[DA1-0039-UM01-010V01-EN]

APG221 USB-IDE
User Manual

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Chapter 1 Introduction

APG221 is a feature-rich 8051 based micro-controller with hardware debug support. A debug monitor is developed to use the built-in USB device module to interface with the debugger software on the PC side. With USB filter driver architecture in Windows OS, debug and application channel can be multiplexed on the same USB connection.

With such an approach, power supply, debug interface and application interface to APG221's development board is possible, with a single USB connection.

Keil's uVision IDE is the development platform for APG221. For the debug monitor to connect to Keil's debugger, a debugger plug-in (in DLL form) is developed according to Keil's application note (http://www.keil.com/appnotes/docs/apnt_145.asp).

In this document, procedures to install the debugger plug-in, as well as how to use it for development with the Keil uVision IDE, will be described.

Chapter 2 APG221 EVK (Evaluation Kit)

The APG221 EVK board is a hardware platform for evaluation of the APG221 micro-controller. With the APG221 USB-IDE, application debugging can be easily achieved.

Description of the connectors and jumpers are described in the following figures.

Chapter 3 Installation

3.1. Install Keil uVision IDE for 8051

The APG221 USB-IDE works with Keil's uVision 2, 3 or 4 for 8051.

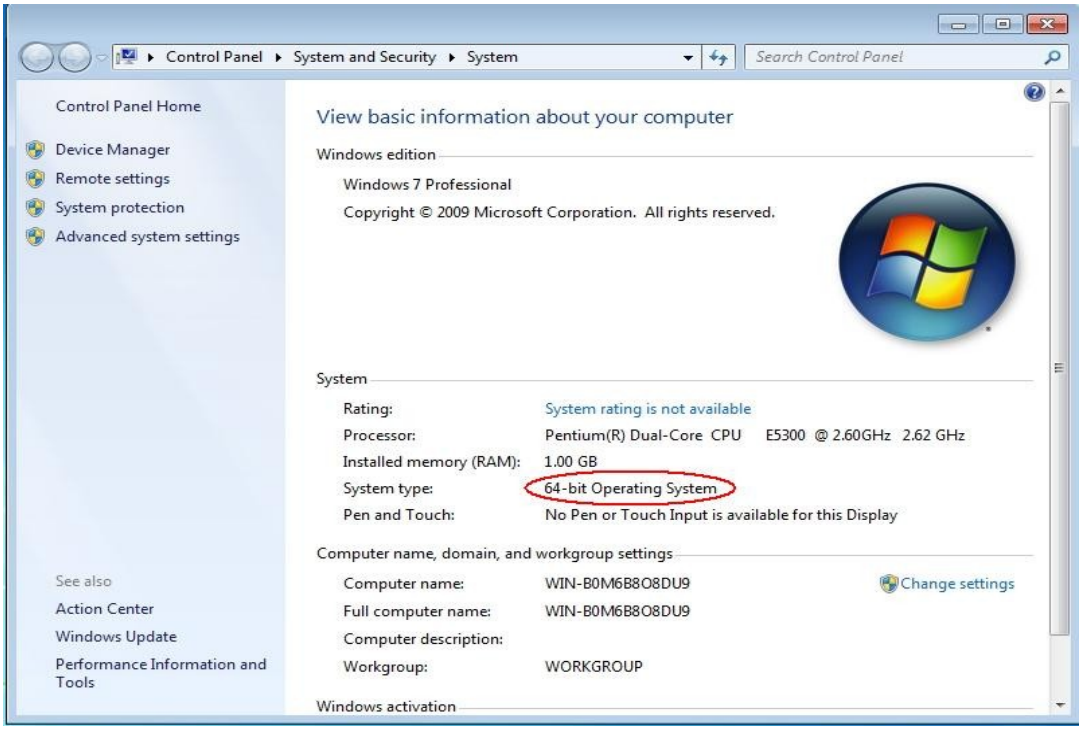
Skip this part if uVision has already been installed.

An evaluation copy of uVision 4 is included in the installation package (in folder "KeilUV4EvaVer"). Simply start the installer and follow the instructions to install it.

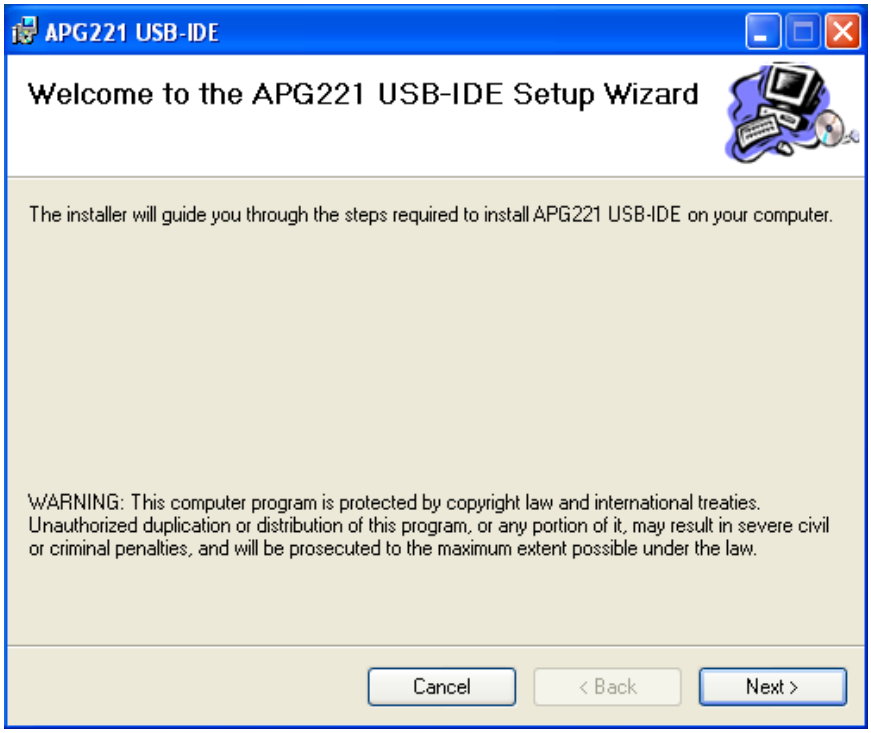
3.2. Install APG221 USB-IDE

The installer can be found in folder "Setup". For 32/64 bit system, installer "Setup.msi"/"SetupX64.msi" should be executed.

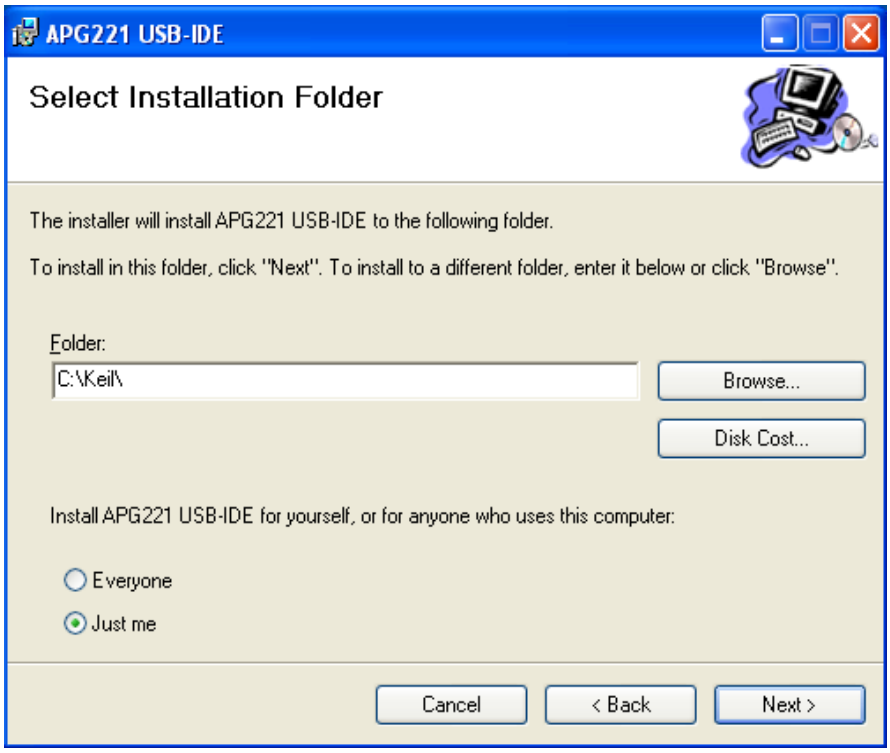
To check what version your Windows is, press "Start" and then right-click on "My Computer" (or "Computer" for Windows 7) and select "Properties".



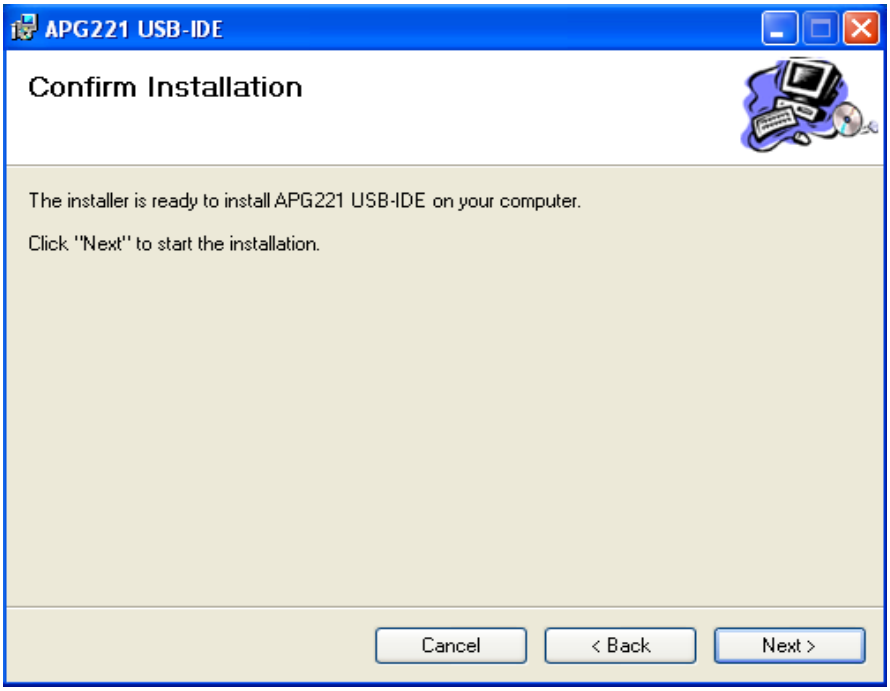
When the installer is executed, the welcome page will be shown.



