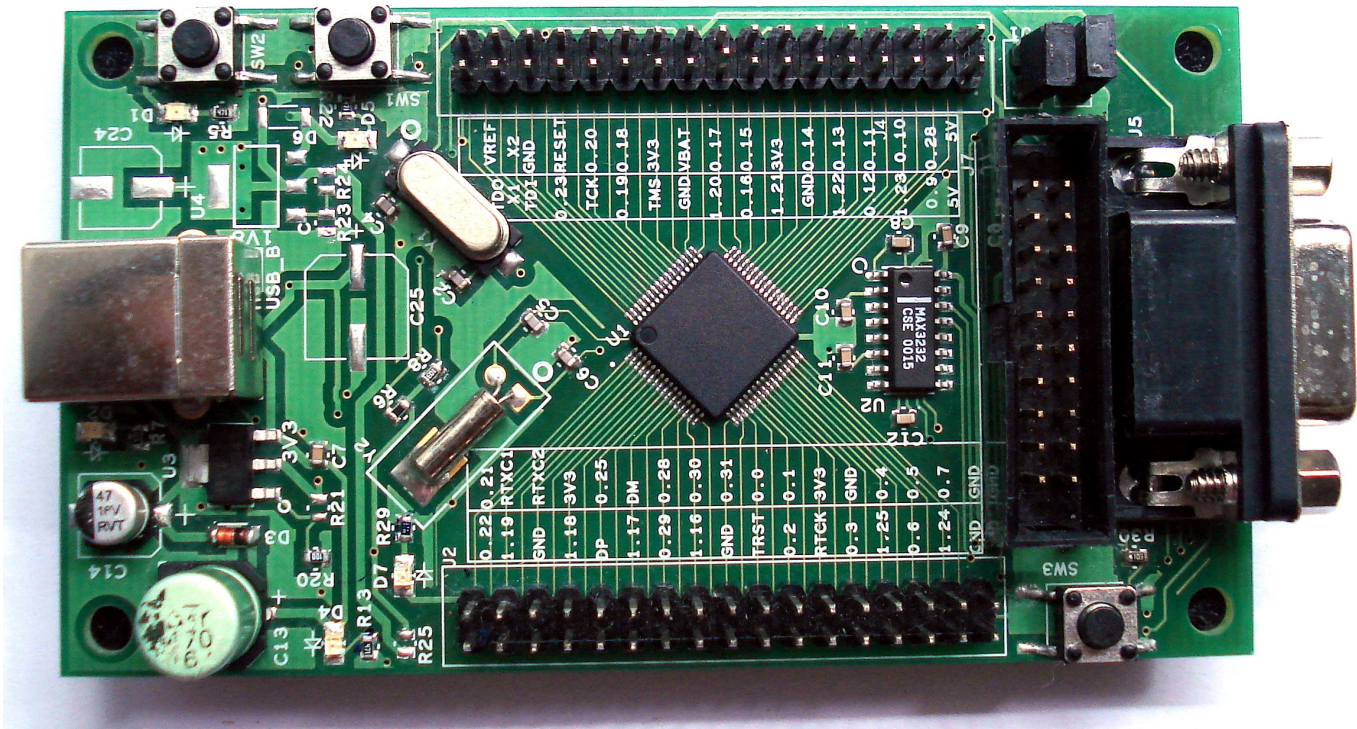


USER MANUAL

BlueBoard-LPC214X-H



Revision 1.1

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Change Log:

Revision 1.0 to Revision 1.1:

- Added a new section USB boot-loader.

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1 INTRODUCTION

1.1 BlueBoard-lpc214x-H Features

BlueBoard-LPC214X is a breakout board for LPC2148 ARM7TMDI based microcontroller. The LPC2148 microcontroller has 512KB of internal flash and 32+8K RAM. Following are the salient features of the board.

- Dimensions: mm2
- Two layer PCB (FR-4 material)
- Power: USB powered
- ISP and reset switch
- Test LED
- 32Khz crystal for RTC
- Connectors:
 - Extension headers for all microcontroller pins
 - 1 RS232 connector for ISP
 - USB B-type connector with Link-LED
 - 20pin - JTAG connector

2 Get going

2.1 System Requirements

- ✓ Windows XP
- ✓ Serial or Parallel port
- ✓ USB port

2.2 Starting off

2.2.1 Connecting the hardware

After unpacking the BlueBoard connect the USB cable to power up the board. To test all the features on this BlueBoard you would need the following accessories:

1. USB cable
2. DB-9 straight serial cable

Once you have all these accessories connected to the BlueBoard you can run through a simple test to verify that all the peripherals are working fine. Please refer to the 'Hardware Configuration' section for testing all the peripherals. It is highly recommended that you test all the peripherals as soon you receive the BlueBoard. The BlueBoard is shipped with the pre-loaded firmware which can test all the peripherals.

2.2.2 Programming BlueBoard

BlueBoard can be programmed through wiggler clone JTAG or through serial port using 'Flash Magic'. 'Flash Magic' is a freeware windows utility used download the hex file format onto the BlueBoard. Flash Magic can be downloaded from here <http://www.flashmagictool.com/>. If your PC does not have a serial port; use a USB to serial converter to download the hex file using the Flash Magic utility. For programming with JTAG your system should have a parallel port and the supporting IDE which can communicate to the processor core over JTAG interface. We have successfully tested BlueBoard with wiggler clone JTAG and CrossWorks IDE. A LINUX utility to download the hex file can be found here http://www.pjrc.com/arm/lpc2k_pgm/.

- Programming BlueBoard Through ISP.

To program in Manual mode you need a serial cable. Please note that the Blueboard-lpc214x-H only supports manual mode for programming.

