

QuickStart Instructions

phyCORE[®] - PXA270
Acceleration Kit for
Windows Embedded CE

**Using Microsoft Visual Studio 2005
Software Development Tool Chain**

Note: The phyCORE-PXA270-Acceleration CD includes the electronic version of the English phyCORE[®]-PXA270 Hardware Manual

Edition: December 2007

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1 Introduction

**5 min**

This QuickStart provides general information on the PHYTEC phyCORE[®]-PXA270 Single Board Computer (SBC). It gives you also an overview of Microsoft's Visual Studio 2005 software development tool chain and instructions on how to run example programs on the phyCORE[®]-PXA270, mounted on the PHYTEC phyCORE[®]-PXA270 Acceleration Board, in conjunction with Visual Studio 2005.

Please refer to the phyCORE[®]-PXA270 Hardware Manual for specific information on such board-level features as jumper configuration, memory mapping and pin layout.

1.1 Rapid Development Kit Documentation

This "Rapid Development Kit" (RDK) includes the following electronic documentation on the enclosed "phyCORE-PXA270-Acceleration CD ":

- the PHYTEC phyCORE[®]-PXA270 Hardware Manual
- the PHYTEC phyCORE[®]-PXA270 Acceleration Board Manual
- controller User's Manuals and Data Sheets
- this QuickStart Instruction with general "Rapid Development Kit" description, software installation advice and an example program, enabling quick out-of-the box start-up of the phyCORE[®]-PXA270 in conjunction with the Microsoft Visual Studio 2005 software development tool chain

1.2 Professional Support Packages Available

PHYTEC backs up our Rapid Development Kits with a Start-Up Guarantee. We invite you to make use of our free Technical Support concerning installation and setup of QuickStart demos until any kit start-up problem you might encounter is resolved. For more in-depth questions, we offer technical support packages for purchase. Please contact our sales team at sales@phytec.com to discuss the appropriate support option if professional support beyond installation and setup is required.

1.3 Overview of this QuickStart Instruction

This QuickStart Instruction gives a general "Rapid Development Kit" description, as well as software installation advice and one example program enabling quick out-of-the box start-up of the phyCORE®-PXA270 in conjunction with Microsoft's Visual Studio 2005. It is structured as follows:

- 1) "Introduction"
- 2) In the "Getting Started" section you will install Acceleration Kit software from Adeneo and prepare the phyCORE®-PXA270, mounted on the Development Board, to interface to a host-PC. You will also learn how to download an example application from a host-PC using Active Sync and Visual Studio 2005.
- 3) The "Getting More Involved" section provides step-by-step instructions on how to configure and build a new WinCE image, modify the example, create and build a new project and generate and download output files to the phyCORE®-PXA270 using the Microsoft tools.
- 4) The "Debugging" section demonstrates simple debug functions using Visual Studio 2005 debug environment.
- 5) In this section "Building an OS image" you will learn how to add your own application to a WinCE project, create a new image and download this image on the PXA270.

1.4 Conventions used in this QuickStart

The following is a list of the typographical conventions used in this book:

Italic Used for file and directory names, program and command names, command-line options, menu items, URLs, and other terms that correspond to the terms on your desktop.

Bold Used in examples to show commands or other text that should be typed literally by the user.

Pay special attention to notes set apart from the text with the following icons:



At this part you might leave the path of this QuickStart.



This is a warning. It helps you to avoid annoying problems.



You can find useful supplementary information about the topic.



At the beginning of each chapter you can find information of the time to pass the following chapter.



You have successfully passed an important part of this QuickStart.



You can find information to solve problems.

1.5 System Requirements

The use of this "Rapid Development Kit" requires:

- the PHYTEC phyCORE[®]-PXA270
- the phyCORE[®] Development Board PXA270 with the included: DB-9 null serial cable, USB A/mini-B cable and AC adapter supplying 9 VDC /min. 1A
- Windows Embedded CE6.0 R2 (evaluation version)
- the phyCORE-PXA270-Acceleration CD
- an IBM-compatible host-PC (586 or higher running with WindowsXP)

For more information and example updates, please refer to the following sources:

PHYTEC

<http://www.phytec.de>
support@phytec.de



<http://www.adeneo-embedded.com/srt/en/home>
contact.membedded@adeneo.adetelgroup.com

1.6 Microsoft Visual Studio 2005 Development Tool Chain

Microsoft's Software development tools for the PXA270 architecture aid every level of developer from the professional applications engineer to the student just learning about embedded software development.