Press “Next” to proceed.



Select the installation folder and press “Next”.



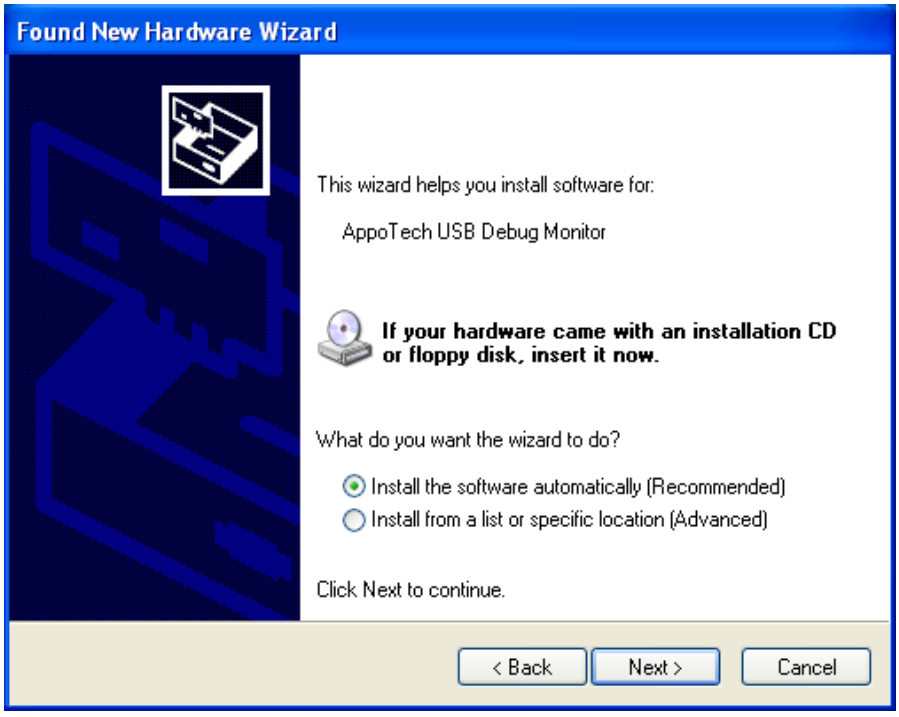
Press “Next” to start installation.

Connect the APG221 EVK to PC through USB cable to complete the USB device

driver installation. Make sure that J10 is on the VBUS side and that the power LED is turned on.

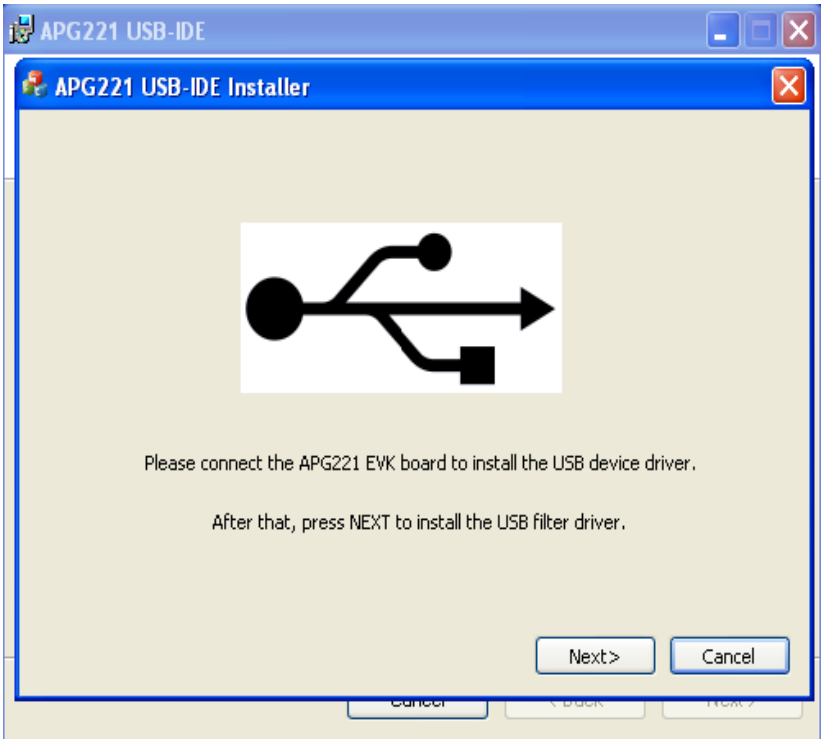
The “Found New Hardware Wizard” dialog box will pop up.

Select “No, not this time” and press “Next”.



Select “Install the software automatically (Recommended)” and press “Next”.

Press “Finish” to complete USB device driver installation.

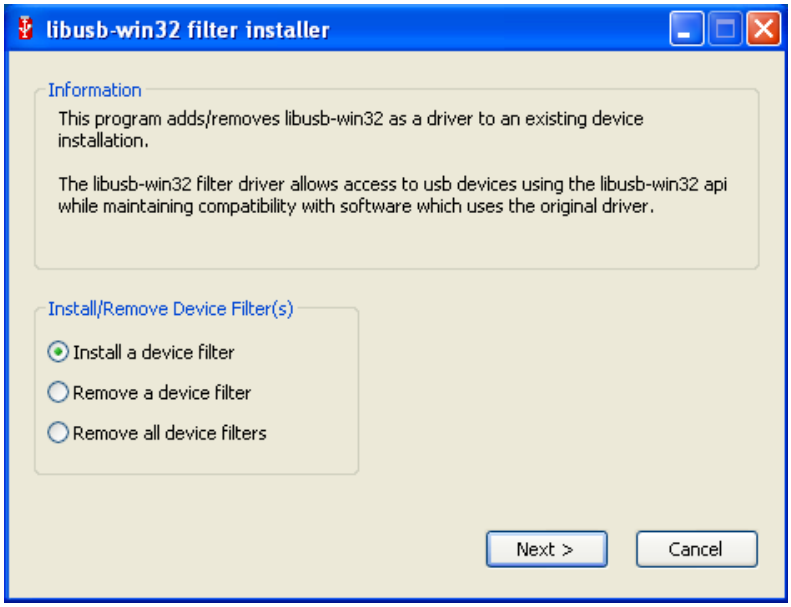


After USB device driver installation, press “Next” to install the LibUsb filter

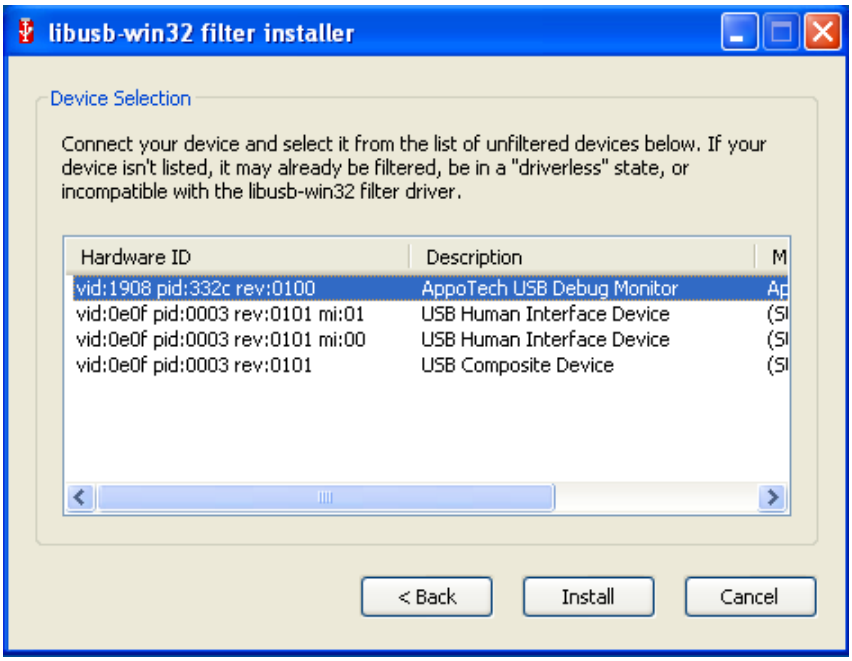
driver.

REMARK: The USB device driver is used by applications to access the USB device, while LibUsb filter driver is used by the debugger plug-in to connect to the debug channel of the device (in parallel to the normal USB connection).

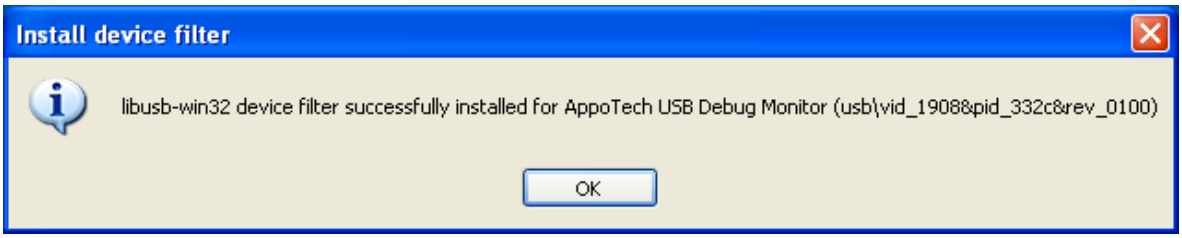
The LibUsb Filter (Driver) Installer will pop up.



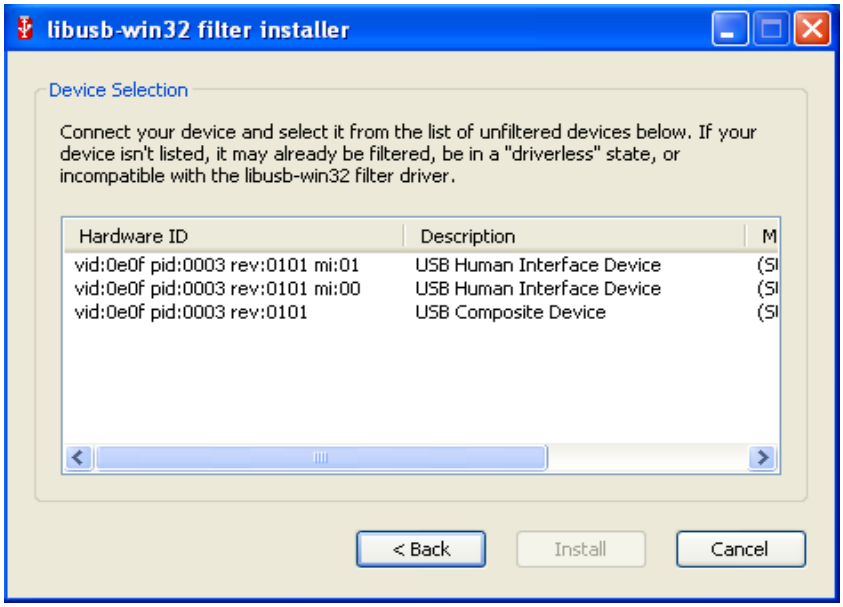
Press “Next” to install the filter driver.