To make the board enter programming mode

- Hold down SW1(isp) and SW2(reset), then release SW2 first and finally SW1
- The controller enters the bootloader mode if during reset the SW1 pin is low

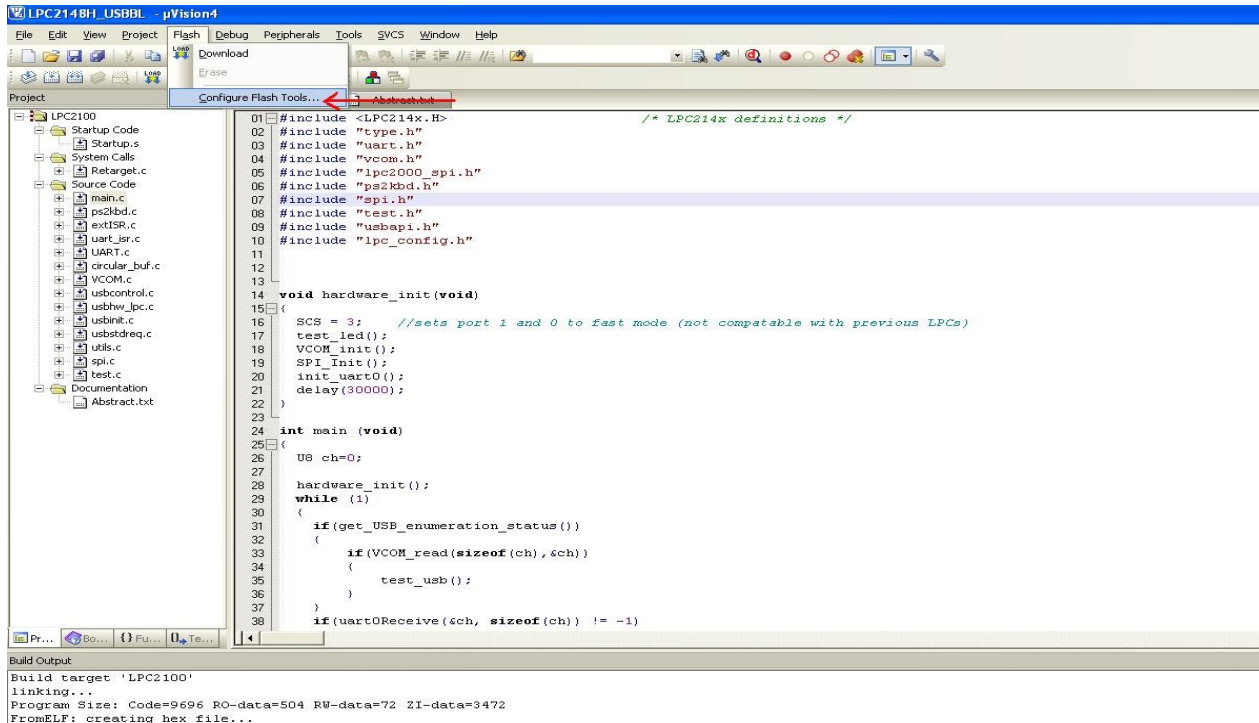
2.2.3 USB Boot-loader

The BlueBoard-lpc2148-H will now be pre-loaded with the USB boot-loader firmware. With the USB boot-loader you can simply drag and drop your compiled binary file onto the device as you would with any USB flash drive, and it will update itself accordingly. No need for serial port for flashing. Hold down SW3 (ISP) and SW2 (RESET), then release SW2 first and finally SW3. Now the pre-loaded USB boot-loader allows you to enumerate the board as a Mass Storage Device. Drag the compiled binary file and drop onto the device and reset the board using SW2, and the firmware runs.

The new USB boot-loader concept for NGX Blueboard series of development boards launched with BlueBoard LPC2148-H, this continues with the rest of our boards in coming days. This is the way to making the BlueBoard LPC2148-H easier to use, with less time and effort involved on the development side for people working with these chips.

Steps involved in making your KEIL project compatible with the pre-loaded USB boot-loader in BlueBoard-lpc2148-H:

1) As shown in below fig. Open the μ Vision IDE and go to **Flash --> Configure Flash Tools-->Target**.