Visual Studio 2005 is a new version of Microsoft's popular IDE that supports also embedded devices. The Platform Builder is now integrated in Visual Studio 2005. So it is now possible to customize the WinCE Image and write user applications with just one tool. Visual Studio 2005 combines project management, source code editing, program debugging, and target programming in a single, powerful environment. This QuickStart provides an overview of the most commonly used VS 2005 features including:

- Project management, device setup, and tool configuration
- Editor facilities for creating, modifying, and correcting programs
- Target debugging
- Building a new image

The VS 2005 editor offers many standard and advanced software editing features like:

- **Automatic completion** of code statements
- **Auto listing** of object members
- Detailed **Syntax Highlighting**. Colours are used in printed output.
- **Automatic indent** and **tab blocks** of code

The Visual Studio 2005 Tool chain is available from your local Microsoft dealer. There is also an evaluation version available which is used in this QuickStart. You can use it to develop standard WinCE applications, MFC WinCE applications and .NET Applications for WinCE.



If you already have installed another version of Visual Studio 2005, you can use this one. We recommend installing the evaluation version when working with this QuickStart.

2 Getting Started



3-4 h

In this chapter you will install Acceleration Kit software and prepare the phyCORE[®]-PXA270, mounted on the Development Board, to interface to a host-PC. You will also learn how to download an example application from a host-PC using Active Sync and Visual Studio 2005.

2.1 Installing Visual Studio 2005

To install Visual Studio 2005 on your desktop PC insert the DVD labeled "Visual Studio 2005 Professional Edition" included in this kit in your DVD Rom drive. The setup should launch automatically. If not, open a Windows Explorer window, go to your DVD drive, change to the directory vs and start "setup.exe" manually.

The following screen appears:



- Click on "Install Visual Studio 2005" and follow the instructions of the setup program.

