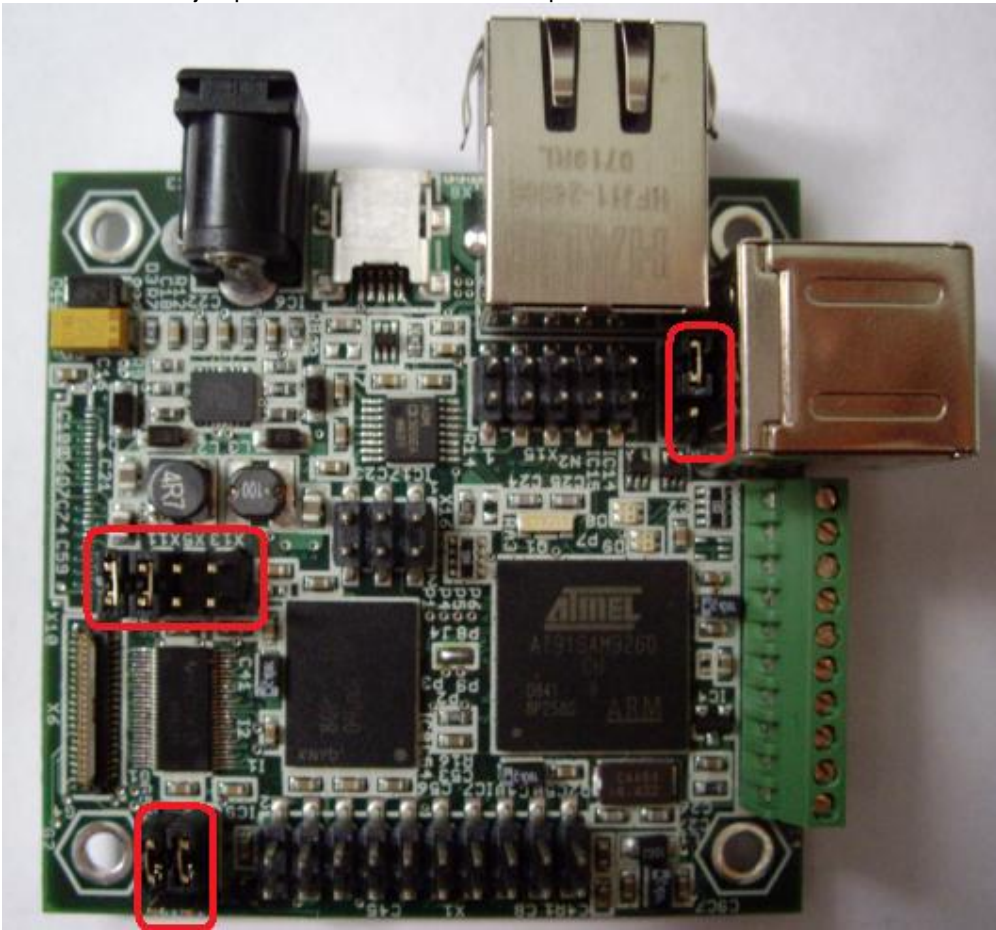
- Atmel AT91SAM9260B-CU ARM9 microcontroller
- MT48H16M32LFCM-75:A TR SDRAM 512MB
- 8MB AT45DB642D DataFlash
- 2-port USB HUB that provides 2 USB 2.0 Full Speed (12 Mbps per second) host ports
- USB 2.0 Full Speed (12 Mbps per second) Device Port
- Ethernet MAC 10/100 Base T
- One Synchronous Serial Controller
- Image Sensor Interface
- One Two-slot MultiMedia Card Interface (MCI)
- IEEE® 1149.1 JTAG Boundary Scan on All Digital Pins
- On-board 5 Volt, 3.3 Volt and 1.8 Volt regulators.



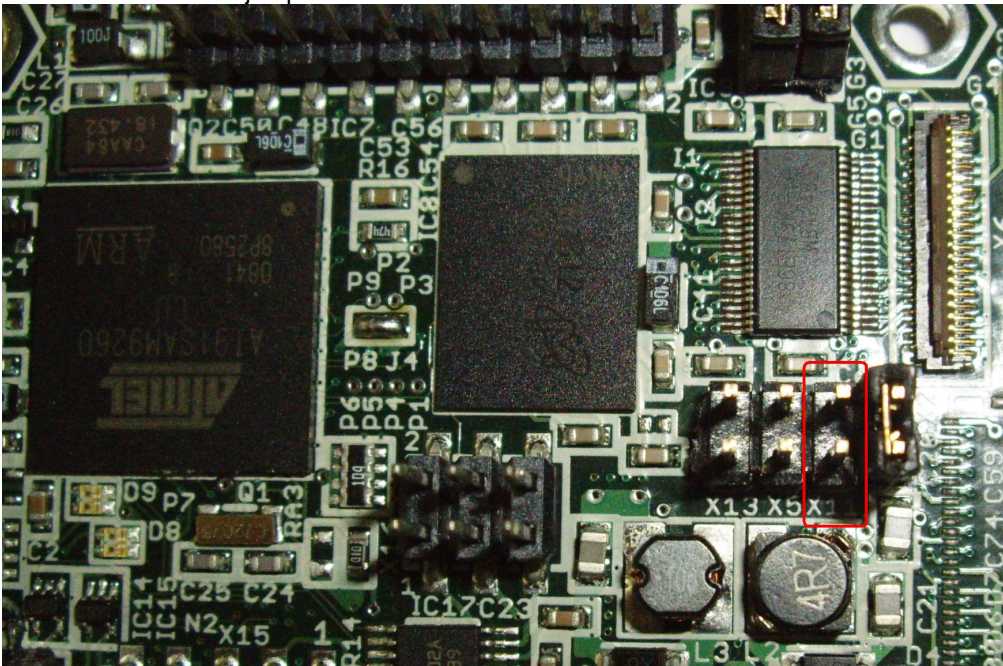
More information on AT91SAM9260B-CU and AT45DB642D-CNU can be obtained from www.atmel.com

More information on MT48H16M32LFCM-75:A TR can be obtained from www.micron.com

3.1 Install all the jumpers in accordance with the picture below.



3.2. Remove the X11 jumper.



Note: X11 jumper enables / disables DataFlash interface. When X11 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.

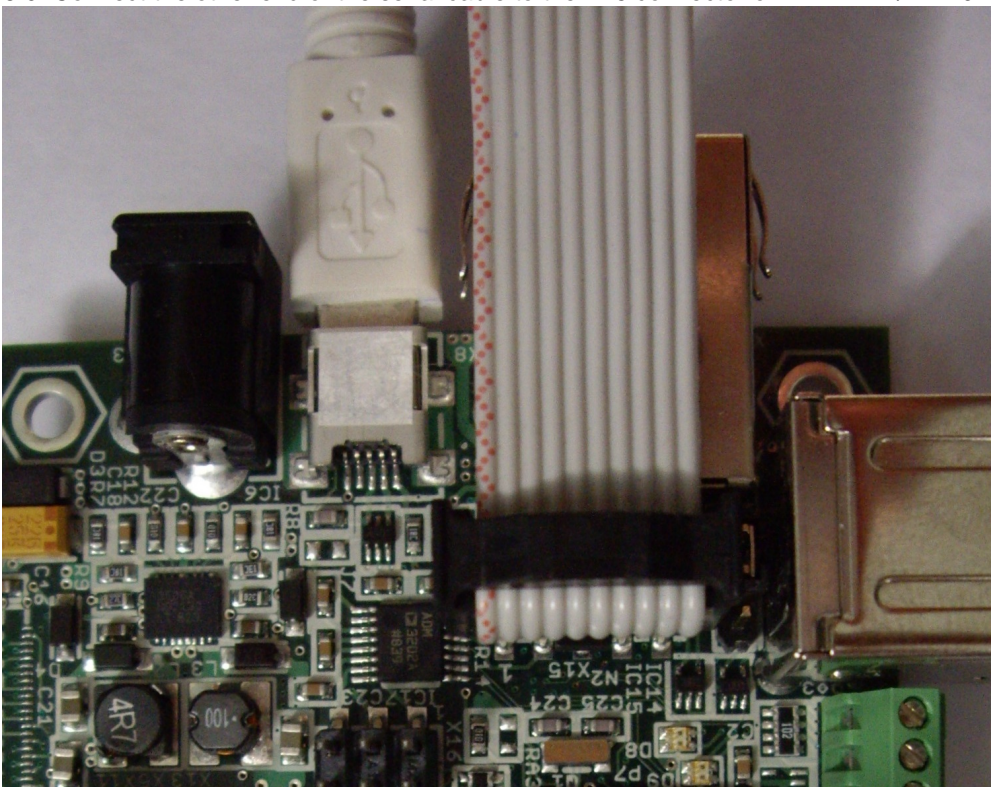
3.3. Connect one end of the USB cable to MINI-MAX/ARM9 Device port:



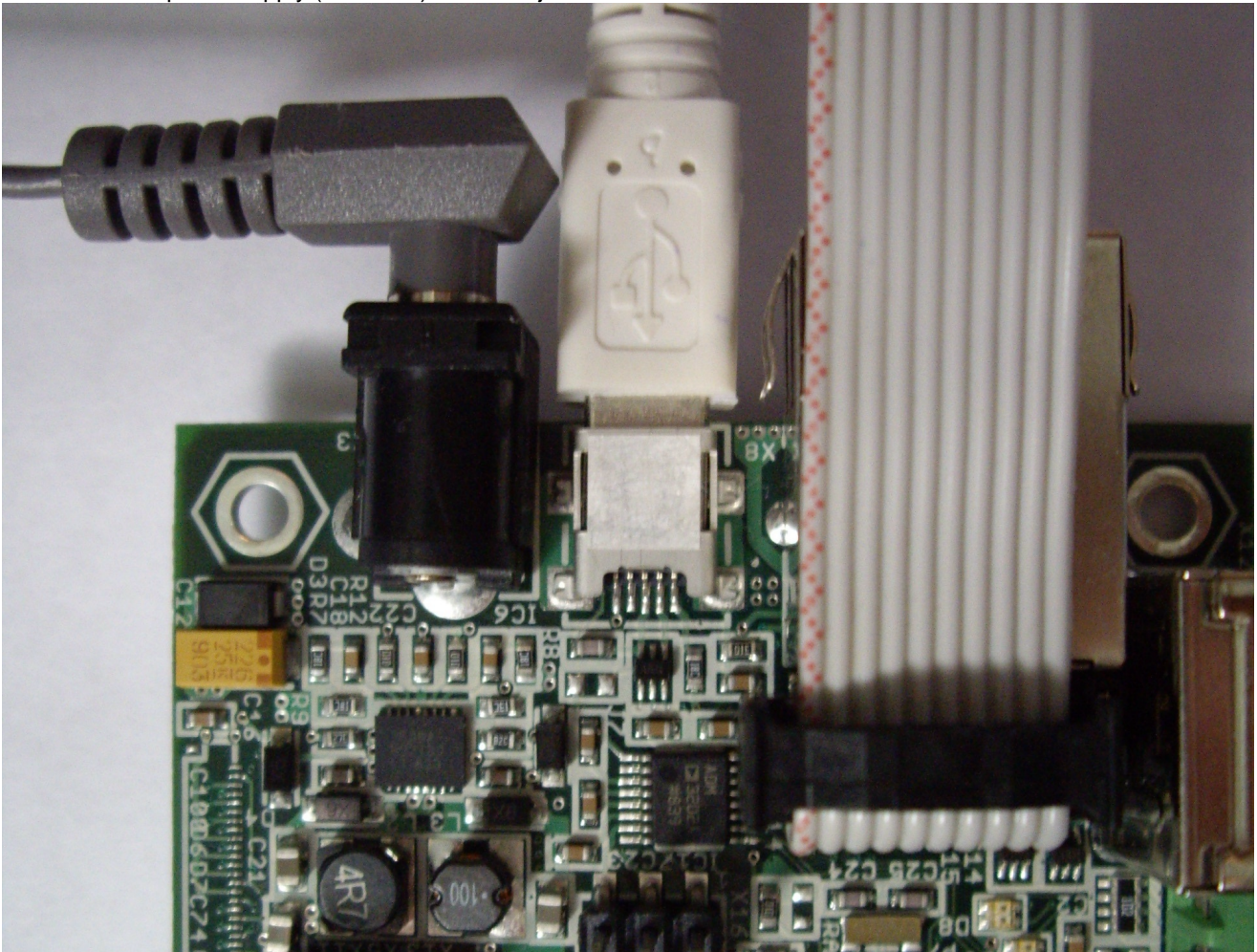
3.4. MINI-MAX/ARM9260-E board provides an RS232 interface on X15 connector (10-pin dual-row header).

3.5. Connect one end of a serial cable to an available serial (COM) port on your PC.

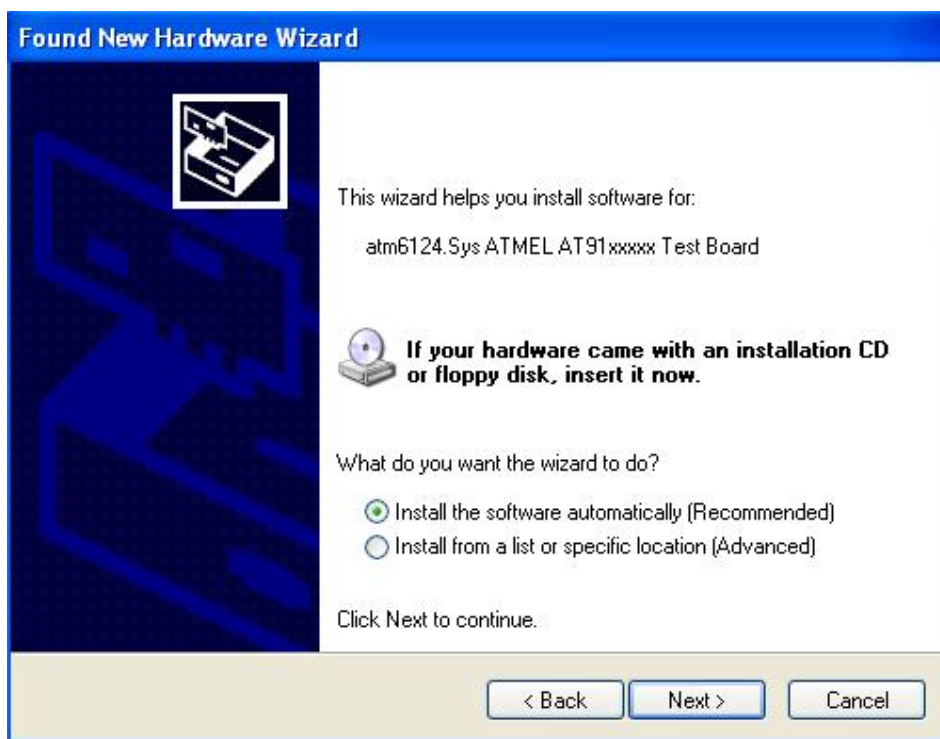
3.6. Connect the other end of the serial cable to the X15 connector of MINI-MAX/ARM9260-E.



3.7. Connect a power supply (8-24VDC) to the X3 jack of MINI-MAX/ARM9260-E.



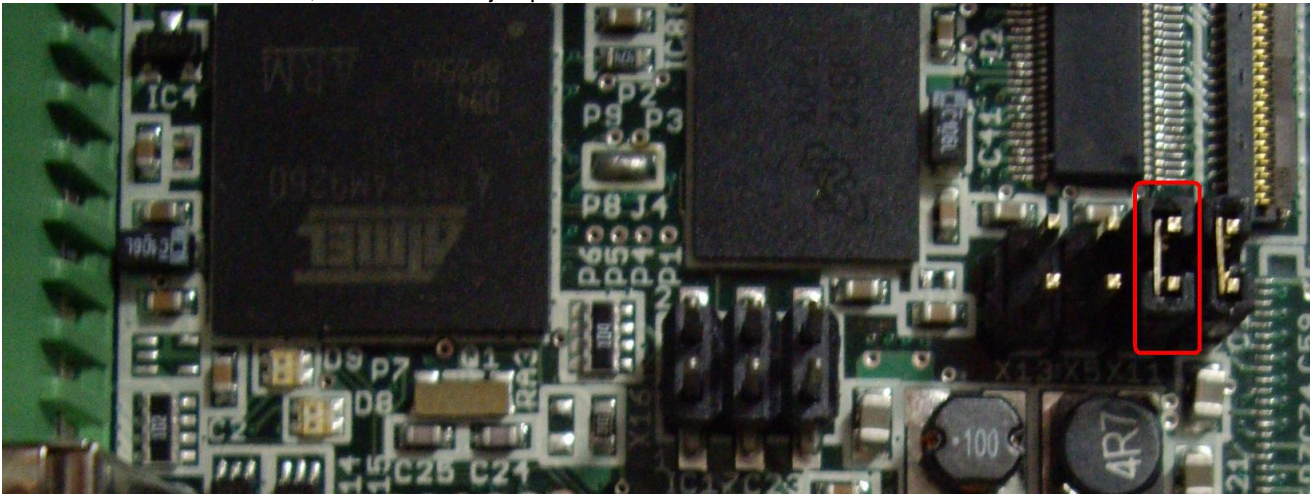
3.8. Connect the other end of the USB cable to any USB HOST port of a PC.
The board will be detected immediately:





Note: If you face any problems with this step please read “4. Known issues of USB driver”

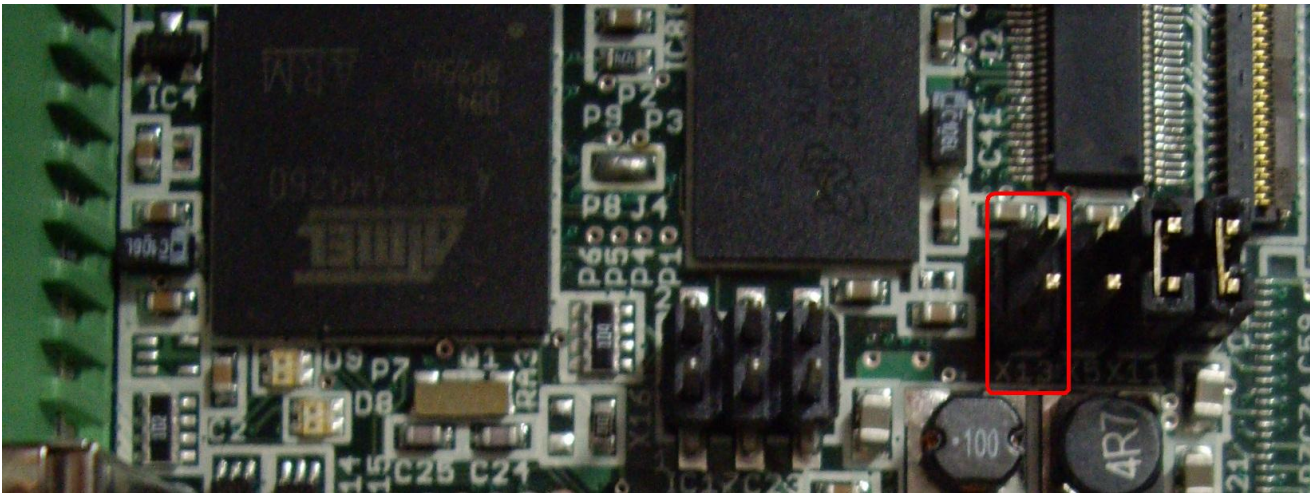
3.9. If the board is detected, install the X11 jumper back to the board:



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 X11 pins without any problems even if the board is powered.