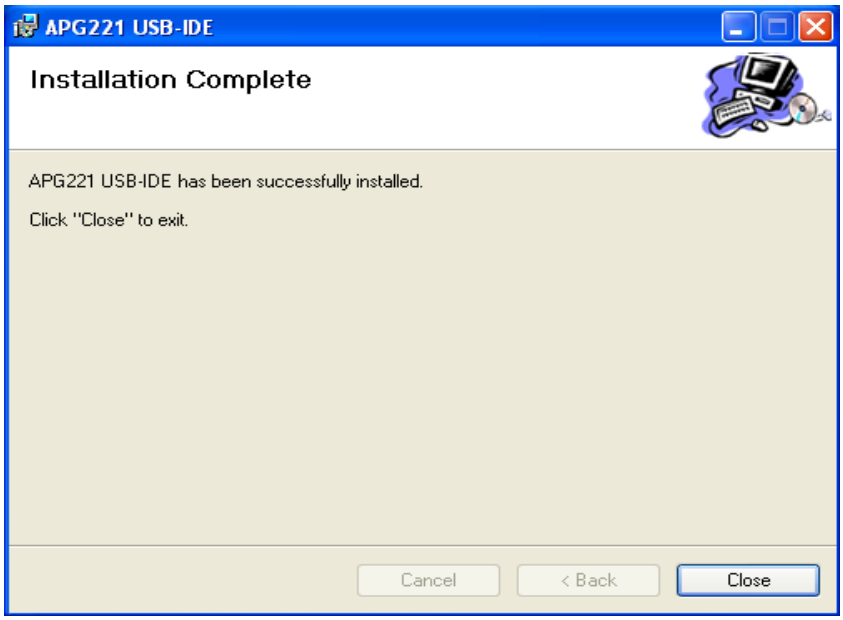
From the list of connected USB devices, select the one with description of "AppoTech USB Debug Monitor" and press "Install".



Confirm that the filter has been successfully installed.



Press "Cancel" to exit the LibUsb Filter Installer.



APG221 USB-IDE has been successfully installed.

3.3. Install LibUsb Filter Driver Manually

When an application with USB device function is developed, APG221 will appear as a USB device other than the “AppoTech USB Debug Monitor”.

For the newly developed USB device to work with Windows OS, the developer has to install an appropriate device driver (unless matched USB class driver is available).

For the uVision debugger to connect to the debug channel of the newly developed USB device, a new LibUsb filter has to be installed. To do it, simple execute the appropriate LibUsb Filter Driver Installer (in folder “LibUsb”) and select the device for which the filter is to be installed (as illustrated in the above figures).

Chapter 4 Test with the sample applications

Two sample applications are included in the installation package. Users may follow the steps described below as a tutorial of how to use the USB-IDE for application development and debugging.

4.1. The LED sample application

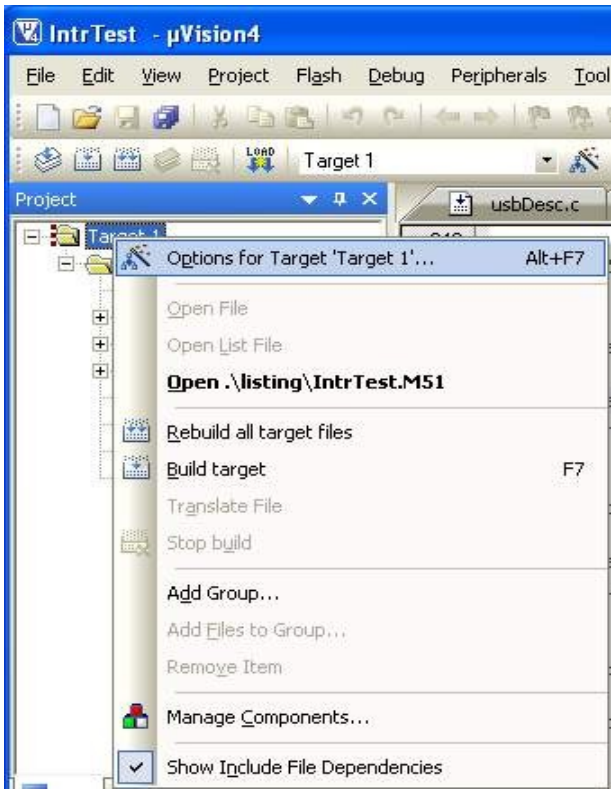
This is an example of how to use the APG221 I/O pins to turn LEDs on and off. Both delay loop and timer interrupt are used for timing control.

4.1.1. Build the sample application

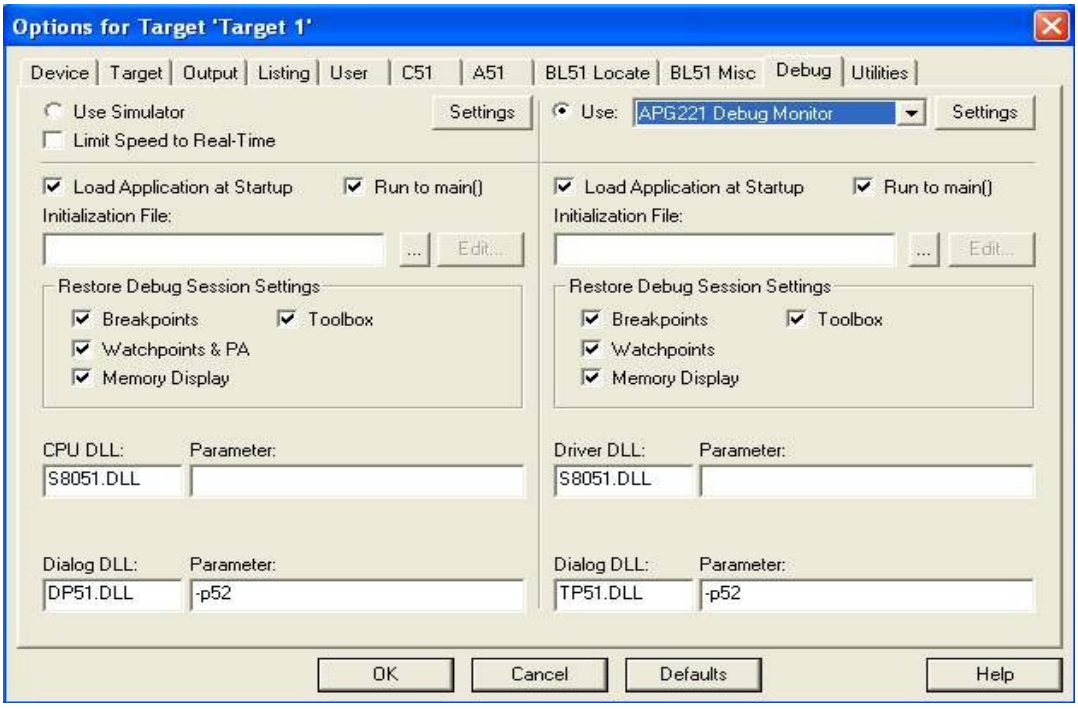
- Copy folder "TestApp\LedTest" to desired location
- Double-click on file “SRC\LedTest.uvproj” to start uVision4 (or SRC\uv2\LedTest.uv2” to start uVision 2 or 3)
- Click on main menu item "Project"/"Rebuild all target files" to rebuild the project
- Verify from the output window that the build is completed successfully with no error

4.1.2. Configure debugger

- In uVision, right-click on “Target 1”



- Select "Options for Target 'Target 1'...



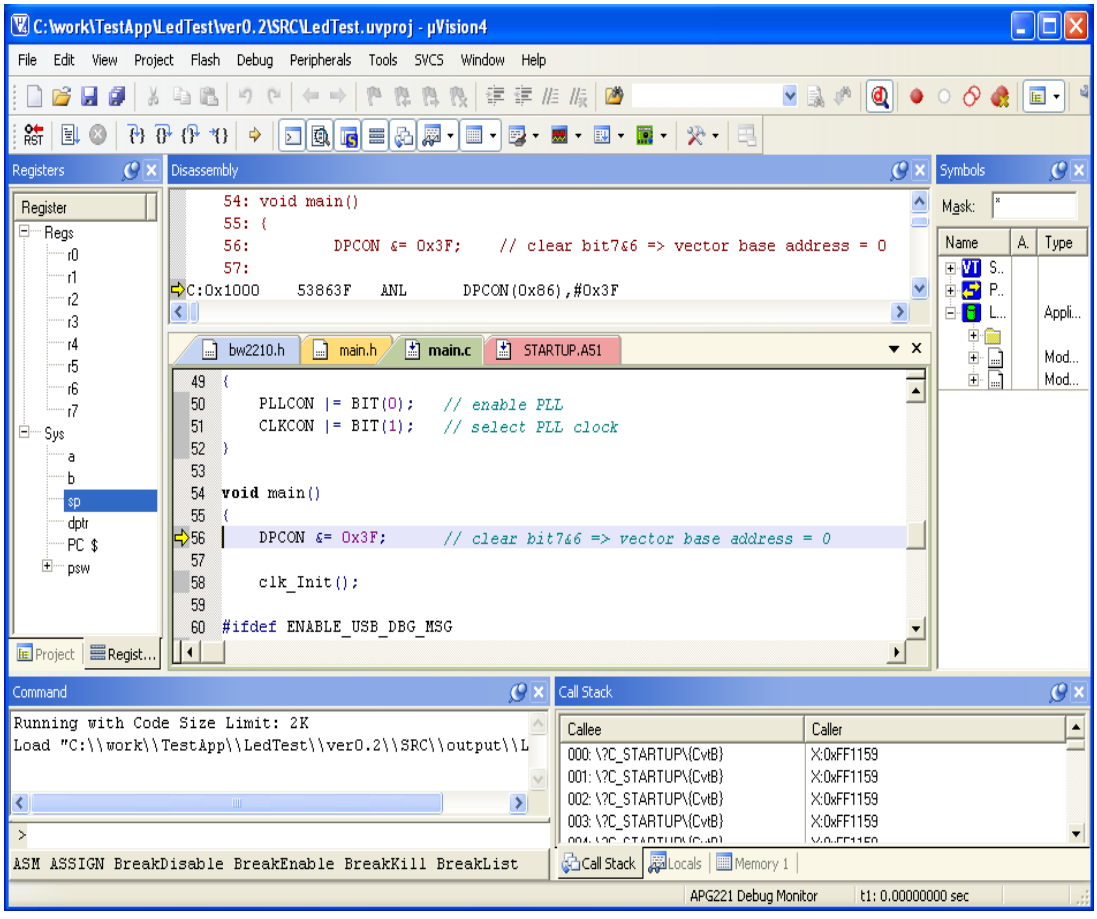
- Select tab "Debug" and select "APG221 Debug Monitor" in the list box