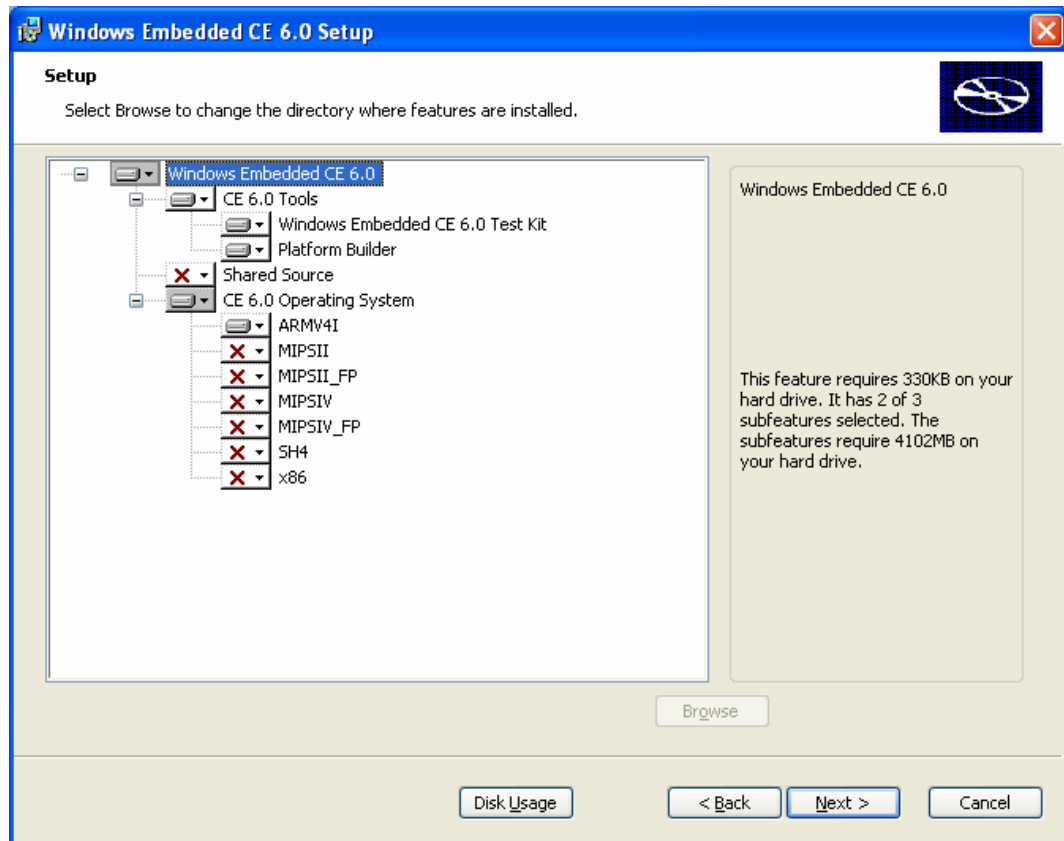


During the setup you have to enter a product activation key. You can request this key from Microsoft. Please read the inside of the Windows Embedded CE6.0r2 DVD package for information.

2.2 Installing Platform Builder

- To install the Platform Builder Plug-in for Visual Studio 2005, please insert the DVD labeled "Windows Embedded CE6.0r2" in your DVD drive. The setup should start automatically. If not, open a windows file explorer, go to your DVD drive and start "setup.exe" manually.

- When the following dialog appears, be sure to select “Platform Builder” and under "CE6.0 Operating System" the files for "ARMV4I".



During the setup you have to enter a product activation key. This key had been sent to you together with the activation key for Visual Studio 2005.

When the installation has finished, you need to install a service pack for Visual Studio 2005. Go to the following webpage <http://www.microsoft.com/downloads/details.aspx?FamilyId=BB4A75AB-E2D4-4C96-B39D-37BAF6B5B1DC&displaylang=en> and download and install the service pack(s).



On the download page you can choose the language of the service pack. For the Visual Studio 2005 evaluation version that comes with the PHYTEC WinCE-PXA270-Kit, you have to download the English version.

After installing the SP1 you need to install some updates for the Platform Builder. Install the SP1 for Platform Builder from <http://www.microsoft.com/downloads/details.aspx?familyid=BF0DC0E3-8575-4860-A8E3-290ADF242678&displaylang=en>.

Also install the monthly updates starting with the rollup package from 2006 from the following site, please ensure to install the packages from ARM4I.

<http://www.microsoft.com/downloads/details.aspx?familyid=5733C26C-168B-474D-8A27-59B30B769402&displaylang=en>

At the end of this page, you can find links to all other monthly updates.

2.3 Copy phyCORE-PXA270-Acceleration CD Contents

Once the installation of Visual Studio 2005 and Platform Builder has been installed, you will need to manually copy the Adeneo Binary BSP, demo files, manuals, and JFlash tools to your host PC. These files are located on the *phyCORE-PXA270-Acceleration CD* which is included in your kit.

- Brows the CD with Windows Explorer and copy the entire root folder of the CD as follows

[CD-ROM Drive]:\PHYTEC

... to your PC hard drive:

C:\PHYTEC

The *PHYTEC* directory contains the sub-folder *pC-PXA270 Acceleration Kit*

The *pC-PXA270 Acceleration Kit* directory contains the following three sub folders:

Datasheets – This folder contains data sheets for the following: PXA270 controller, Hitachi LCD, and Intel Strata Flash

Documentation – This folder contains PHYTEC documentation including an electronic copy of this QuickStart instruction as well as Hardware Manual for the phyCORE-PXA270 module and Acceleration Carrier Board.

WinCE – This folder contains the Adeneo Binary BSP and OSDesign for building binary OS images (nk.bin), SDK for building applications, demo "hello world" application for Visual Studio 2005, and JFlash tools for installing binary images.

JFlash – This folder contains the JFlashMM tool required for installing the Windows Embedded CE bootloader (eboot.nb0), flash data files, and Eboot for downloading OS image files without Visual Studio.

2.4 Installing phyCORE-PXA270 SDK

The PXA270 SDK for WinCE is needed for writing target-oriented applications. It will integrate in the Visual Studio IDE, offering a new target device for code generation. Also the SDK includes all functionality that is included in the image that runs on the PXA270. Therefore using the SDK allows the compiler to check that all functionality needed in the application will be present in the image. The absence of specific features is therefore recognized at “compile-time” not at “runtime”.

- To install the PXA270 SDK open a file manager and navigate to:
- *C:\PHYTEC\pC-PXA270 Acceleration Kit\WinCE\Binary Demo V112\SDK*
- Open *phycore_PXA270_AK_SDK.msi*

2.5 Installing Microsoft Active Sync 4.5

To be able to upload the software you are developing to your PXA270 device you need Microsoft Active Sync 4.5. When your PC is connected to your PXA270 device via a USB cable this software allows you to create a direct connection to your device.