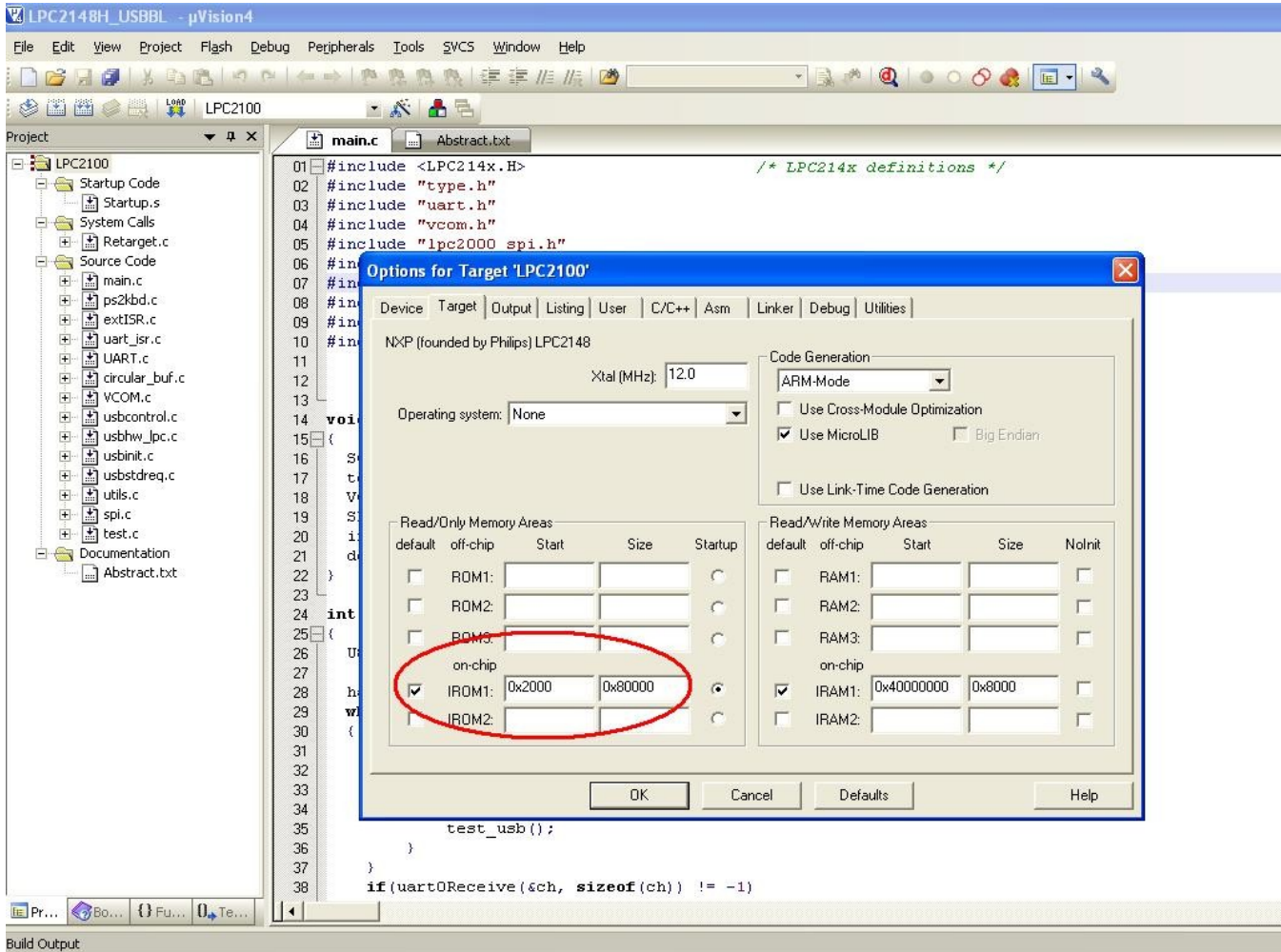
```

01 #include <LPC214x.H>          /* LPC214x definitions */
02 #include "type.h"
03 #include "uart.h"
04 #include "vcom.h"
05 #include "lpc2000_spi.h"
06 #include "ps2kbd.h"
07 #include "spi.h"
08 #include "test.h"
09 #include "usbapi.h"
10 #include "lpc_config.h"
11
12
13
14 void hardware_init(void)
15 {
16     SCS = 3;    //sets port 1 and 0 to fast mode (not compatible with previous LPCs)
17     test_led();
18     VCOM_init();
19     SPI_Init();
20     init_uart0();
21     delay(30000);
22 }
23
24 int main (void)
25 {
26     US ch=0;
27
28     hardware_init();
29     while (1)
30     {
31         if(get_USB_enumeration_status())
32         {
33             if(VCOM_read(sizeof(ch), &ch))
34             {
35                 test_usb();
36             }
37         }
38         if(uart0Receive(&ch, sizeof(ch)) != -1)

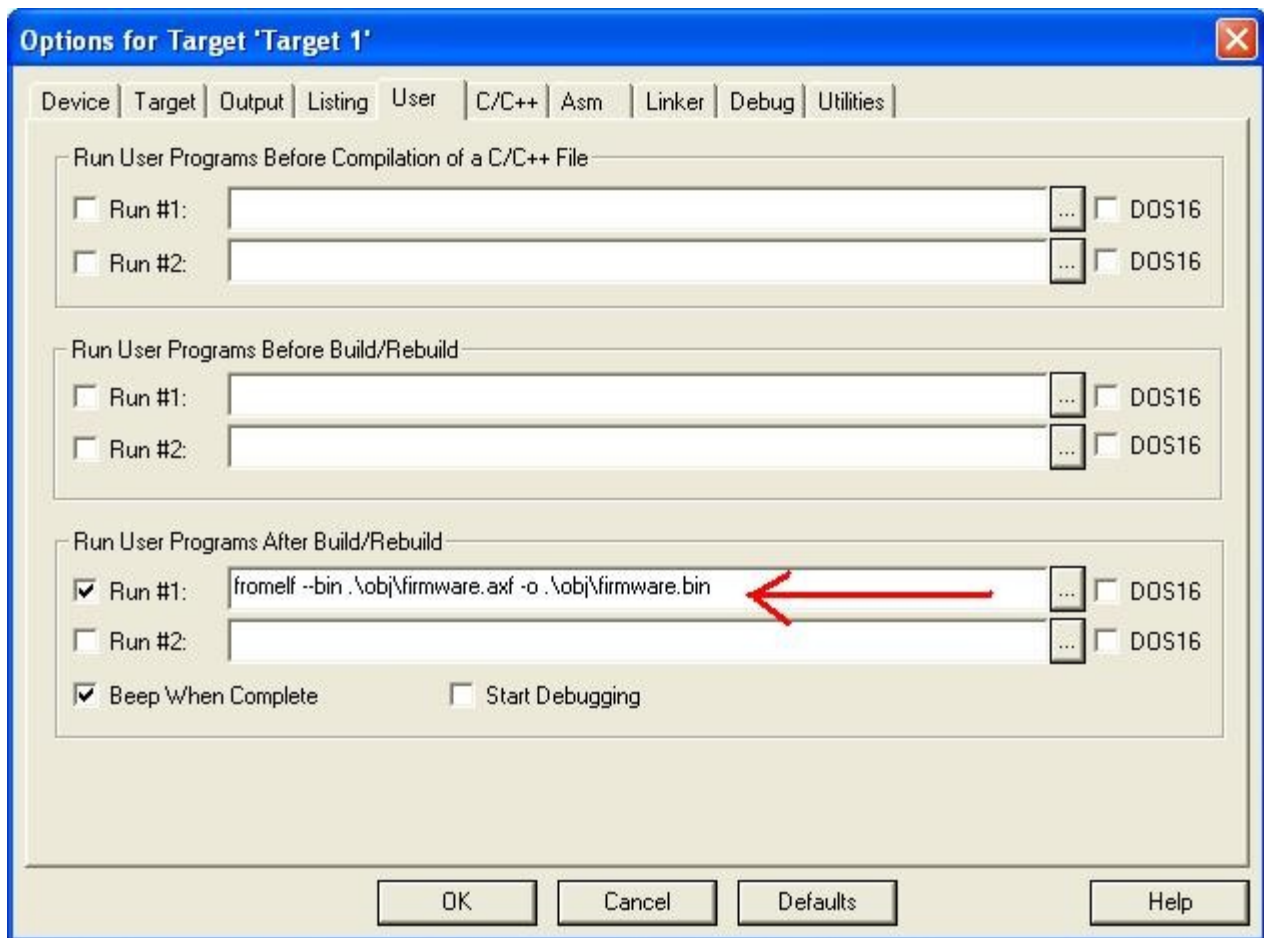
```

Build Output
Build target 'LPC2100'
linking...
Program Size: Code=9696 RO-data=504 RW-data=72 ZI-data=3472
FromELF: creating hex file...