4.1.3. Connect EVK board

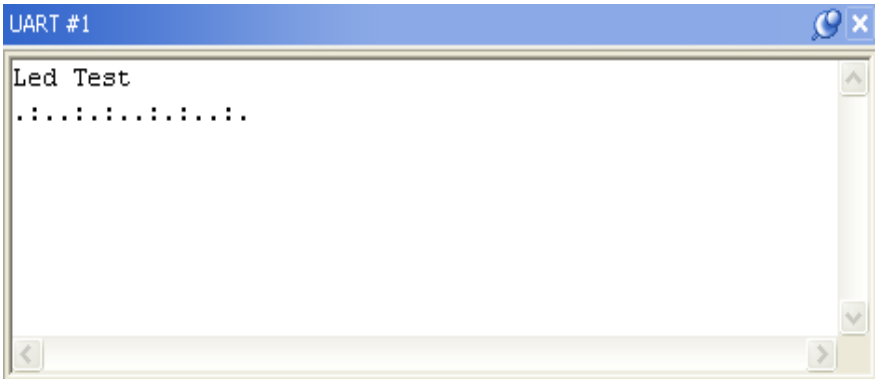
- Make sure that jumper JP9 (Bootmode Select) is on the “Monitor” (“GND”) side
- Connect the EVK board to PC through USB cable
- Confirm that “Power LED” is turned on

4.1.4. Debug sample application

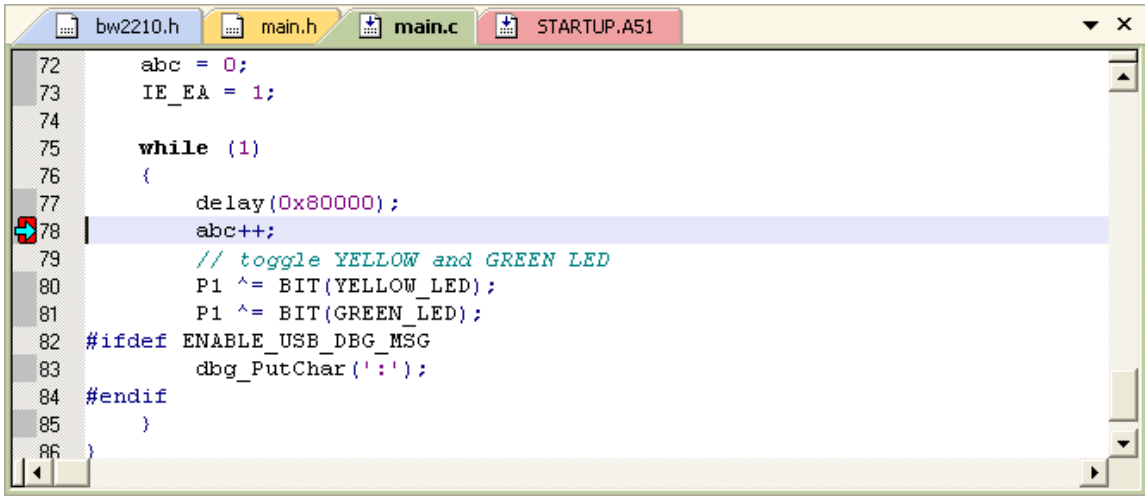
- In uVision, click on main menu item "Debug"/"Start/Stop Debug Session" (or press shortcut key Ctrl-F5).
- Confirm that debugger is started and then paused at main().
- Select main menu item “View”/”Serial Windows”/”UART #1”.



- Press F5 to run and confirm that debug messages are printed to the “UART #1” window and that LED D2, D3 and D4 are flashing



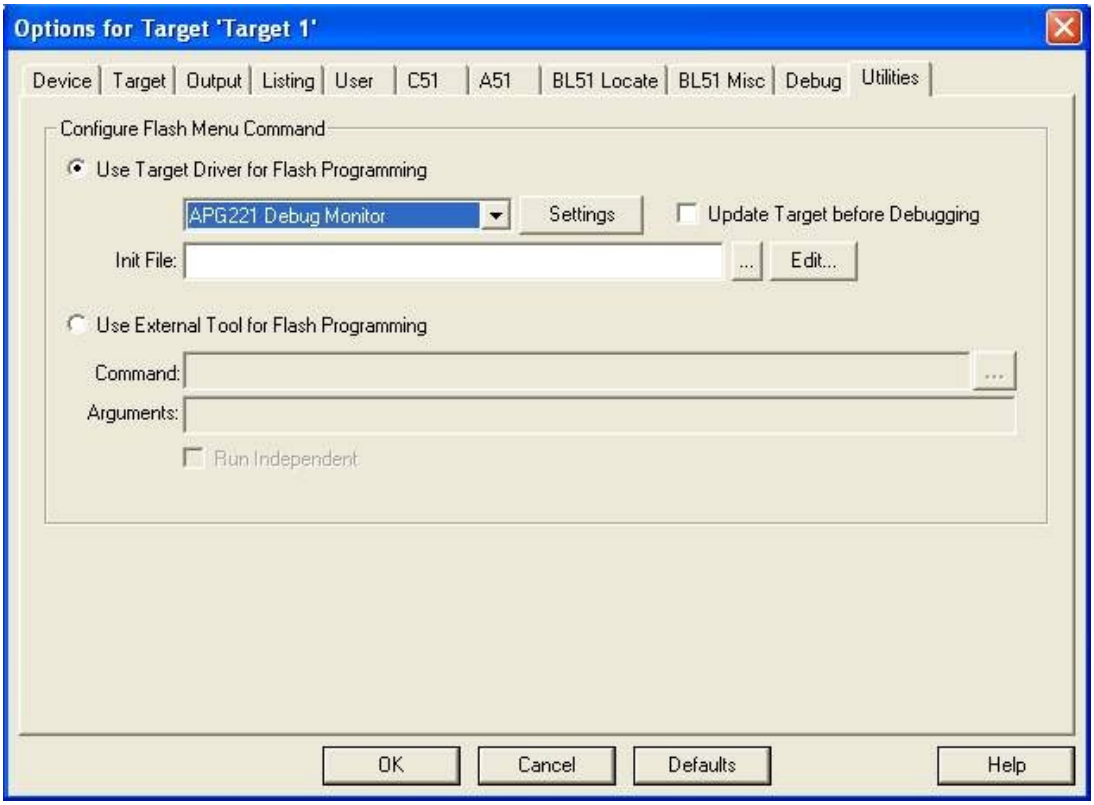
- Click on the STOP icon to pause.
- In the "Watch 1" window, double-click on the line "<double-click or F2 to add> and type "abc" to add variable to watch window.
- Add a breakpoint to line 78 of "main.c" (by double-click on the right-hand-side of the line).



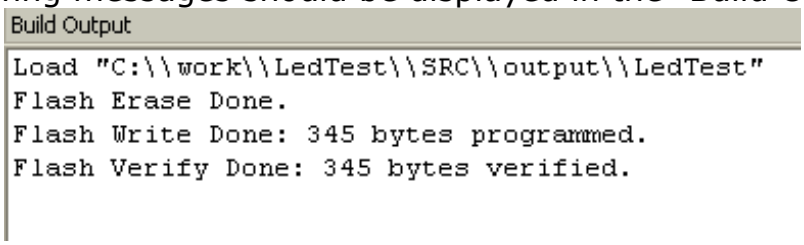
- Press F5 to run and confirm that debugger aborts at the breakpoint. Note value of "abc".
- Repeatedly press F5 and confirm that value of "abc" is incremented by 1 everytime the debugger aborts.
- Press Ctrl-F5 to stop debug session.

4.1.5. Flash programming

- Click on main menu item "Flash"/"Configure Flash Tools..." and select "APG221 Debug Monitor"



- Click OK
- Click on main menu item "Flash"/"Download" (REMARK: flash will be erased before program)
- The following messages should be displayed in the “Build Output” window:



4.1.6. Test boot modes

A) Normal Mode

- Short jumper JP9 (Bootmode Select) to “Normal” (i.e. to “VCC 3.6”)
- Reset EVK board (by pressing the RESET button or unplug-plug the USB cable)
- Confirm that sample program is running (indicated by flashing LED D2, D3 and D4)

B) Monitor Mode

- Short jumper JP9 (Bootmode Select) to “Monitor” (i.e. to “GND”)
- Reset EVK board (by pressing the RESET button or unplug-plug the USB cable)
- Confirm that sample program is not running (LEDs for testing are not flashing)
- Press CTRL-F5 to start debug session
- Confirm that debugger is started and then paused at main().

4.2. The HID sample application

In this example, the APG221 functions as a HID USB device. LED D2, D3 and D4 on the EVK board can be turned on/off through a PC application that control the HID device. Status of jumpers JP8 and JP9 on the EVK board will be indicated on the PC application.