- You can download **Microsoft Active Sync 4.5** from the Microsoft website at <http://www.microsoft.com/windowsmobile/activesync/activesync45.msp>

To download the software:

- Follow the instruction given on the webpage and save the downloaded file to your hard drive. Select the folder you saved the software to and double-click setup.exe.



You have successfully installed the software for the WinCE-PXA270-Kit. You can find the programs you will need to develop own applications for the target on your host system. All necessary configurations were done by the setup program.

2.6 Boot Windows Embedded CE OS on the phyCORE®-PXA270

A Windows Embedded CE OS image was pre-installed to the phyCORE-PXA270 on-board Flash memory.

- Connect the 9 V AC/DC adapter with the power supply connector (X301) on your board.
- Press and release the ON/OFF button (X301).



Only use the included power supply with 9 VDC output, center positive.



If Windows CE does not start within 1 minute, you may have a kit without the OS image preinstalled. Please contact support@phytec.com

When Windows CE has loaded it will display a Windows Embedded CE 6.0 desktop on the LCD screen.

2.7 Establishing an Active Sync Connection

The PXA270 device should already be running Windows CE 6.0 OS as described in chapter 2.5.

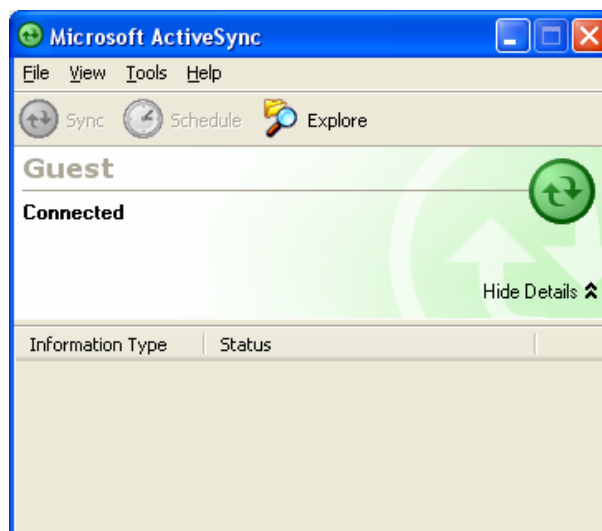
ActiveSync should already be running after the installation in chapter 2.4.

- Connect the USB A/mini-B cable with the USB OTG connector (X16) on the target to a free USB port on your host.



Ensure to use the USB A/mini-B included in this kit.

Establishing the connection might take a few seconds. Once the connection has been established Active Sync will show a screen with status information.



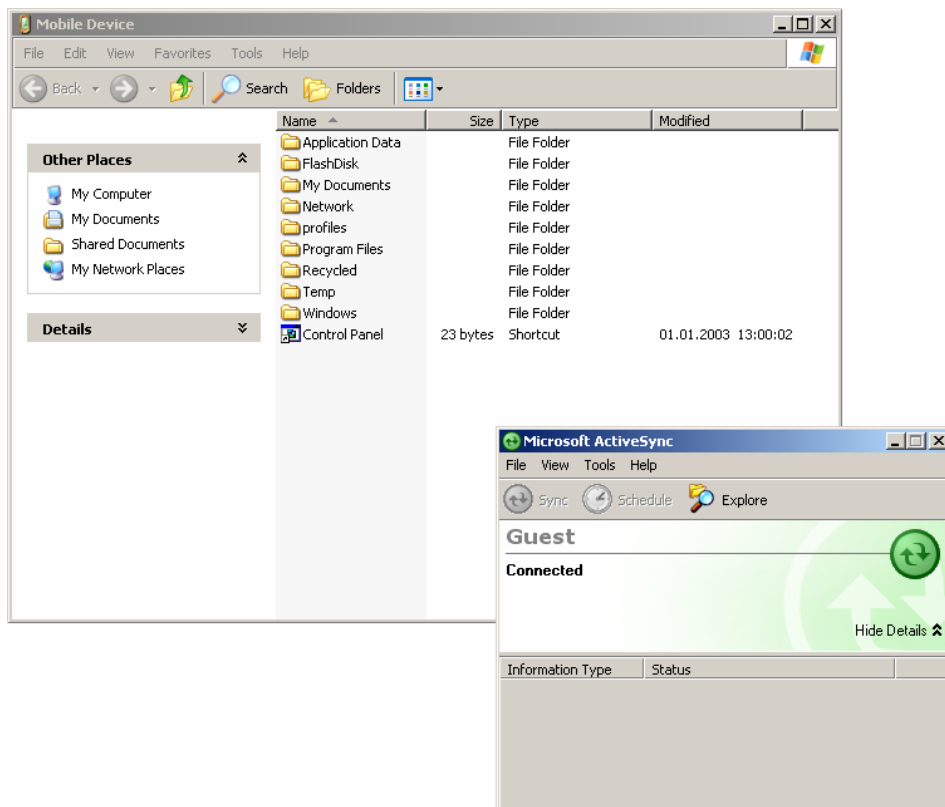
Your PC is now connected to the PXA270 Acceleration Kit.