Note: The board provides the X13 jumper as well. When the jumper is installed the DataFlash chip is write-protected.



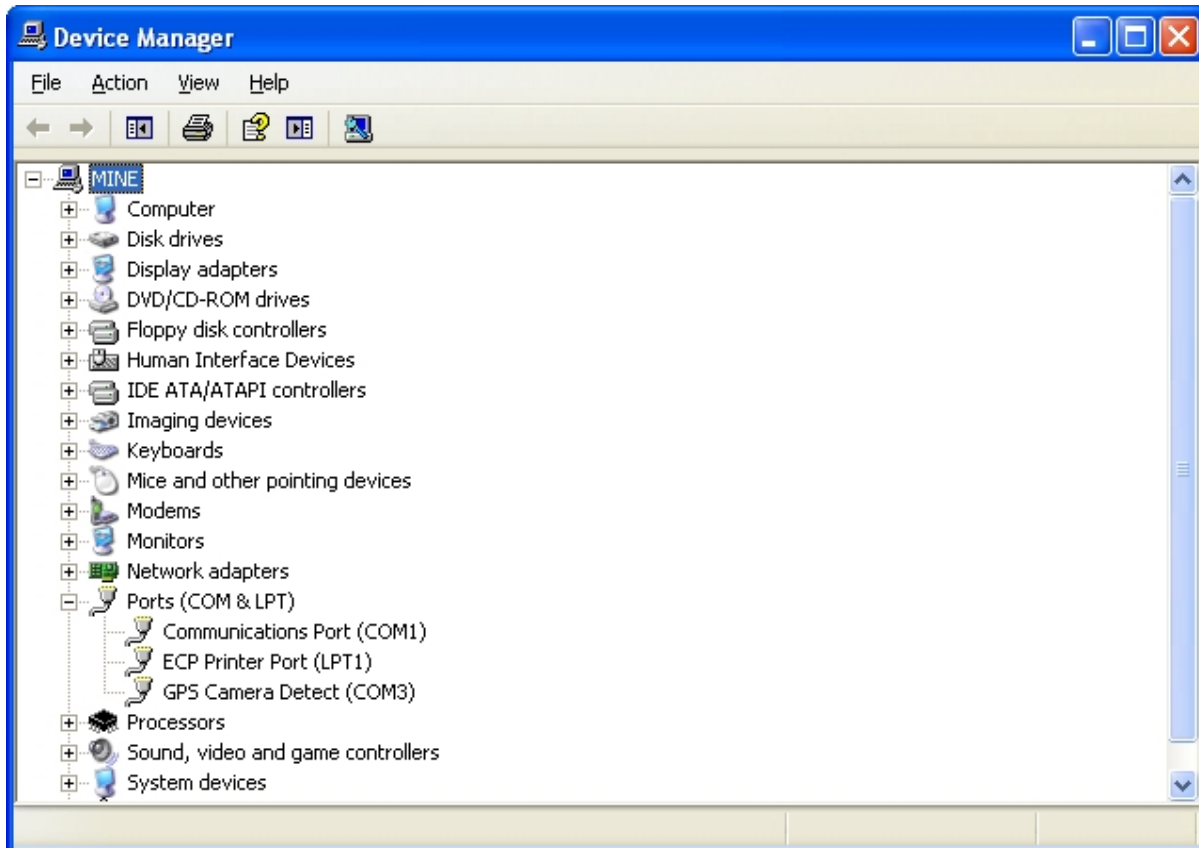
4. Known issues of USB driver

If the board is detected you may skip this chapter.

If you face any problems with the board detection (3.8. step) please try to install the USB driver manually. For example, on some Windows PC's, MINI-MAX/ARM9260-E 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 MINI-MAX/ARM9260-E.

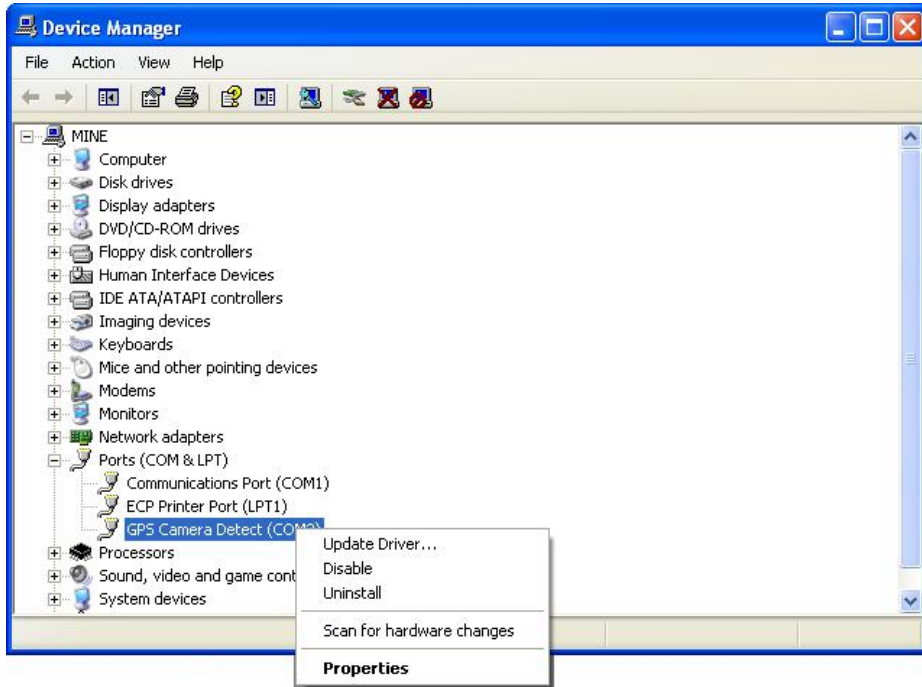
To resolve this try the following:

- 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:

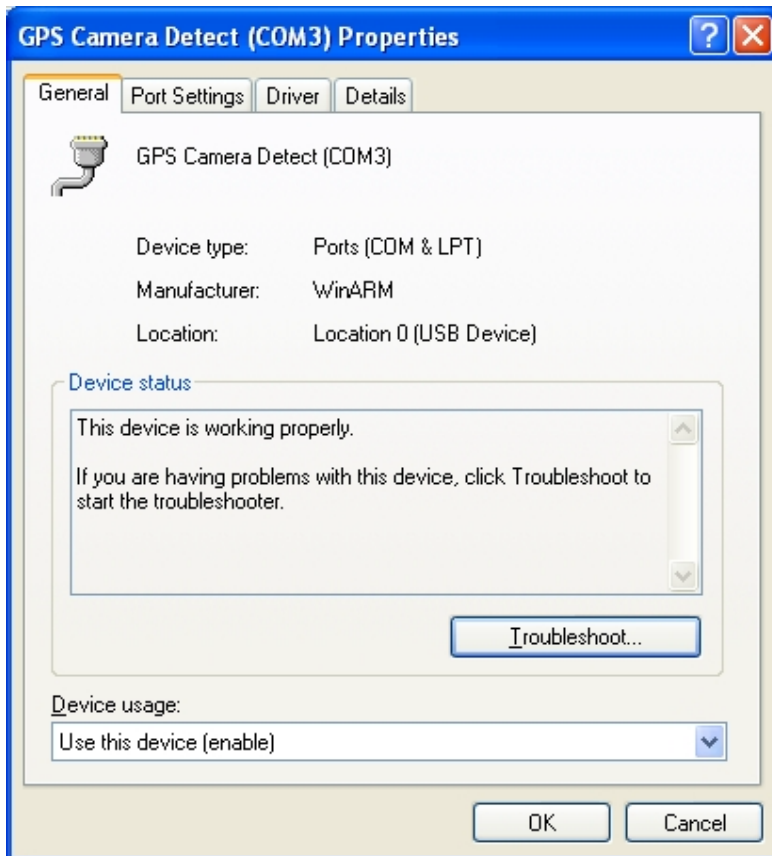


Please note that MINI-MAX/ARM9260-E appears as GPS Camera under Ports (COM&LPT). To correct this and make the MINI-MAX/ARM9260-E appear as a USB device, make the following steps.