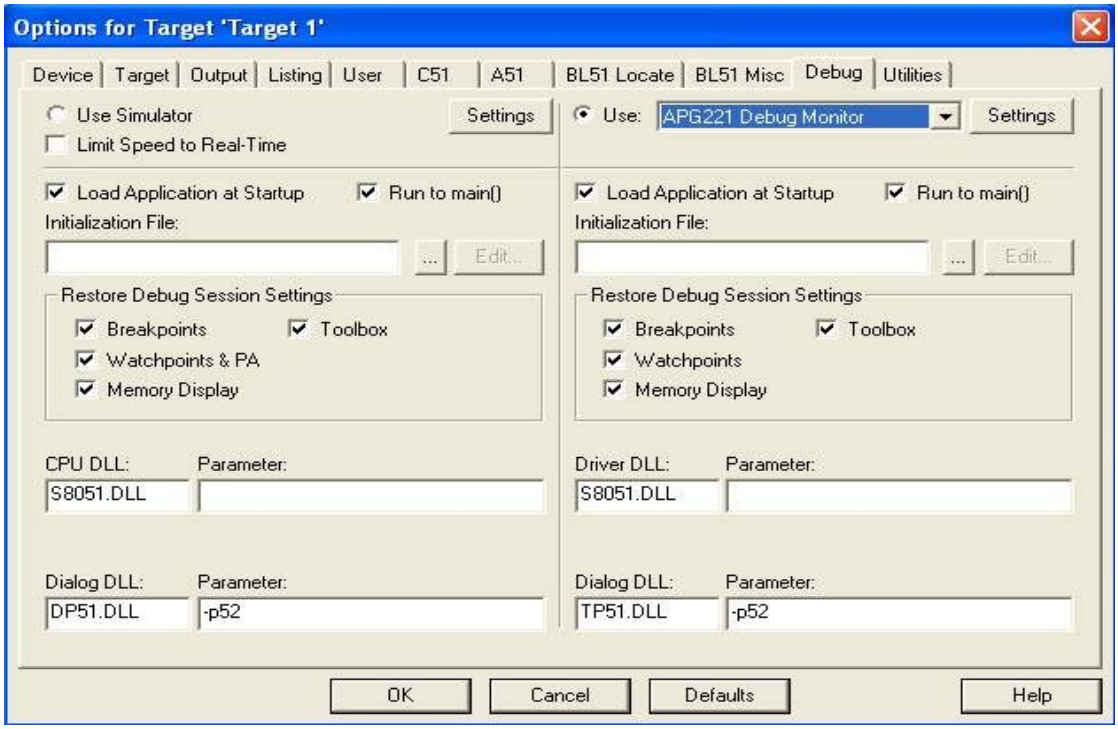
4.2.1. Build the sample application

- Copy folder "TestApp\HidTest" to desired location
- Double-click on file “SRC\HidTest.uvproj” to start uVision4 (or SRC\uv2\HidTest.uv2” to start uVision 2 or 3)
- Click on main menu item "Project"/"Rebuild all target files" to rebuild the project
- Verify from the output window that the build is completed successfully with no error

4.2.2. Configure debugger

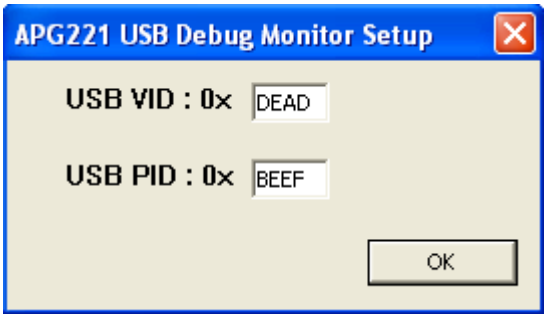
- In uVision, right-click on “Target 1”

- Select "Options for Target 'Target 1'...



- Select tab "Debug" and select "APG221 Debug Monitor" in the list box
- Click on "Settings"

- Enter “DEAD” for VID and “BEEF” for PID as follows:

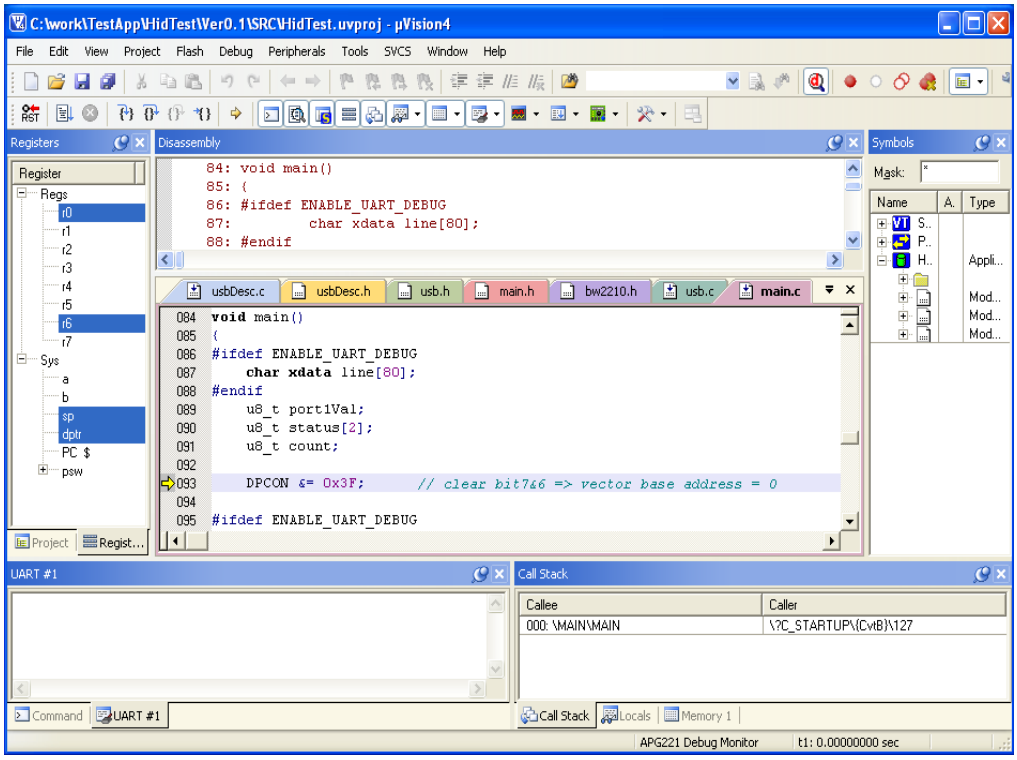


4.2.3. Hardware setup

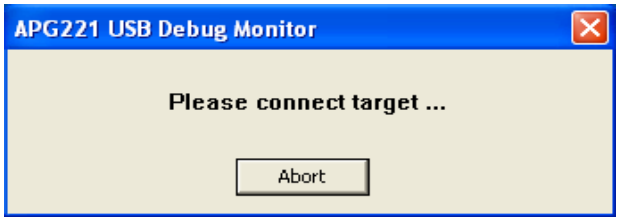
- Make sure that jumper JP9 (Bootmode Select) is on the “Monitor” (“GND”) side
- Connect the EVK board to PC through USB cable
- Confirm that “Power LED” is turned on

4.2.4. Execute sample application

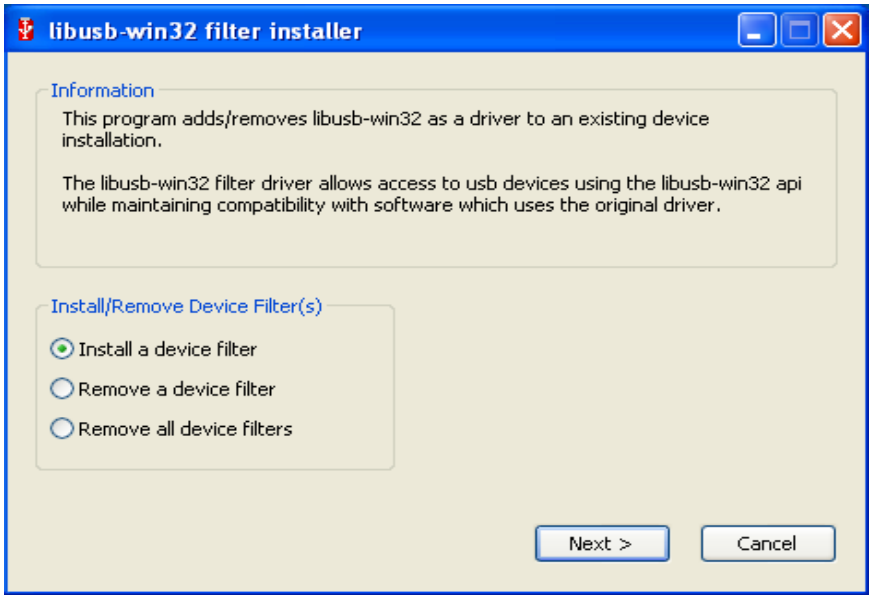
- In uVision, click on main menu item "Debug"/"Start/Stop Debug Session"
- Confirm that debugger is started and then pauses at main()
- Select main menu item “View”/”Serial Windows”/”UART #1”



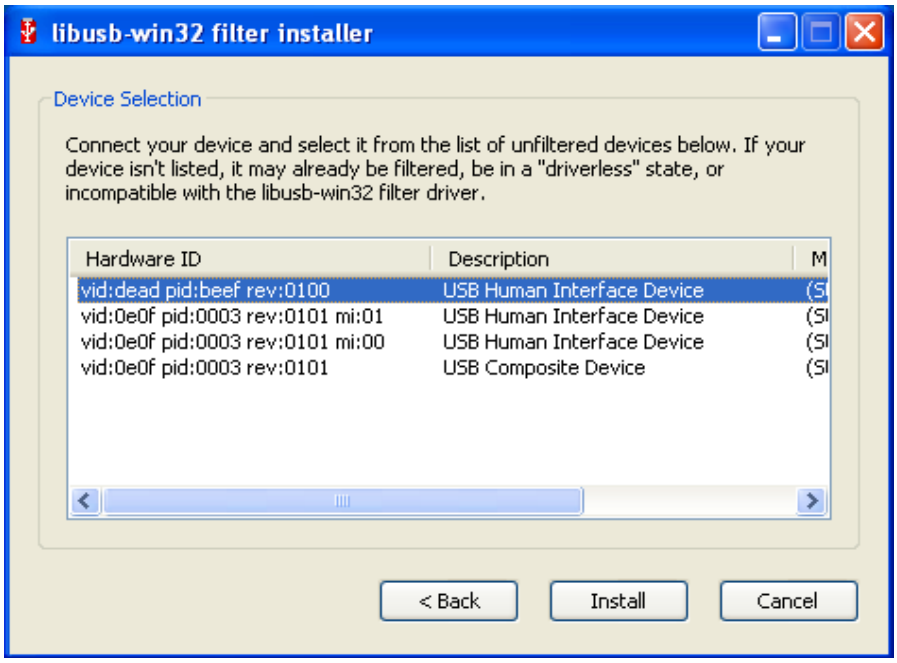
- press F5 to run



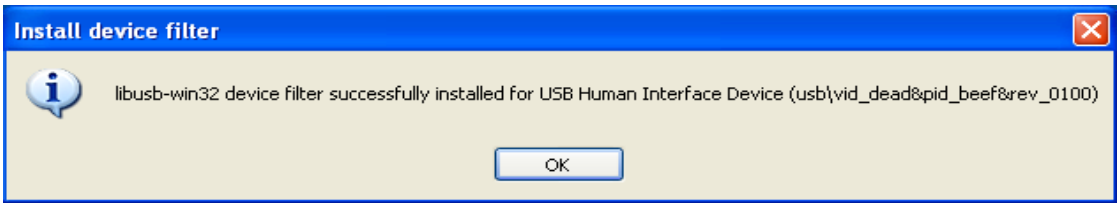
- Dialog box with message “Please connect target ...” will be popped up.
- Execute application “install-filter-win.exe” in folder “LibUsb\x86” or “LibUsb\x64” according to the Windows OS version