- Change the start address of on-chip IROM1 memory from 0 to 0x2000 as shown in fig. Below .This is the area where user program is placed and has to run when the controller is reset.



3) Here in fig as below Go to Flash --> Configure Flash Tools-->User.



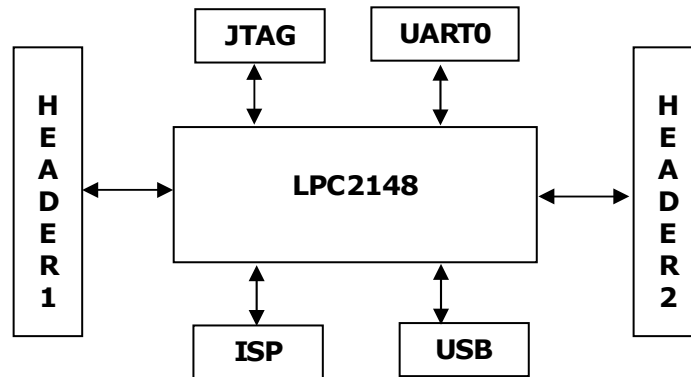
Insert the user command in Run #1 ticking the check box. After compile and build the entire project, from elf it creates hex file along with the hex file there will be another file with the extension .axf. This user command is used to convert .axf file to .bin. Here in fig. Above firmware.axf is converted to firmware.bin which is used for drag drop programming with the USB boot-loader that allows you to enumerate the board as a Mass Storage Device.

Note: The location of .axf file in the user command must be same where its located in the project folder. In the above fig the default location of .axf file is folder obj in the project folder so the user commands goes like `.\obj\firmware.axf`.

The Boot-Loader Examples and BIN files can be found at [USB Boot-loader](#)

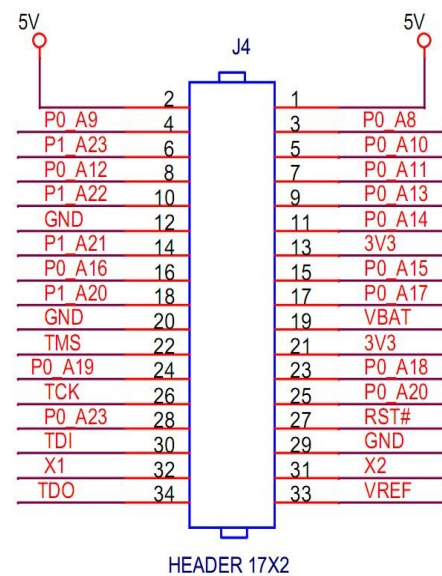
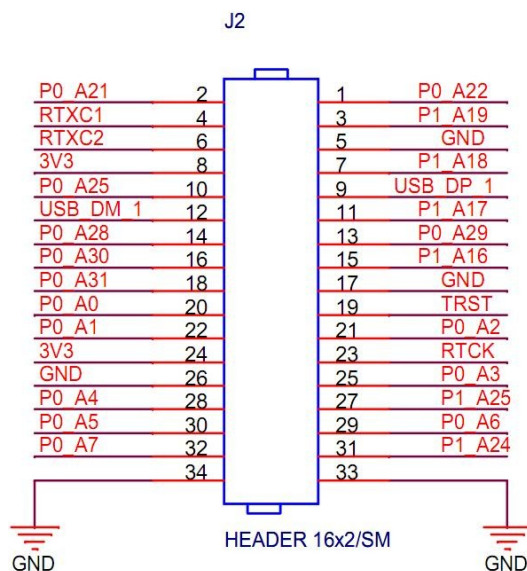
3 BlueBoard Hardware

3.1 Functional Overview



3.2 Hardware Configurations

Blueboard-lpc214x-h header board pin assignments



Testing Blueboard-lpc214x-H

The board is shipped with the pre-loaded USB boot-loader firmware which can test all the peripherals.

USB boot-loader :USB boot-loader allows you to enumerate the board as a Mass Storage Device. With the USB boot-loader you can simply drag and drop your compiled binary file onto the device as you would with any USB flash drive, and it will update itself accordingly. By this, programming is made easier so that there will be no more messing around with the serial port and to flash with PC tool for programming like FlashMagic etc.,.

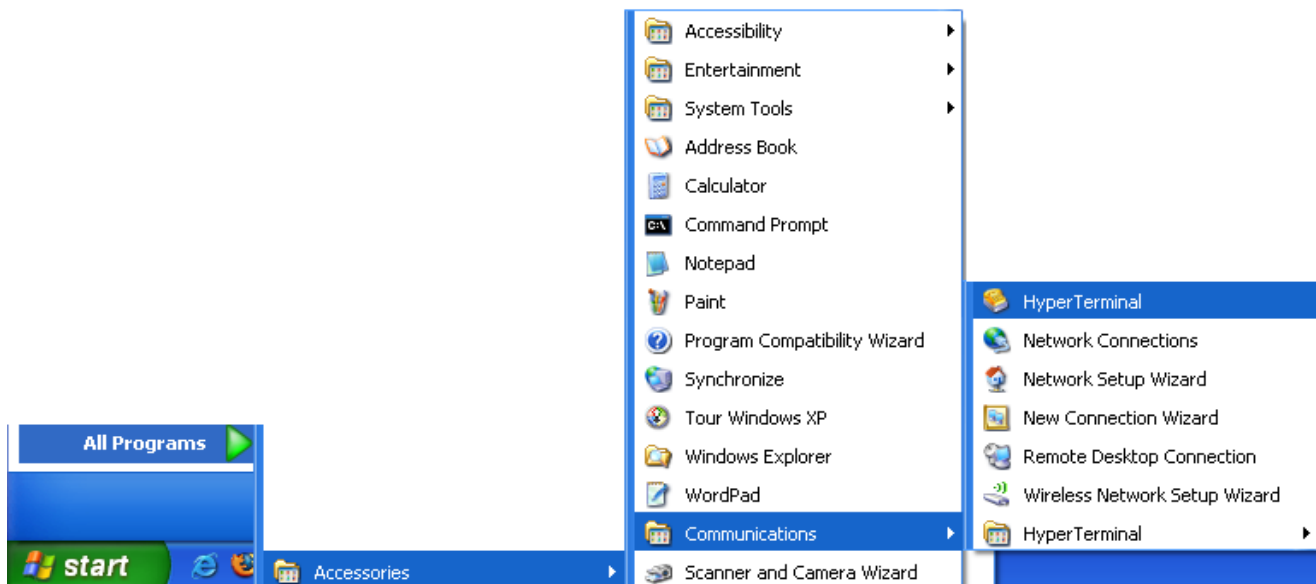
3.2.1. LED

Test Setup: Power the board with USB and you should observe that the LED blinks for a couple of times