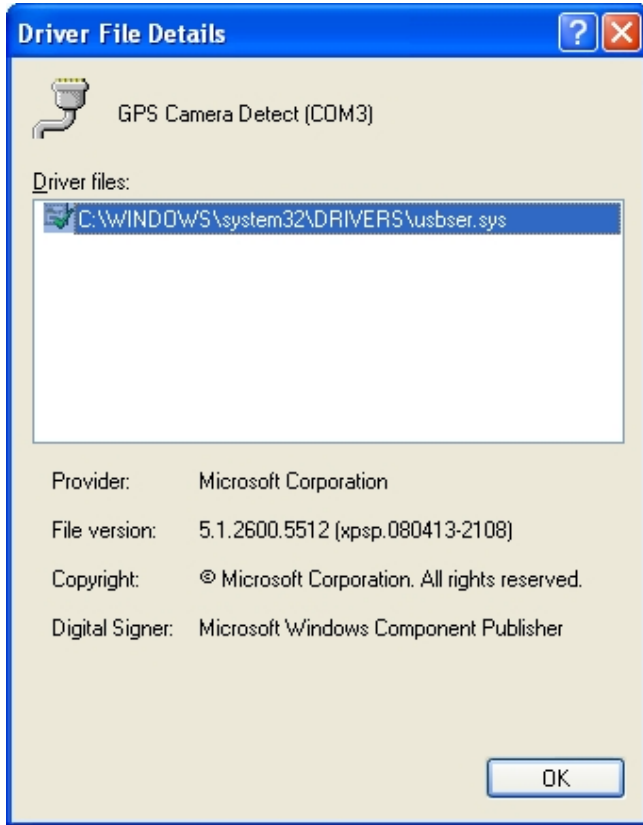
4.1. Right click on GPS Camera Detect... and this will bring up the menu:



4.2. Select Properties from the menu.



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



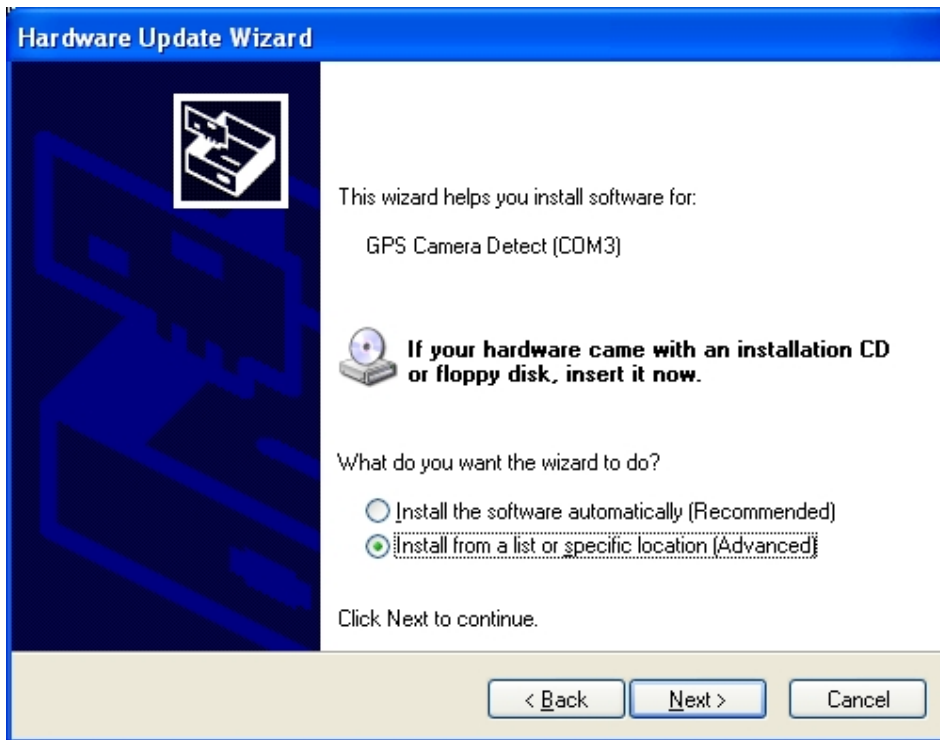
usbser.sys is shown as the driver for MINI-MAX/ARM9260-E. This is incorrect. We will correct this. Click OK.

4.4. Click the Update Driver button.

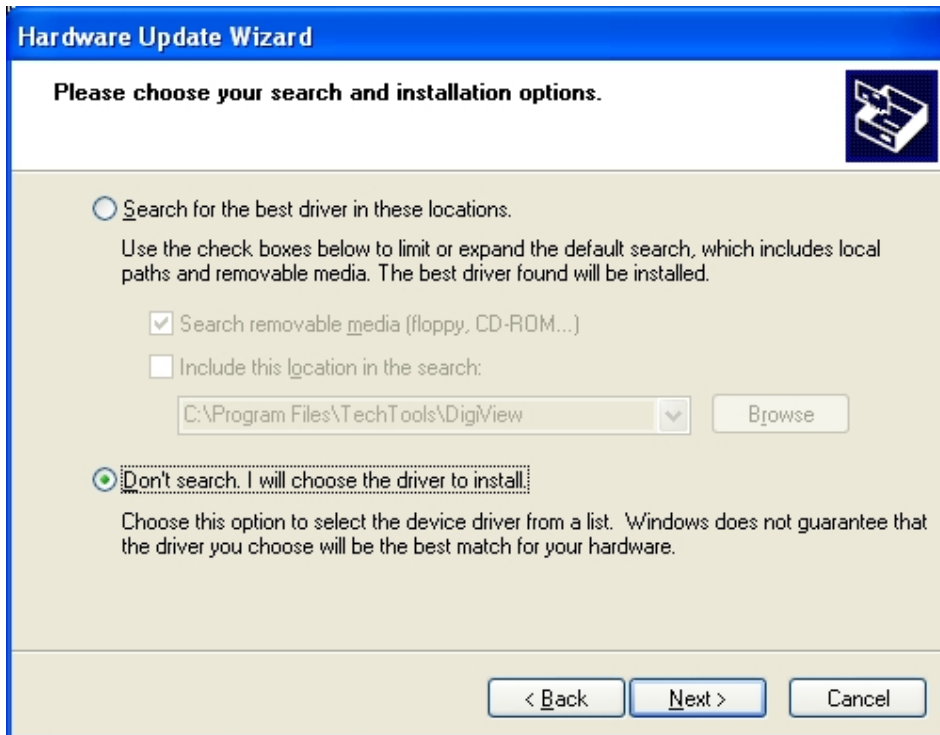
4.5. Select "No, not this time". Click Next:



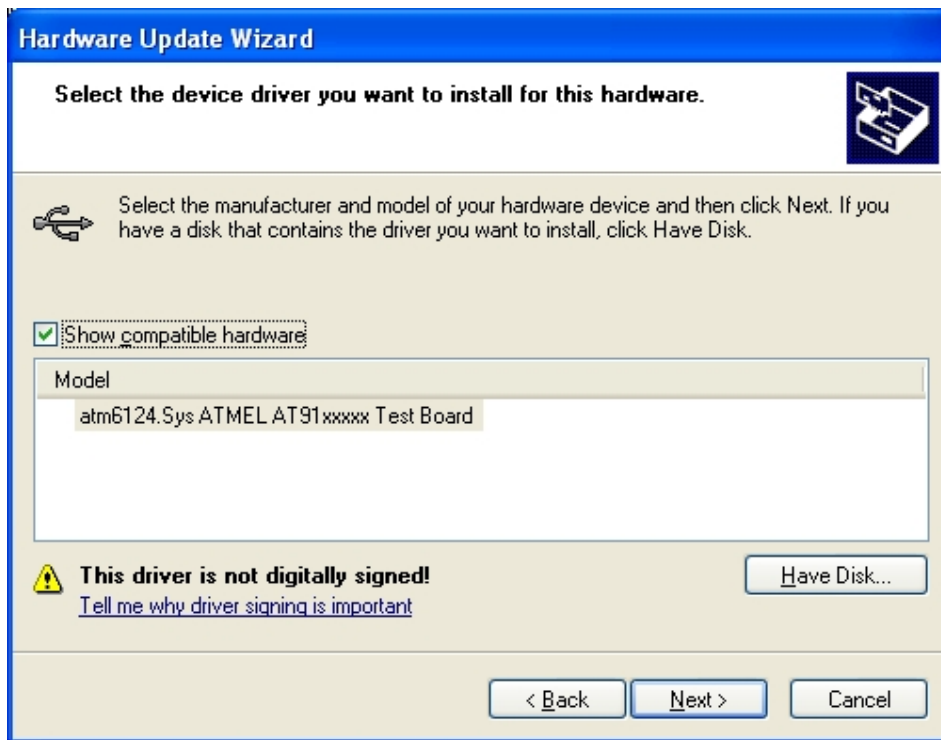
4.6. Select "Install from a list or specific location (Advanced)". Click Next:



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

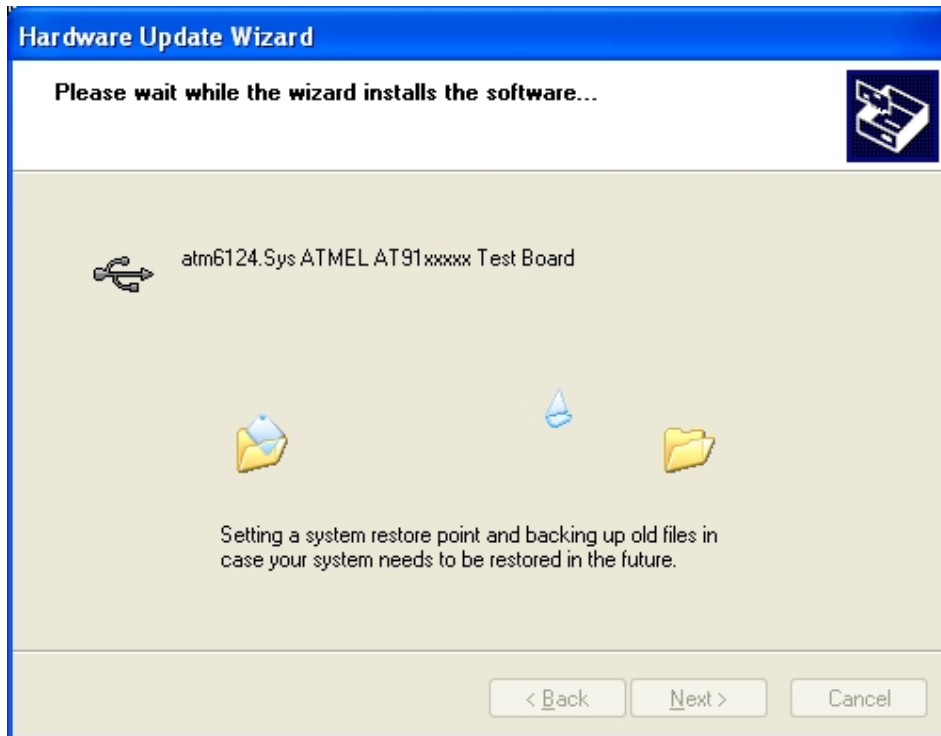


4.8. You should now see the following view:

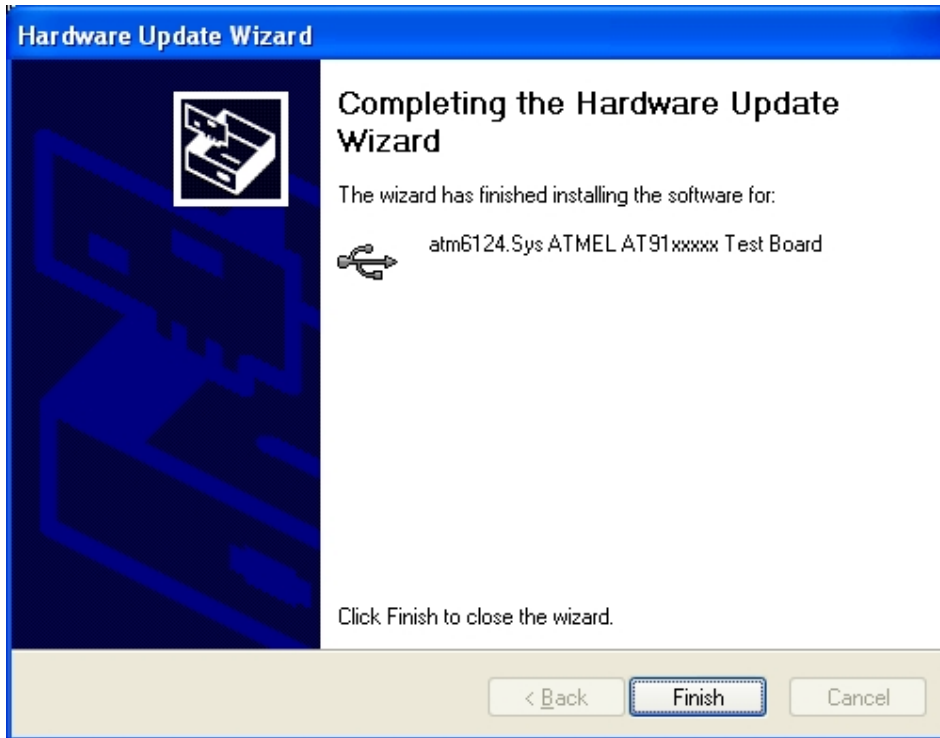


Move your mouse over “atm6124.Sys ATMEL AT91xxxx Test Board” and click to select. Then click Next.

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

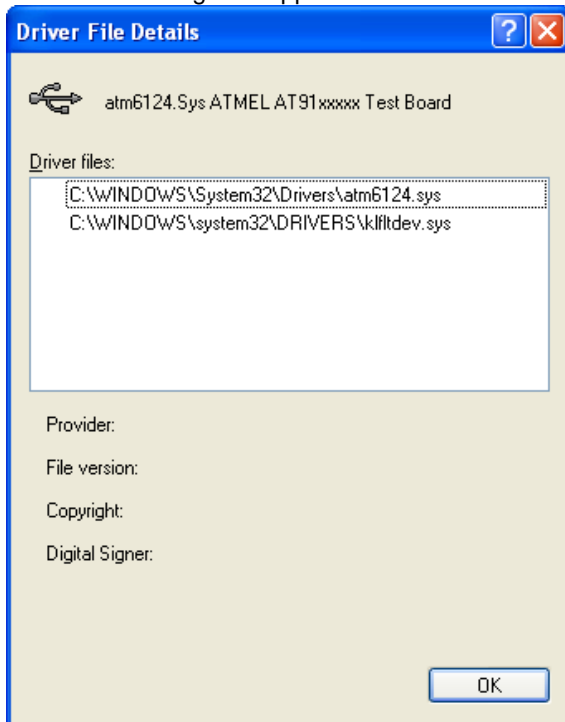


4.10. When the installation is completed, you will see the following:



Click Finish.

4.11. Go back to Device Manager. You should now see that MINI-MAX/ARM9260-E 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 MINI-MAX/ARM9260-E without an operating system (SDRAM test)

If you plan to use MINI-MAX/ARM9260-E with an operating system such as Linux only, you can skip this section.

Development software for MINI-MAX/ARM9260-E includes ARM Development System and GNUARM C compiler. To download the developed firmware to MINI-MAX/ARM9260-E, 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:

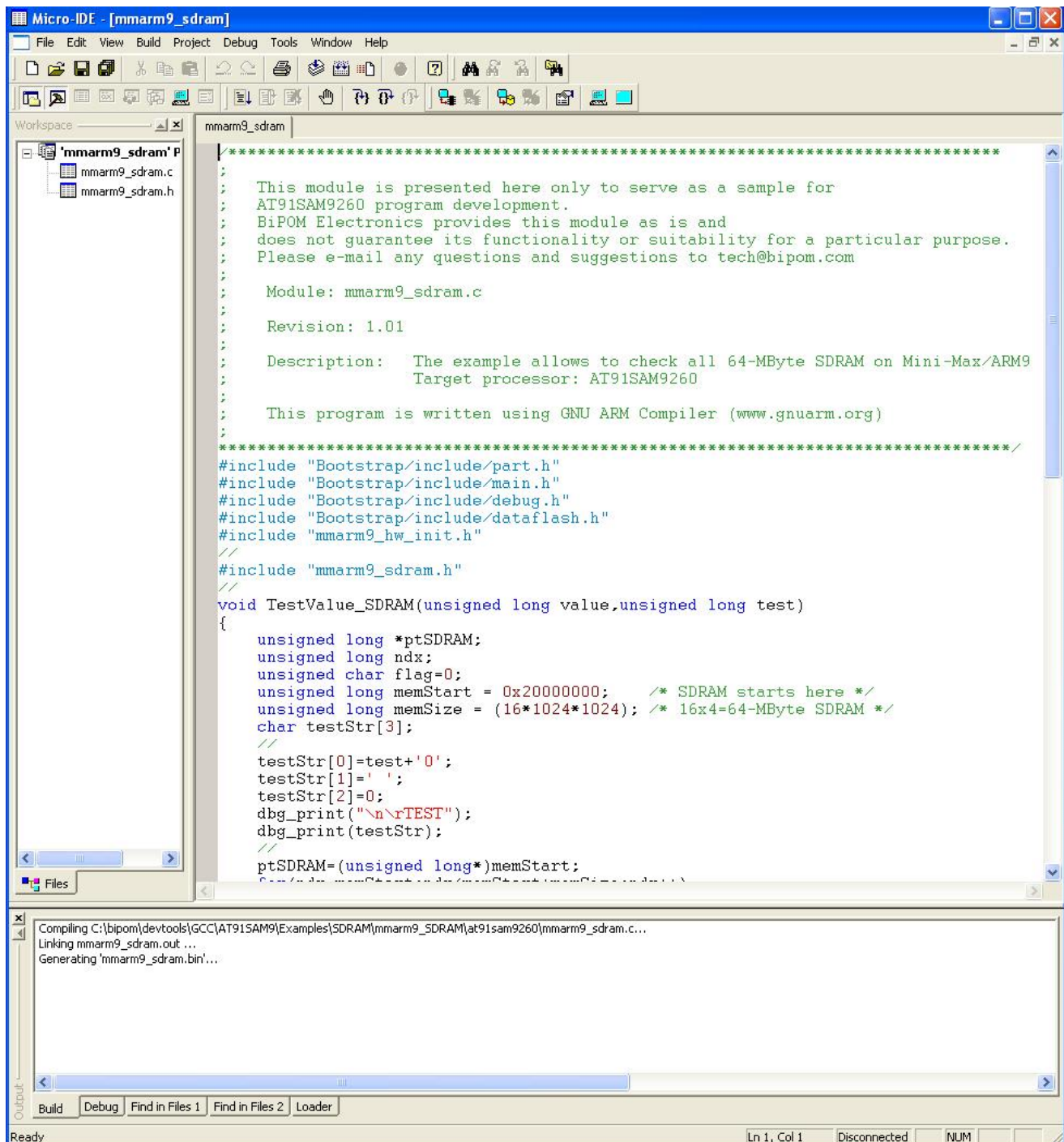
- Compile the existing example using ARM development system;
- Download the resulting **mmarm9_sdram.bin** file to DataFlash;
- Connect the board output to Micro-IDE terminal.