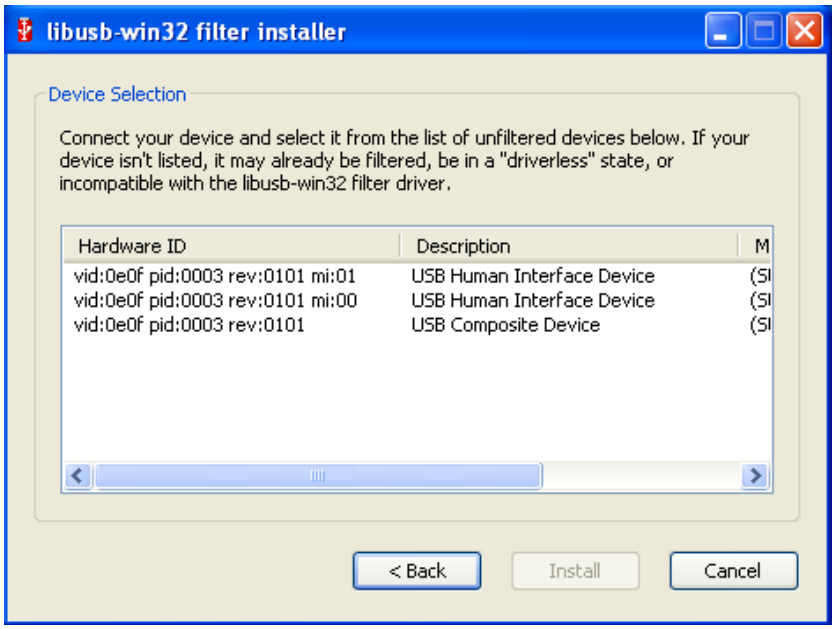
- Press "Next"



- Select the "USB Human Interface Device" with VID "dead" and PID "beef", and press "Install"

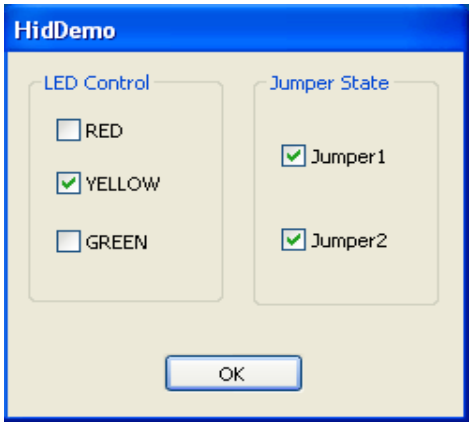


- Confirm that the filter has been installed successfully



- Press "Cancel" to terminate the LibUsb Filter Install
- Confirm that the dialog box with message "Please connect target ..." is closed and that debug messages are printed to the "UART #1" window as follows:

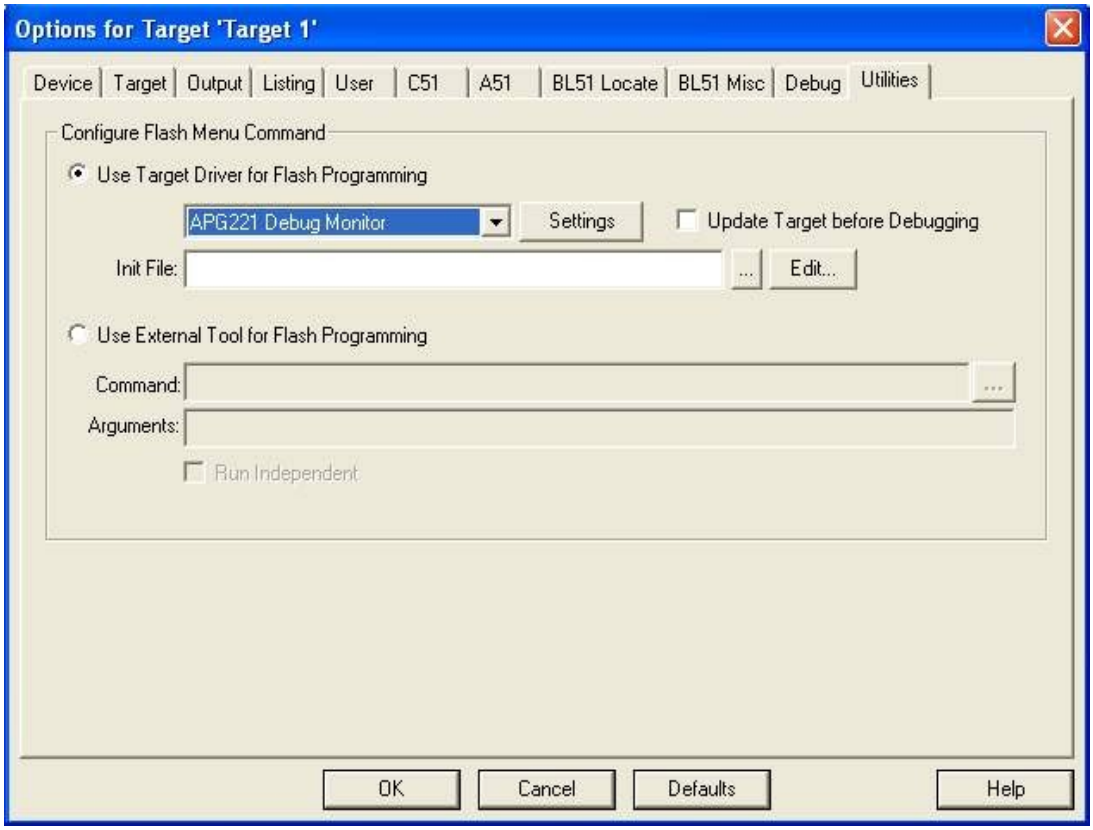
- Start application "TestApp\HidMfcDemo\OUTPUT\Release\HidDemo.exe"



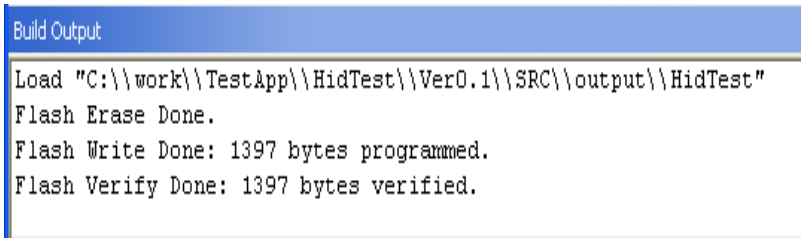
- Check/uncheck the checkboxes under “LED Control” and confirm that LED D2, D3 and D4 on the EVK is turned on/off accordingly
- Move the jumpers JP8 and JP9 on EVK board between “VCC3.6” and “GND” and confirm that the status under “Jumper State” changes accordingly

4.2.5. Flash programming

- Make sure that jumper JP9 (Bootmode Select) is on the “Monitor” (“GND”) side and press the Reset button
- Click on main menu item "Flash"/"Configure Flash Tools..." and select "APG221 Debug Monitor"



- Click OK
- Click on main menu item "Flash"/"Download" (REMARK: flash will be erased before program)
- The following messages should be displayed in the “Build Output” window:
-