3.2.2 UART0

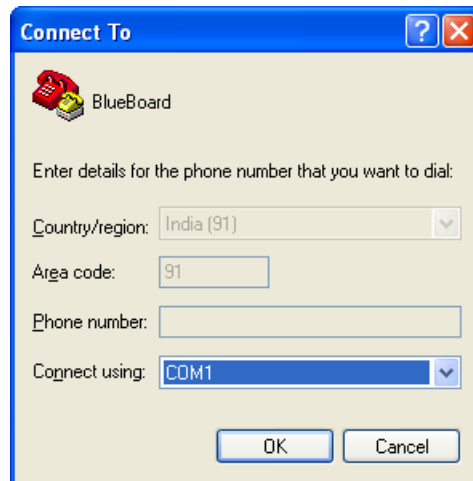
Test setup: Connect jumpers to all pins of J1 & J6. Open the hyper terminal as shown in the below image.

To test the UART you can use either a full modem or half modem cable.

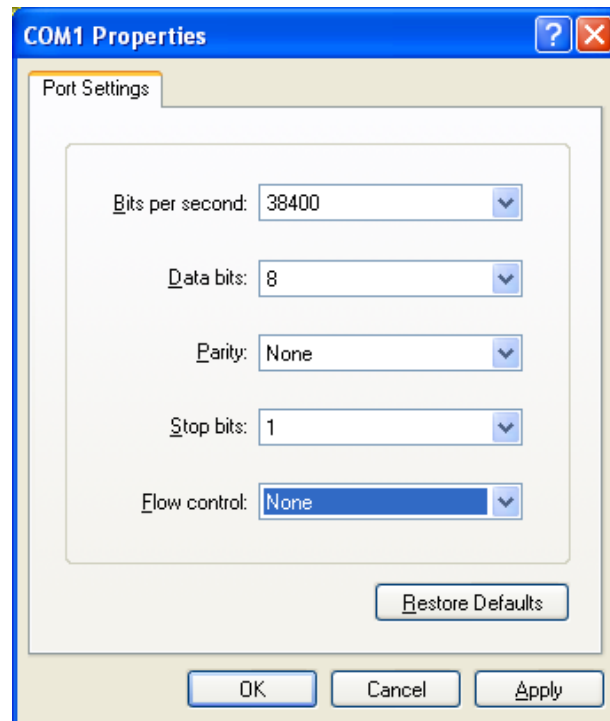


Click on hyper terminal a “Connection Description” window opens. Enter a name under the name tab e.g. BlueBoard and click OK.

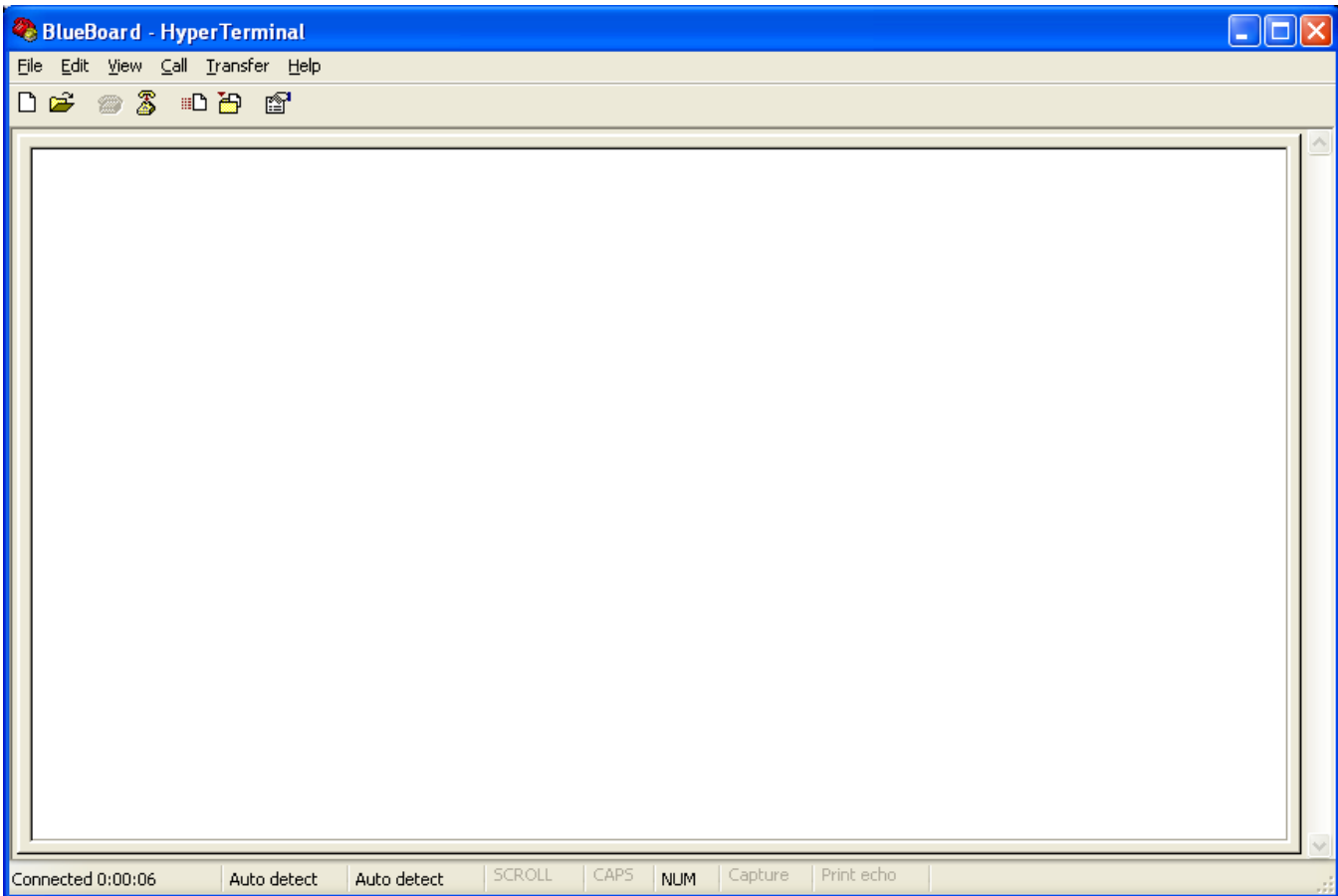
A “Connect To” window opens where you have to select the COM port. In this example it is COM1. Click OK.