5.3.1. To compile the existing GadgetPC_sdram example please go to **C:\bipom\devtools\GCC\AT91SAM9\Examples\SDRAM\mmarm9_SDRAM\at91sam9260** folder.

5.3.2. Double-click **mmarm9_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 *mmarm9_sdram.bin*



Note: The pre-compiled example can be downloaded from http://www.bipom.com/support/mmarm9260/MMARM9260_10CLOCKS_SDRAM_TEST.zip

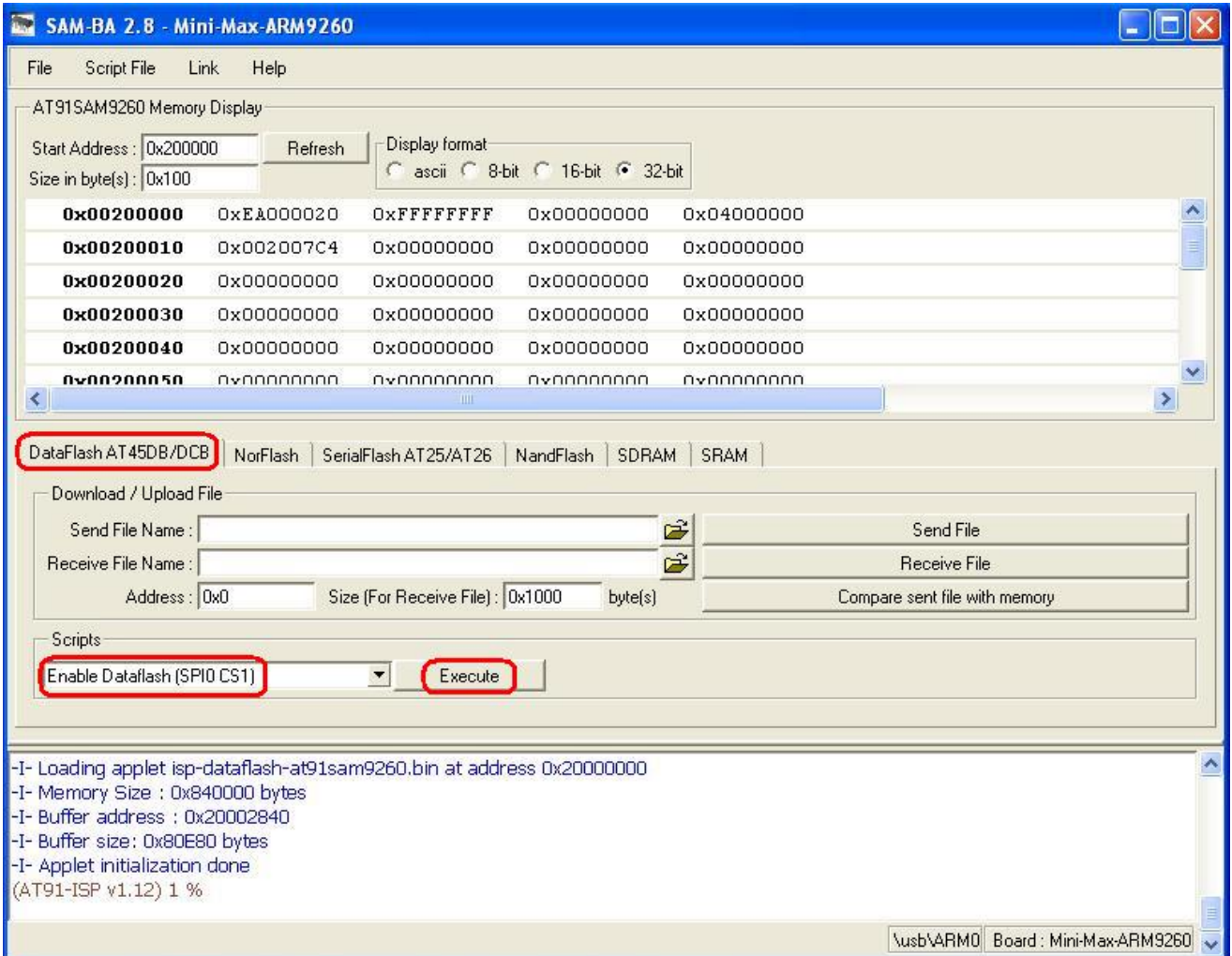
5.3.5. Run C:\Program Files\ATMEL Corporation\AT91-ISP v1.12\SAM-BA v2.8\SAM-BA.exe
Select "\usb\ARM0" and "Mini-Max-ARM9260" from pull-down lists and press "Connect"



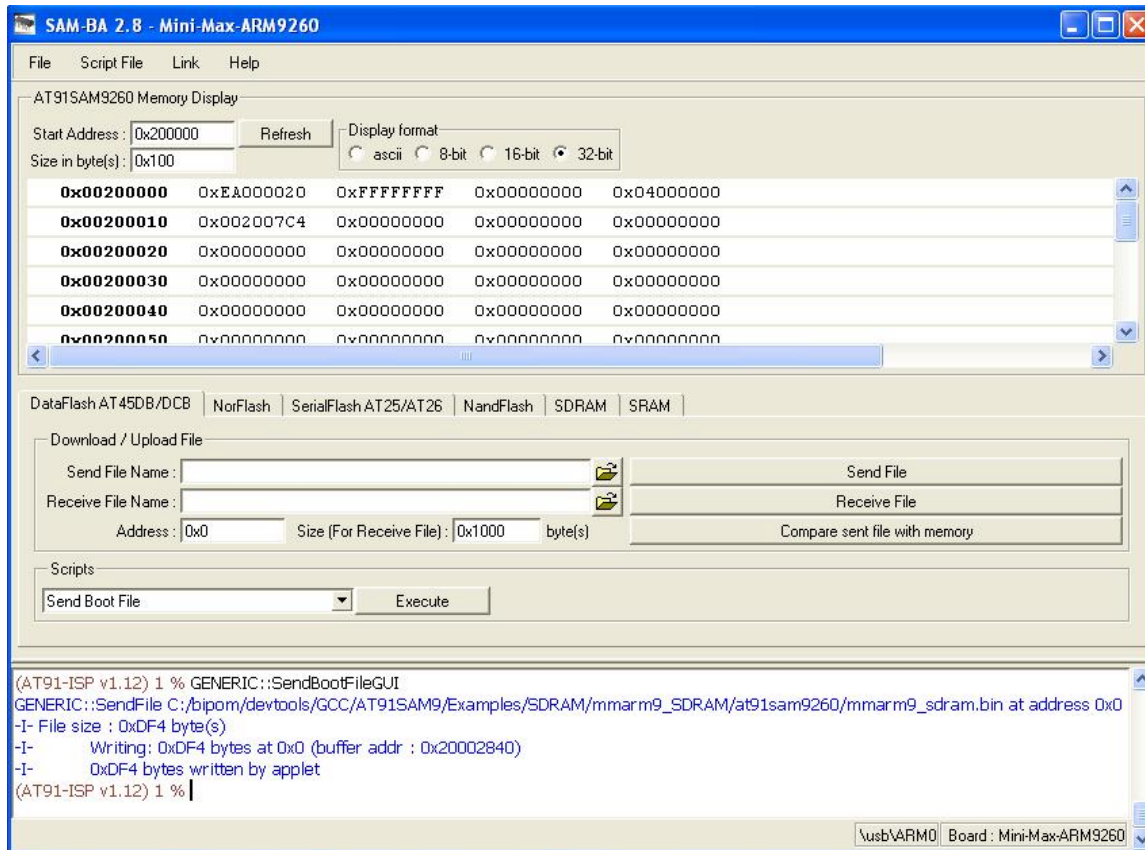
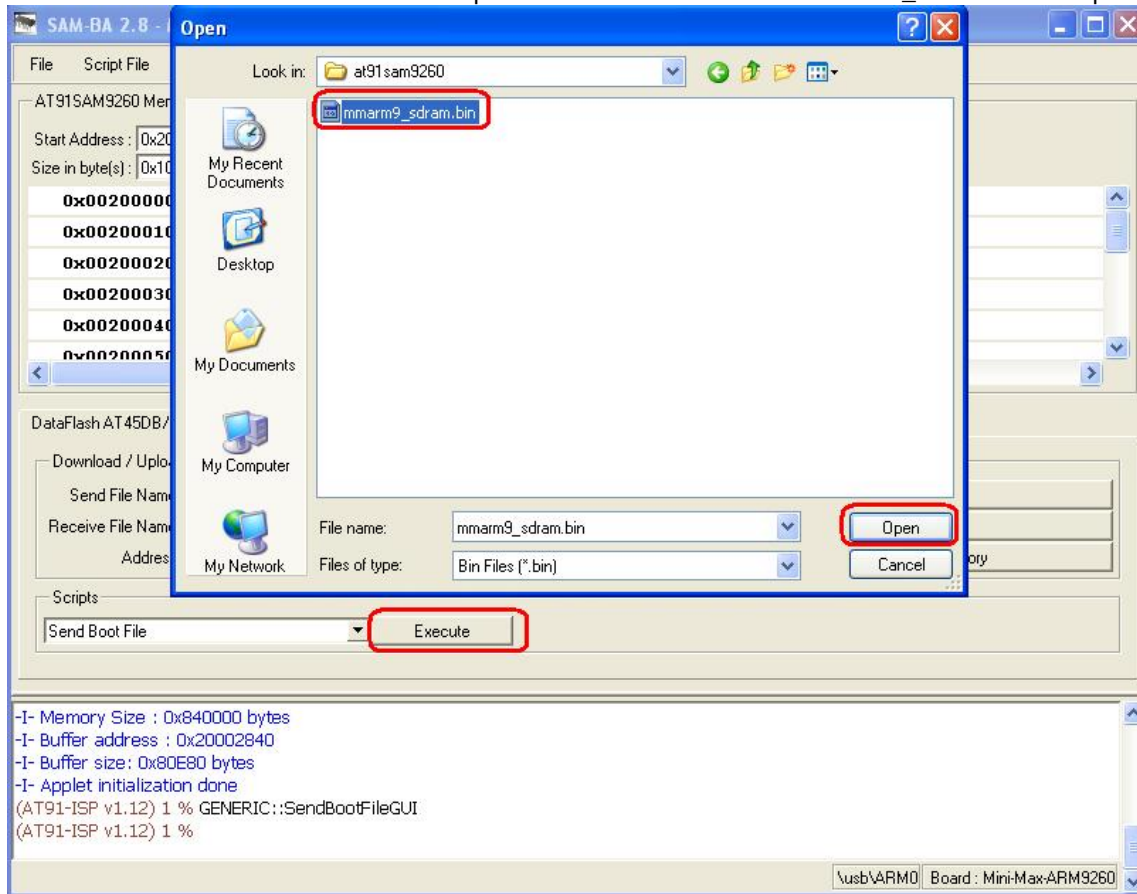
Note: If you face problems with this step please pass through 2.1-3.7 steps again.