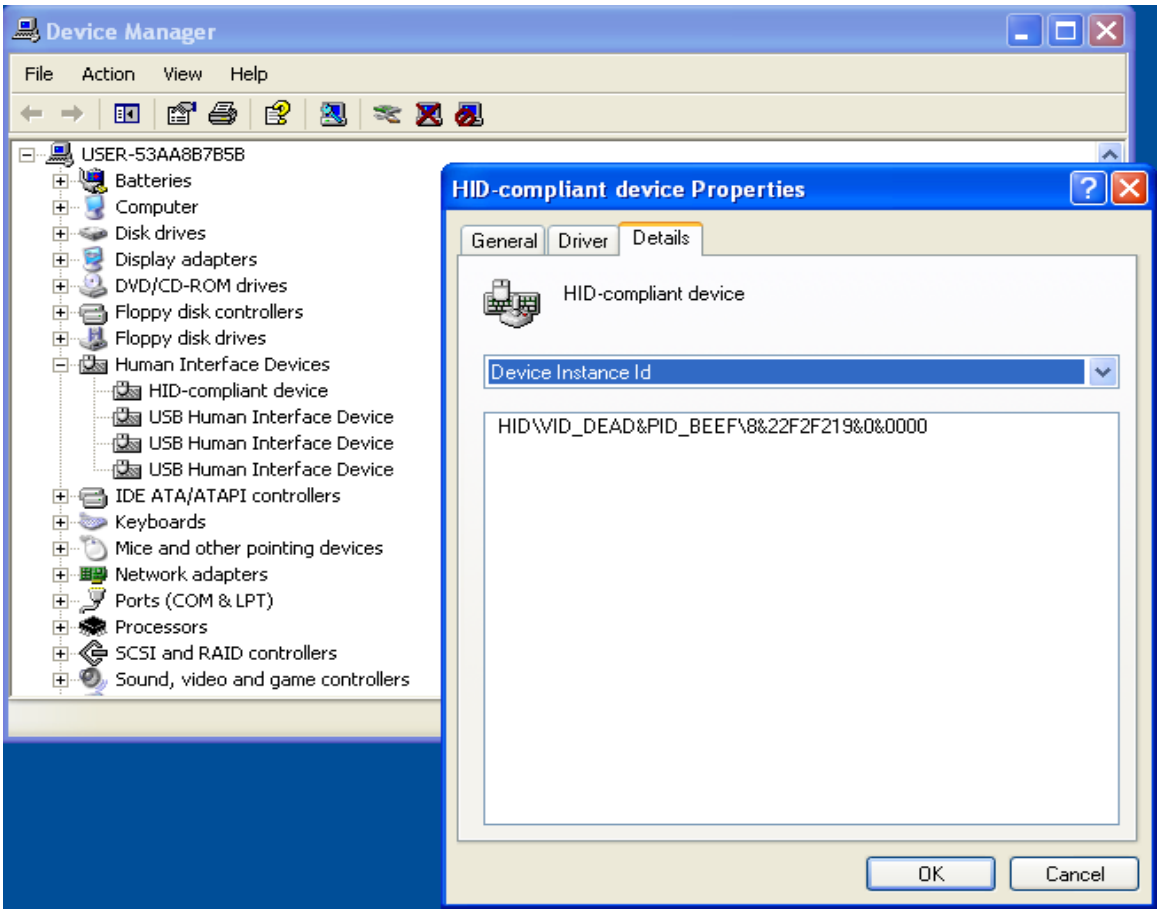


4.2.6. Test boot modes

A) Normal Mode

- Short jumper JP9 (Bootmode Select) to “Normal” (i.e. to “VCC 3.6”)
- Reset EVK board (by pressing the RESET button or unplug-plug the USB cable)
- Confirm that sample program is running (by checking the existence with

Device Manager for a “HID-compliant device” with VID=DEAD and PID=BEEF)



- Start application “TestApp\HidMfcDemo\OUTPUT\Release\HidDemo.exe” and confirm that it works as expected

B) Monitor Mode

- Short jumper JP9 (Bootmode Select) to “Monitor” (i.e. to “GND”)
- Reset EVK board (by pressing the RESET button or unplug-plug the USB cable)
- Confirm that sample program is not running (LEDs for testing are not flashing)
- Press CTRL-F5 to start debug session
- Confirm that debugger is started and then paused at main().

4.3. The flash read/write sample application

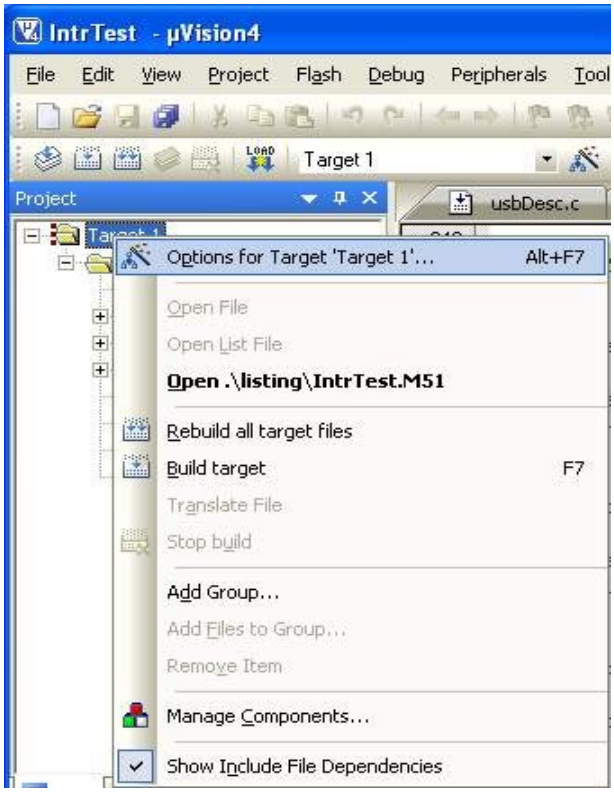
- This is an example of how to read/write the internal serial flash of APG221.

4.3.1. Build the sample application

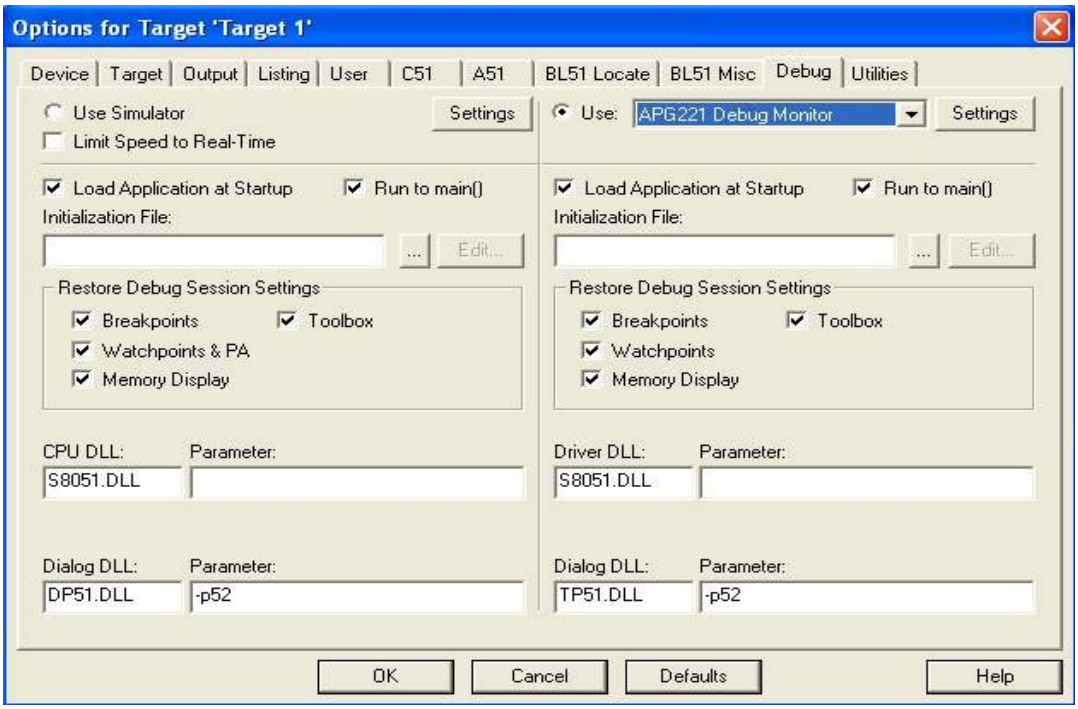
- Copy folder "TestApp\FlashTest" to desired location
- Double-click on file "SRC\FlashTest.uvproj" to start uVision4 (or SRC\uv2\FlashTest.uv2" to start uVision 2 or 3)
- Click on main menu item "Project"/"Rebuild all target files" to rebuild the project
- Verify from the output window that the build is completed successfully with no error

4.3.2. Configure debugger

- In uVision, right-click on "Target 1"



- Select "Options for Target 'Target 1'...



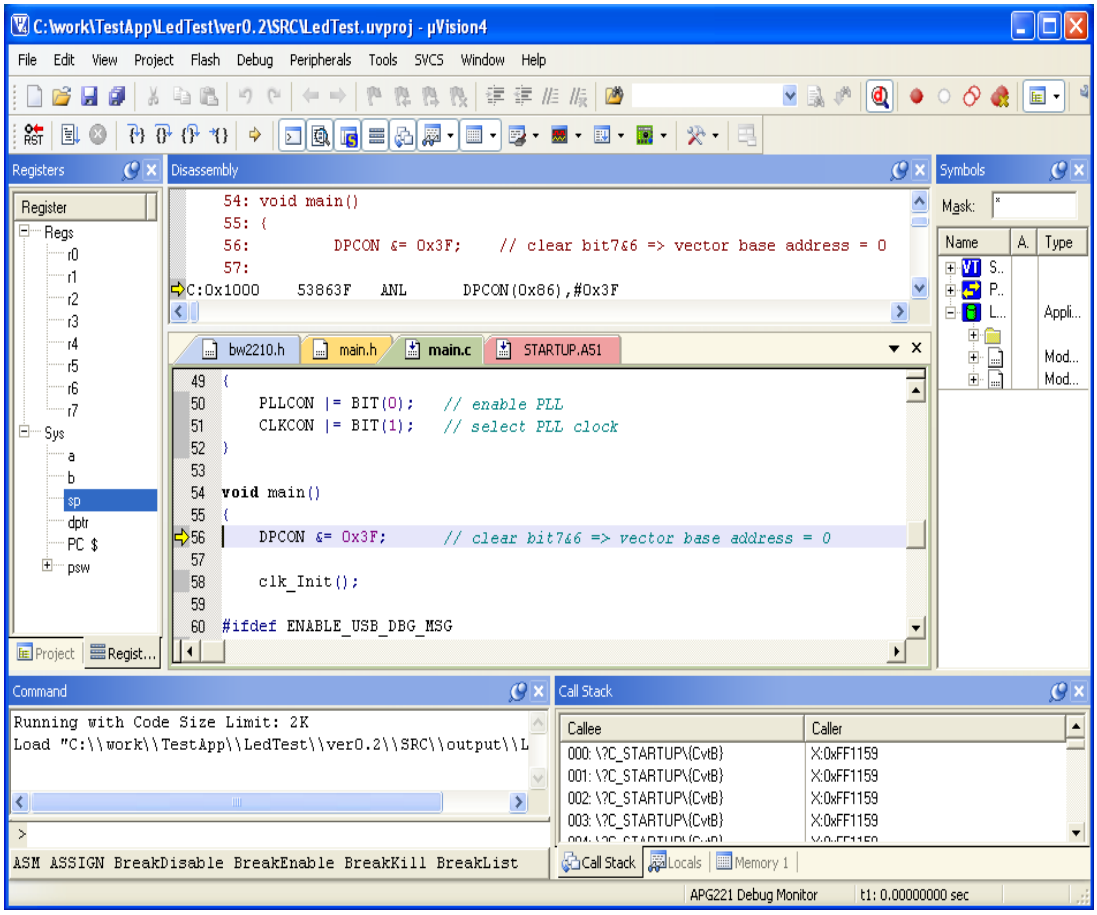
- Select tab “Debug” and select “APG221 Debug Monitor” in the list box