A “COM1Properties” window appears. Set the values as shown below. Click OK.

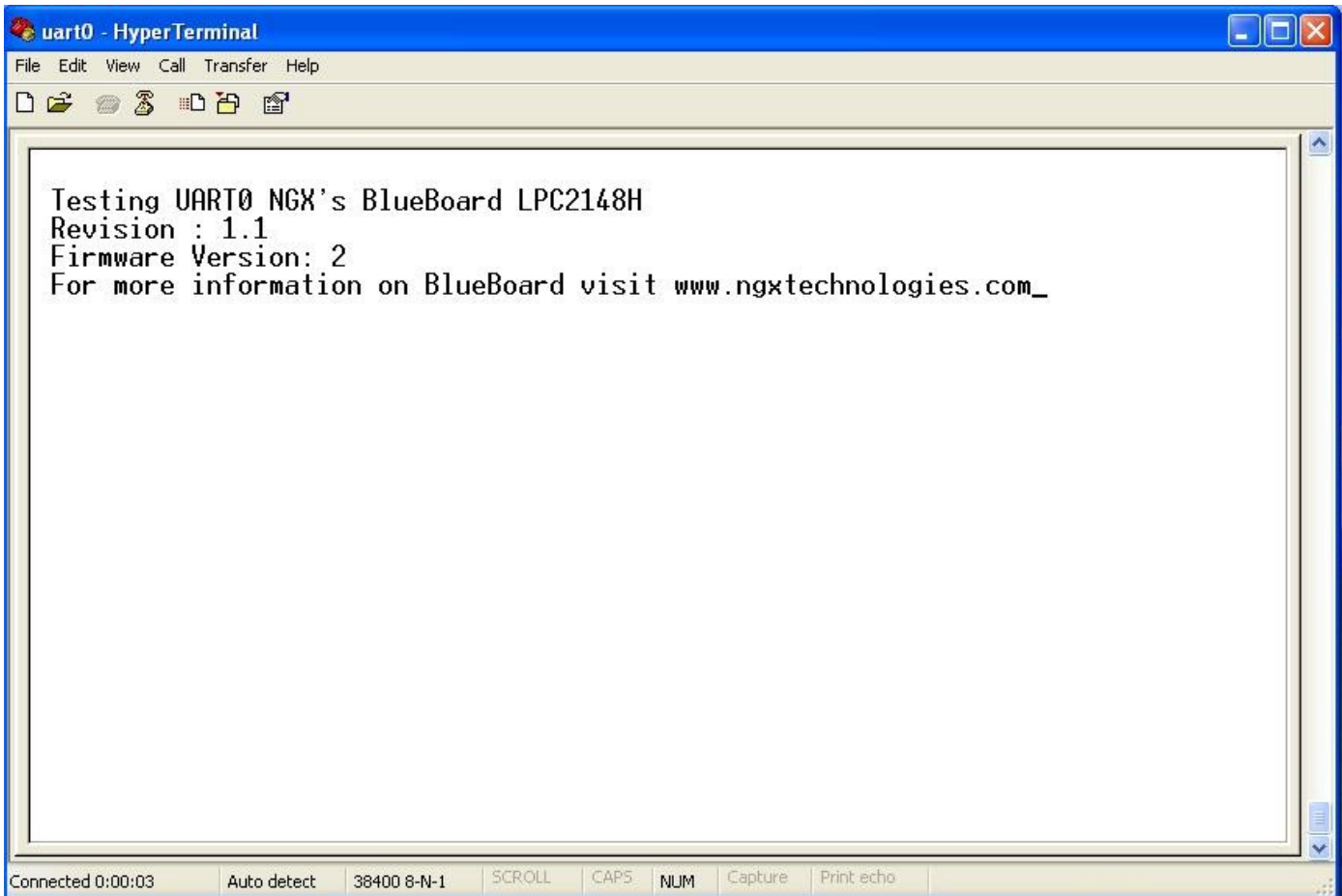


Next an empty “BlueBoard-Hyper Terminal” window opens as shown.



Now make sure that the BlueBoard-lpc2148-H is powered and the serial port is connected to the respective port to be tested (UART0). By pressing any key from keyboard the following message will appear for the respective UART.

For UART0:



UART0 can also be used for serial programming.

3.2.3 USB

Before moving ahead with this section, refer to [USB Virtual COM Port Installation for Windows XP](#) section.

Test setup: Connect the USB cable to USB connector. The power LED (D1) and USB connect LED (D2) turn ON. The USB enumeration can be checked in device manager. The BlueBoard enumerates as a Virtual COM port. To test the Virtual COM port; we can test it as we tested the UART0/1 of BlueBoard.

3.2.4 JTAG connector

Test setup: To enable debugging on the board connect jumper to J6 and connect the JTAG to debug port. We have successfully tested the BlueBoard with JTAG interface using a Wiggler Clone JTAG. To test this feature you need to have the necessary software support on your PC.

Take a look at http://blueboard-lpc214x.googlecode.com/files/NGX_ARM_USB_JTAG.pdf and <http://blueboard-lpc214x.googlecode.com/files/NGX%20parallel%20port%20JTAG.pdf> to know how to use the JTAG interface

4 BlueBoard Utilities

4.1 Overview

For the working with BlueBoard there are certain tools that need to be installed. The tools required to work with BlueBoard are:

- ✓ Flash Magic.