- If the *Set Up a Partnership* window pops up, select *No* and then *Next*.

2.8 Downloading Example Code with Active Sync

To download the example code provided on the *phyCORE-PXA270 Acceleration CD*, you need to have Active Sync running on your PC to be able to establish a connection to your PXA270 device as described in the previous chapter.

- Click on *Tools* in the menu bar of Active Sync and select *Explore Device*. An Explorer window called *Mobile Device* will open that will show you the folder structure of the Windows CE installation on your PXA270 device.



- Open a file manager and navigate to the
C:\PHYTEC\pC-PXA270 Acceleration Kit\WinCE\Demo Application\HelloWorld\phycore_PXA270_AK (ARMV4I)\Debug folder.
- Select ***HelloWorld.exe*** and copy it to the *Mobile Device* window in the folder *Program Files* using drag and drop.

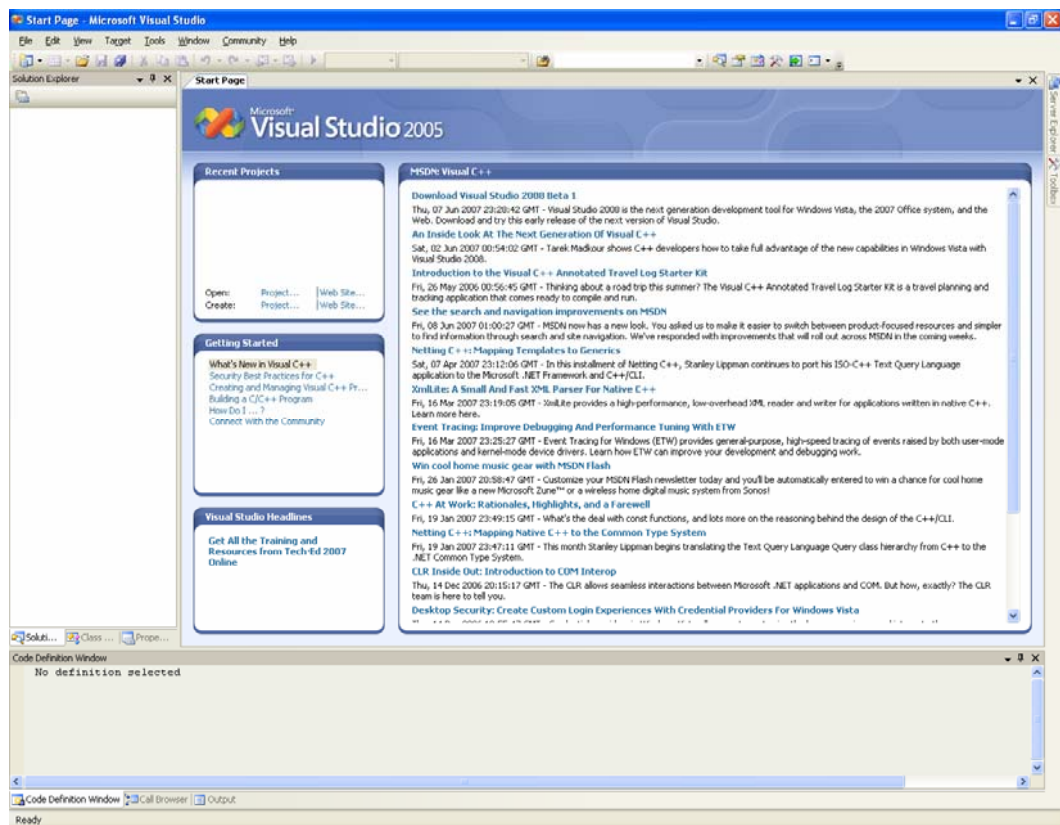
The program has now been copied to your PXA270 device. You will be able to access it by double-clicking the *My Device* icon on your PXA270 device. This opens a window that will show you the file structure of your device. You should be able to find ***HelloWorld.exe*** at the location you copied it to. Double-click it to execute the program. A window will open on your PXA270 device that will print a *Hello World* message.