4.3.3. Connect EVK board

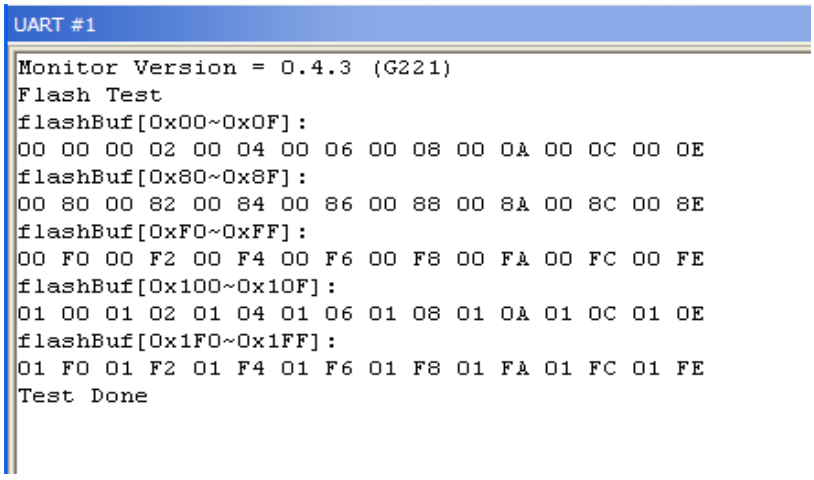
- Make sure that jumper JP9 (Bootmode Select) is on the “Monitor” (“GND”) side
- Connect the EVK board to PC through USB cable
- Confirm that “Power LED” is turned on

4.3.4. Debug sample application

- In uVision, click on main menu item "Debug"/"Start/Stop Debug Session" (or press shortcut key Ctrl-F5).
- Confirm that debugger is started and then paused at main().
- Select main menu item “View”/”Serial Windows”/”UART #1”.



- Press F5 to run and confirm that debug messages are printed to the "UART #1" window



- Click on the STOP icon to pause.
- Press Ctrl-F5 to stop debug session.

Chapter 5 Trouble Shooting

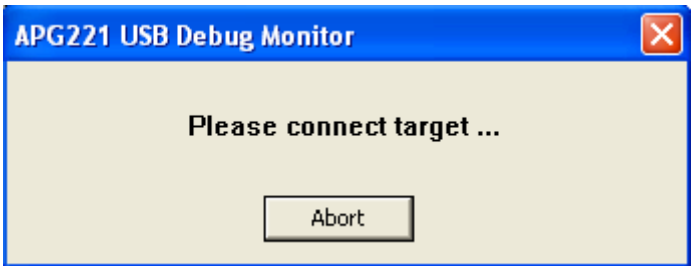
5.1. Power LED is not turned on

Problem: Power LED is not turned on when the EVK board is connected to PC

Solution: make sure that jumper J10 is connected on the VBUS side.

5.2. “Please connect target ...” pops up

Problem: Dialog box with message “Please connect target ...” pops up when starting a debug session

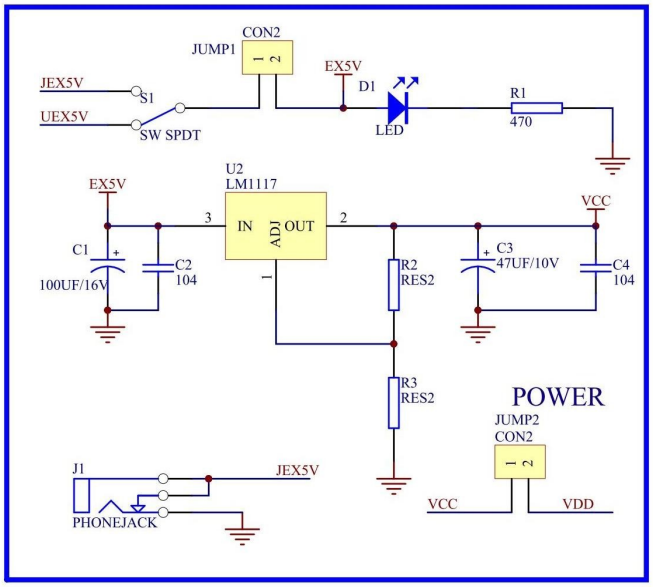


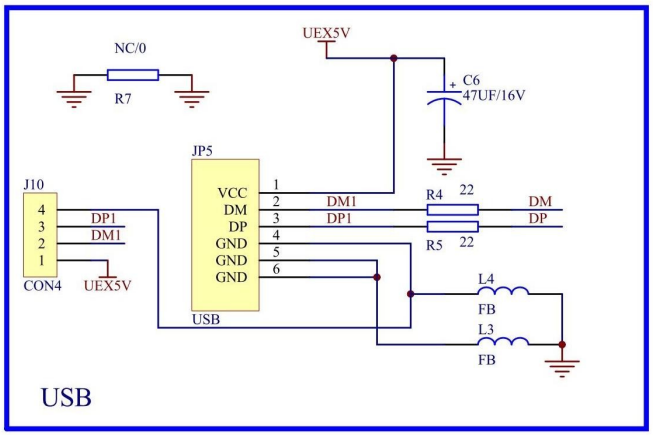
There are 2 possible causes.

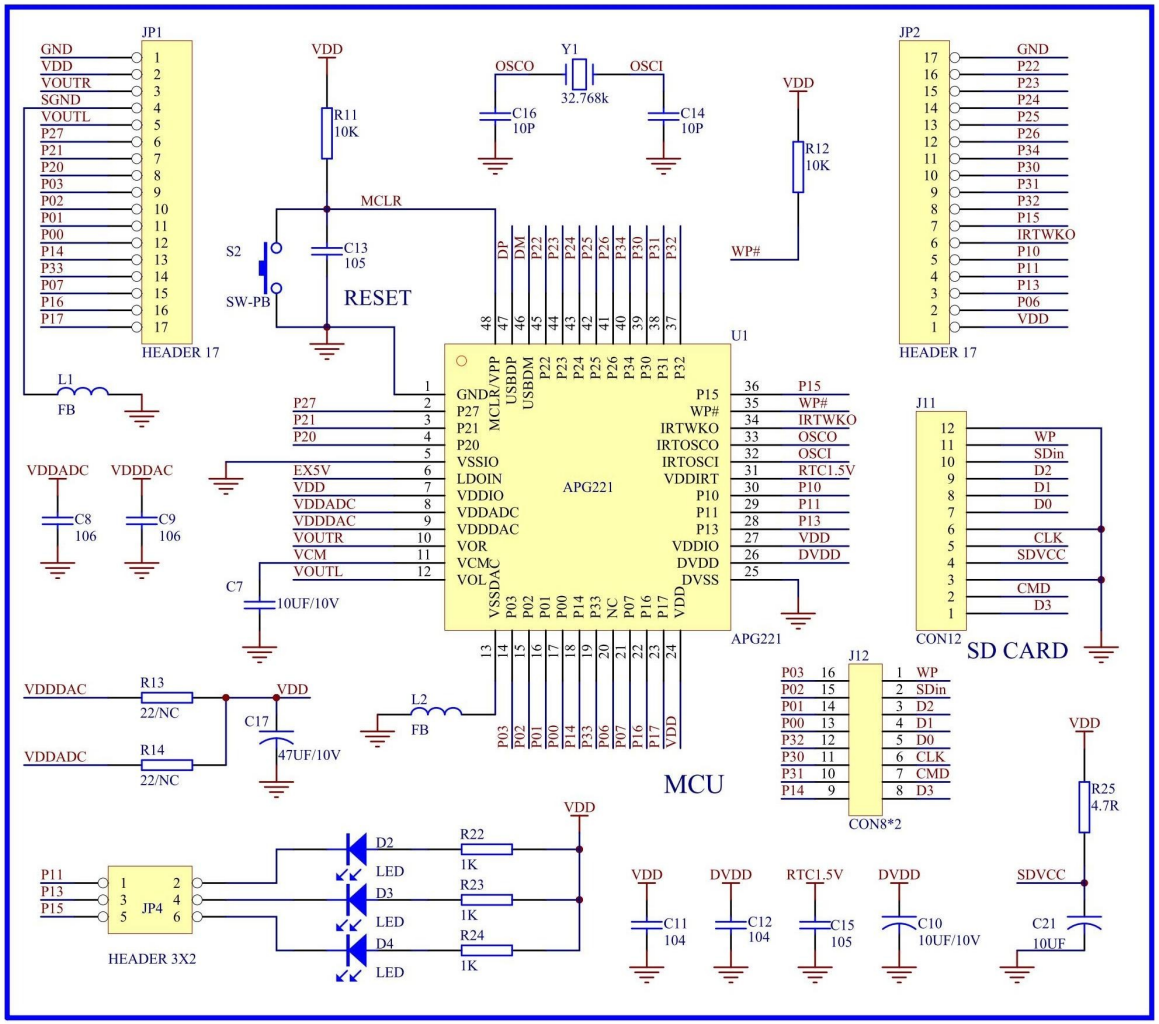
1) The debug session is started while the EVK is not ready. To solve the problem, reset the EVK and make sure the USB cable is connected properly to the PC.

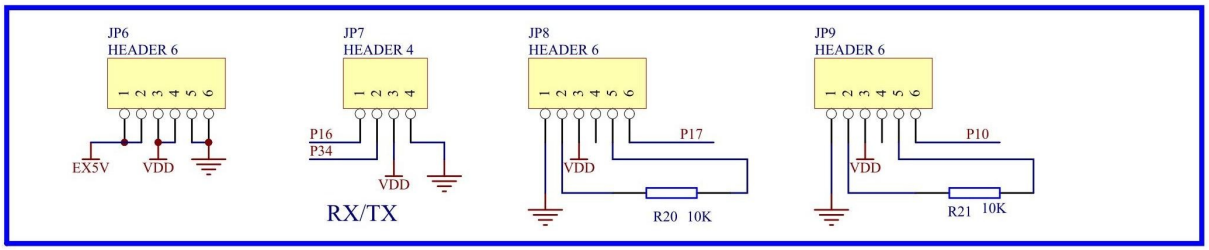
2) The LibUsb filter driver has not been installed. Follow chapter 3.3 Install LibUsb Filter Driver Manually of how to install the filter driver.

Appendix A: EVK board schematic









Revision History

Date	Version	Comment	Revised by
Jun 20, 2011	1.0.0	First Release	Thomas Wong
Jul 18, 2011	1.0.1	Add section 4.3 "The flash read/write sample application"	Thomas Wong

In case of any questions or comments about this documentation, please feel free to contact AppoTech at documents@appotech.com.