The flash magic tool can be downloaded from the following link:

<http://www.flashmagictool.com/>

For LINUX machines you may use http://www.pjrc.com/arm/lpc2k_pgm/

Tool chain:

To be able to generate the hex or the binary file the user needs to install the tool chain for ARM based microcontrollers. Any toolchain can be used as long as it is able to generate the necessary files for downloading onto the BlueBoard. Here are few toolchain suggestions:

GNUARM ToolChain: <http://winarm.scienceprog.com/winarm-tools/prepare-gnuarm-compiler-toolchain-for-windows.html>

WINARM :

Rowley Crossworks IDE: <http://www.rowley.co.uk/arm/>

Yagarto ToolChain: <http://yagarto.de/>

KEIL: <http://www.keil.com/arm/>

IAR: <http://iar.com/website1/1.0.1.0/3/1/>

4.2 Starting off

The board is shipped with pre-loaded firmware to verify all the above peripherals.

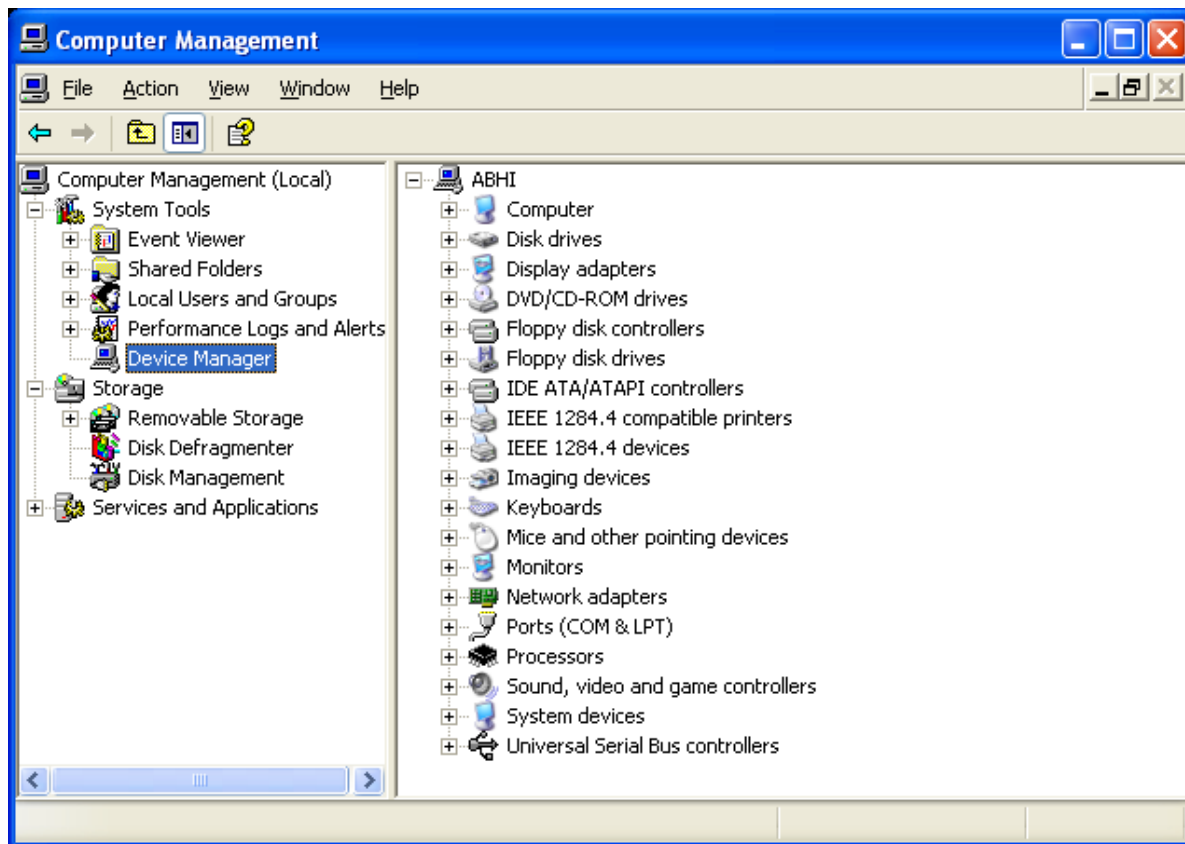
BlueBoard Default Setup:

The blueboard-lpc214x-H will blink the test led for couple times and then will initialize the UART and USB peripherals. A default message is dumped on the UART on power up. It also enumerates as USB virtual COM.

5 Troubleshooting

5.1 USB Virtual COM Port Installation For Windows XP

The USB in BlueBoard might not get enumerated if it does not find the appropriate driver for it. To check USB enumeration status Right Click on "My Computer" icon and select Manage. A "Computer Management" window opens. In this select Device Manager as shown below:



The device uses the *usbser.sys* driver. This driver file is not unpacked in Windows by default and needs to be extracted from a Windows .cab file which should be in the C:\WINDOWS\Driver Cache\i386 directory for Windows XP SP2. Change directory to **C:\WINDOWS\Driver Cache\i386** expand the CAB file by running the below command in Command-Prompt

```
expand sp2.cab -f:usbser.sys C:\WINDOWS\system32\drivers
```

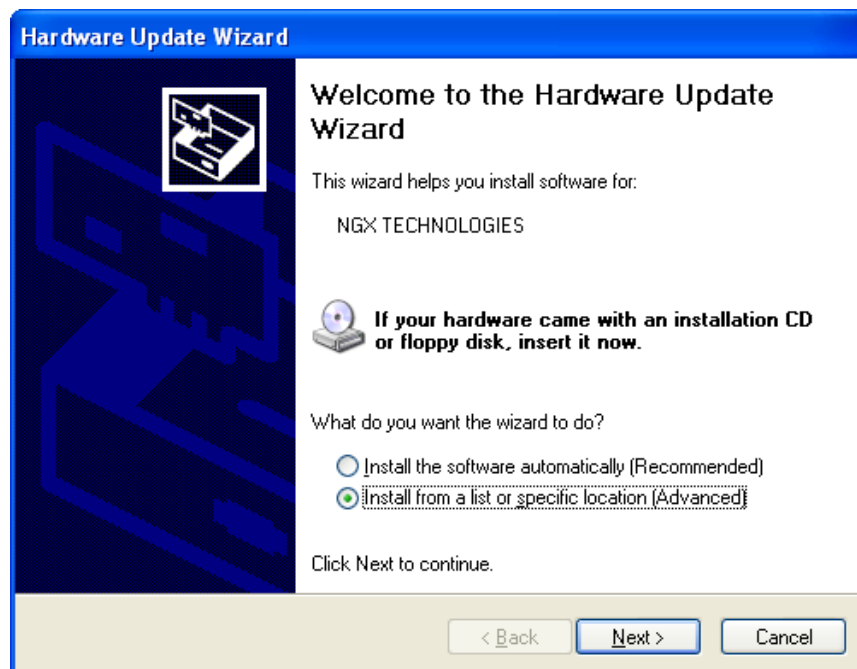
Note: On some systems like the XP home edition; extraction of driver files from cab files might not be supported. In such situation the user can download the *usbser.sys* file from <http://blueboard-lpc214x.googlecode.com/files/usbser.sys> and copy it to C:\WINDOWS\system32\drivers folder