5.3.6. Install the X11 jumper back to the board (step 3.9).

5.3.7. Select "DataFlash AT45DB/DCB"/" Enable Dataflash (SPI0 CS1)" and press "Execute" button

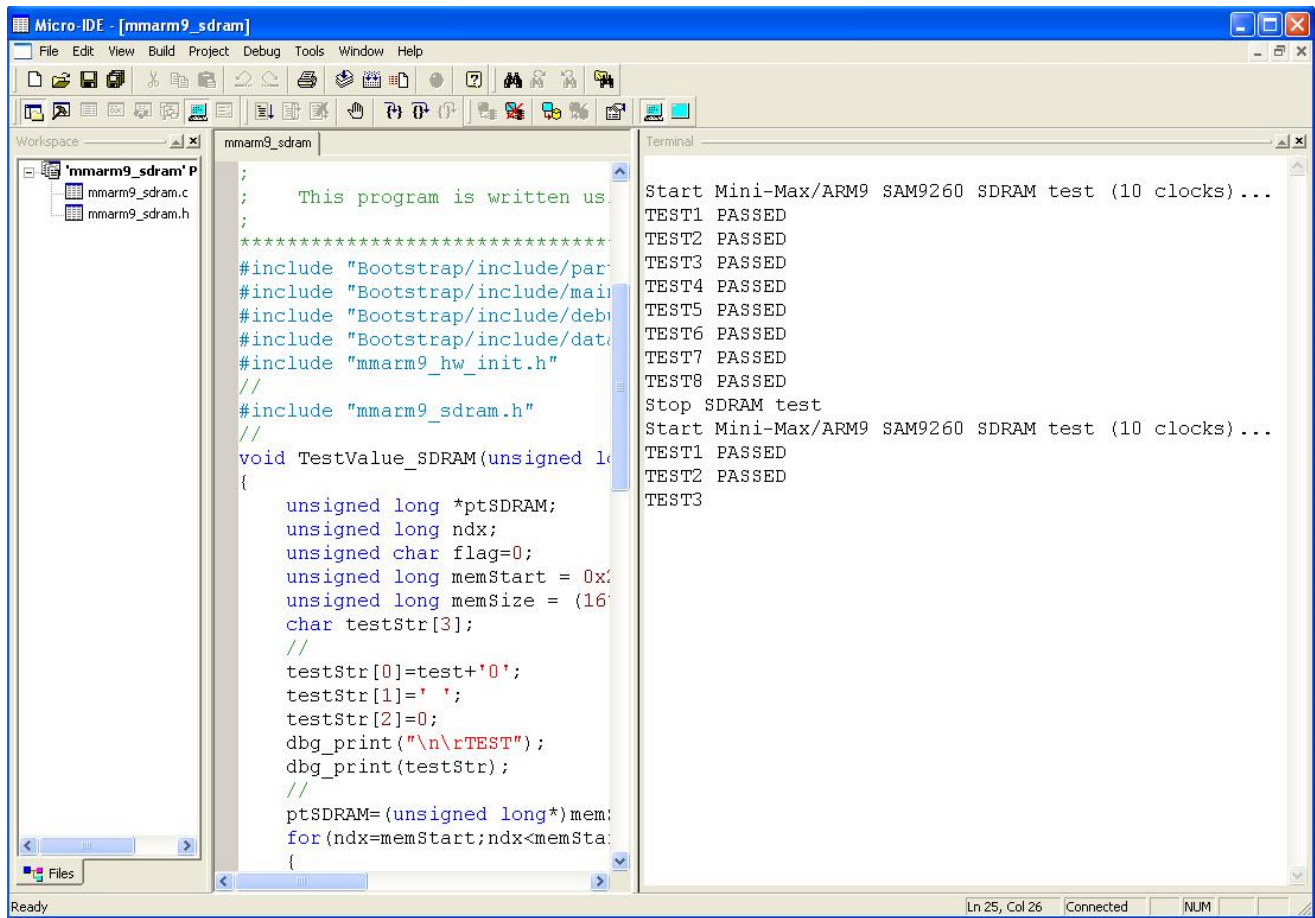


5.3.8. Please select “Send Boot File” and press “Execute”. Then select **mmarm9_sdram.bin** and press “Open”



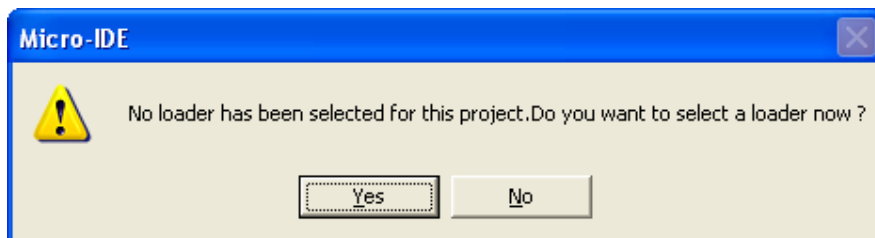
Close the SAM-BA window.

5.3.9. 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 power jack to start the SDRAM test.



Note: The board will not be detected as “ATMEL AT91xxxx 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 MINI-MAX/ARM9260-E

6.1. Download and install MINI-MAX/ARM9260-E Linux release

http://www.bipom.com/files/mmarm9260e/mmarm9260e_setup.exe

from Software section under <http://www.bipom.com/products/us/2900044.html>

The release provides all necessary components to configure and run Linux on MINI-MAX/ARM9260-E:

- compressed Linux kernel (ulmage file);
- compressed RAMDISK image (gpafs.gz)
- logo image;
- utilities;
- drivers;
- user.sh command file

6.2. In order to install U-Boot loader to MINI-MAX/ARM9260-E it is necessary to download

C:\bipom\devtools\MMARM9260E\loader\MMARM9_USB_loader.bin file to the board using SAM-BA utility. MMARM9_USB_loader.bin is a complete image of loader that includes:

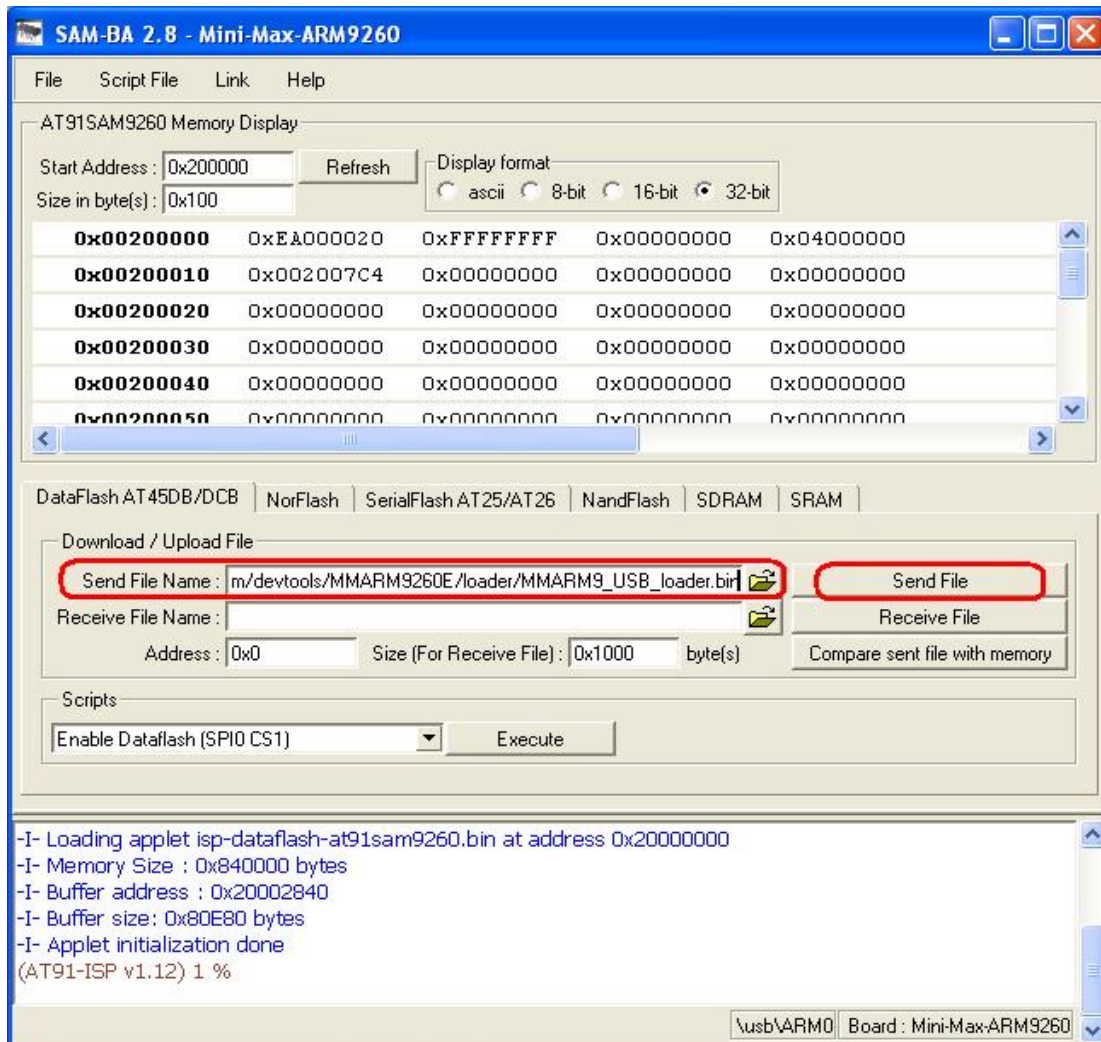
- At91BootStrap loader;
- U-boot loader.

6.3. Execute all steps of "Hardware setup" to enter the board into SAM-BA boot mode.

6.4. Execute 5.3.5 - 5.3.7 steps to run SAM-BA utility to initialize DataFlash.

6.5. Please assign MMARM9_USB_loader.bin to the "Send File Name Field", then press "Send File". The "Please Wait..." message box will appear.

It will download the MMARM9_USB_loader.bin file to the board.



6.6. Click on “Compare sent file with memory”

The screenshot shows the SAM-BA 2.8 - Mini-Max-ARM9260 interface. The main window is titled "AT91SAM9260 Memory Display". It features a menu bar with "File", "Script File", "Link", and "Help". Below the menu bar, there are input fields for "Start Address" (0x200000) and "Size in byte(s)" (0x100), along with a "Refresh" button and a "Display format" dropdown menu (set to 32-bit). A table displays memory contents in hexadecimal format. Below the table, there are tabs for "DataFlash AT45DB/DCB", "NorFlash", "SerialFlash AT25/AT26", "NandFlash", "SDRAM", and "SRAM". The "Download / Upload File" section includes fields for "Send File Name" (m/devtools/MMARM9260E/loader/MMARM9_USB_loader.bin), "Receive File Name", "Address" (0x0), and "Size (For Receive File)" (0x1000). A red box highlights the "Compare sent file with memory" button. The "Scripts" section has a dropdown menu (set to "Enable Dataflash (SPI0 CS1)") and an "Execute" button. The bottom status bar shows "\usb\ARM0" and "Board : Mini-Max-ARM9260".

Address	0xE&000020	0xFFFFFFFF	0x00000000	0x04000000
0x00200010	0x002007C4	0x00000000	0x00000000	0x00000000
0x00200020	0x00000000	0x00000000	0x00000000	0x00000000
0x00200030	0x00000000	0x00000000	0x00000000	0x00000000
0x00200040	0x00000000	0x00000000	0x00000000	0x00000000

Send File Name: m/devtools/MMARM9260E/loader/MMARM9_USB_loader.bin
Receive File Name:
Address: 0x0 Size (For Receive File): 0x1000 byte(s)
Compare sent file with memory

Scripts
Enable Dataflash (SPI0 CS1) Execute

-I- Send File C:/bipom/devtools/MMARM9260E/loader/MMARM9_USB_loader.bin at address 0x0
GENERIC::SendFile C:/bipom/devtools/MMARM9260E/loader/MMARM9_USB_loader.bin at address 0x0
-I- File size : 0x30000 byte(s)
-I- Writing: 0x30000 bytes at 0x0 (buffer addr : 0x20002840)
-I- 0x30000 bytes written by applet
(AT91-ISP v1.12) 1 %

\usb\ARM0 Board : Mini-Max-ARM9260

The screenshot shows a "Comparison Result" dialog box with a blue title bar. It contains an information icon and the text: "Sent file & Memory area content (address: 0x0, size: 196608 bytes) match exactly!". There is an "OK" button at the bottom.

Comparison Result

Sent file & Memory area content (address: 0x0, size: 196608 bytes) match exactly!

OK

Close SAM-BA window.

6.7. 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 power jack to start the U-boot loader.

```

Micro-IDE
File Edit View Build Project Debug Tools Window Help

Terminal

Mini-Max/ARM-SAM9260 rev 1.08(10)
BiPOM Electronics, Inc.
www.bipom.com

U-Boot 2008.10 (Mar  1 2009 - 18:37:50)

DRAM:  64 MB
DataFlash:AT45DB642
Nb pages:  8192
Page Size:  1056
Size= 8650752 bytes
Logical address: 0xD0000000
Area 0: D0000000 to D0003FFF (RO) Bootstrap
Area 1: D0004000 to D0007FFF Environment
Area 2: D0008000 to D002FFFF (RO) U-Boot
Area 3: D0030000 to D042FFFF Kernel
Area 4: D0430000 to D083FFFF FS
In:  serial
Out: serial
Err: serial
Net: macb0
macb0: PHYID1=0x0181
macb0: PHYID2=0xb8a0
macb0: DM9161 reset...
DM9161_BMCR Basic Mode Control Register = 0x3100
DM9161_BMSR Basic Mode Status Register = 0x7849
DM9161_PHYID1 PHY Identifier Register 1 = 0x0181
DM9161_PHYID2 PHY Identifier Register 2 = 0xb8a0
DM9161_ANAR Auto_Negotiation Advertisement Register = 0x01e1
DM9161_ANLPAR Auto_negotiation Link Partner Ability Register = 0x0000
DM9161_ANER Auto-negotiation Expansion Register = 0x0000
DM9161_DSCR Specified Configuration Register = 0x0c14
DM9161_DSCSR Specified Configuration and Status Register = 0xf200
DM9161_10BTCSR 10BASE-T Configuration and Satus Register = 0x5800
DM9161_MDINTR Specified Interrupt Register = 0x1f00
DM9161_RECR Specified Receive Error Counter Register = 0x0000
DM9161_DISCR Specified Disconnect Counter Register = 0x0000
DM9161_RLSR Hardware Reset Latch State Register = 0xd6e0
macb0: Autonegotiation timed out (status=0x7849)
macb0: link down (status: 0x7849)
Hit any key to stop autoboot:  0
(Re)start USB...
USB:  scanning bus for devices... 1 USB Device(s) found
      scanning bus for storage devices... 0 Storage Device(s) found
** Can't read from device 0 **

** Unable to use usb 0:1 for fatload **
(Re)start USB...
USB:  scanning bus for devices... 1 USB Device(s) found
      scanning bus for storage devices... 0 Storage Device(s) found
** Can't read from device 0 **

** Unable to use usb 0:1 for fatload **
** Can't read from device 0 **

** Unable to use usb 0:1 for fatload **
ERROR: can't get kernel image!
U-Boot>

Ready Connected

```

6.8. Assign the given MAC address typing the following command on Micro-IDE terminal

setenv ethaddr 00:50:C2:46:9x:xx; saveenv

where **x:xx** are unique numbers that assigned to your board.

6.9. Please read “**Quick Start Guide**” document to obtain information how to install Linux to MINI-MAX/ARM9260-E from Software section under <http://www.bipom.com/products/us/2900044.html>