Next, download the usbser.inf file from <http://blueboard-lpc214x.googlecode.com/files/usbser.inf>

Place it in any convenient folder

Plug in the device

A Hardware Update Wizard opens up. Select the second option as shown and Click Next.



Note: If the wizard does not open up automatically then the user needs to go the 'Device Manager' window and right click on the device and select 'update driver'

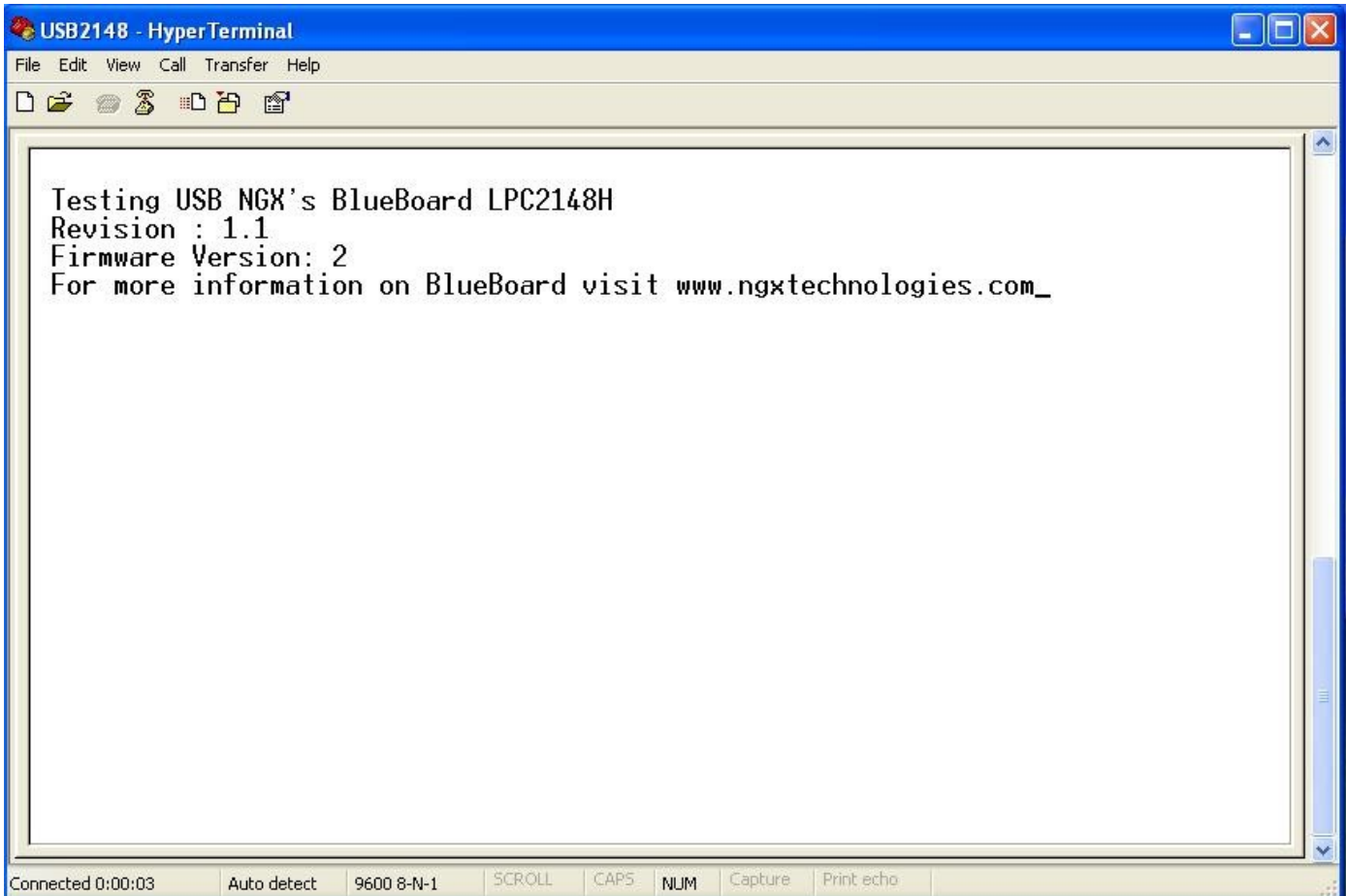
Set the new hardware Wizard to search a specific location for the driver, and specify the folder containing usbser.inf

The Wizard will prompt for the location of usbser.sys. Specify its location

(i.e. C:\WINDOWS\system32\drivers) and Click Next.

The installation should now complete and indicate the device has been installed. The device should now get enumerated under "**Ports(COM & LPT)**" option in 'Device Manager' window.

To test the USB interface open Hyper Terminal by selecting the COM port specified by the system. The COM port number assigned to the USB serial device is not fixed and can change. To know the current COM port number the user needs to look into the 'Device Manager' page under "Ports(COM & LPT)" . After selecting the appropriate COM PORT, press any key on keyboard; a message will be displayed in the hyper terminal window as shown below. This confirms that the USB interface on the BlueBoard is fine.



6 Schematics

A PDF version of the schematic can be downloaded from:

[BLUEBOARD-LPC2148H_V2.pdf](#)

7 Sample applications

The source code to demonstrate the usage of the following peripherals can be found at <http://code.google.com/p/blueboard-lpc214x/source/checkout>

The Boot-Loader Examples and BIN files can be found at [USB Boot-loader](#)

8 Known Issues

Nil