2.9 Downloading Example Code with Visual Studio 2005

PHYTEC provides you with example code to learn about downloading code onto your PXA270 device. This code has already been copied to your local hard drive by the setup.

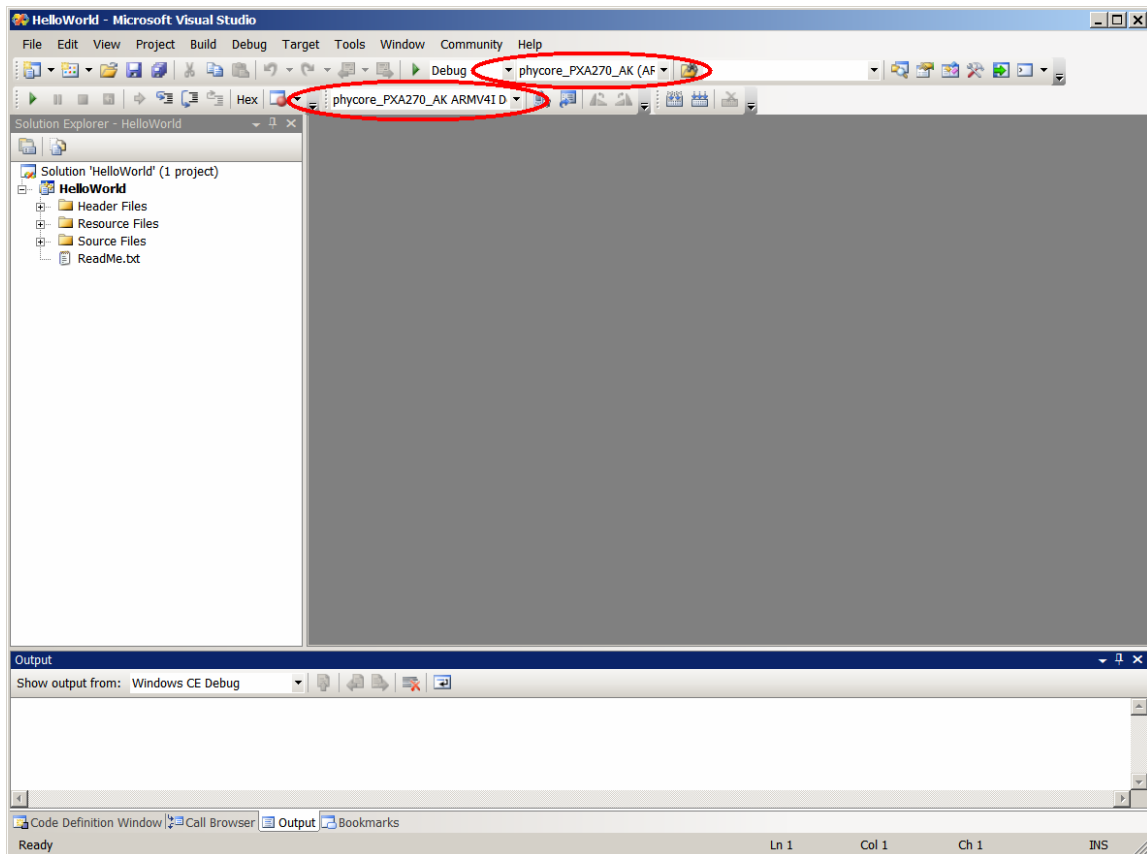
- Start the tool chain by selecting *Microsoft Visual Studio 2005* from the programs group: *Start\Programs\Microsoft Visual Studio 2005*.

After starting Visual Studio 2005 the window shown below will appear. Here you can create projects, edit files, configure tools, assemble, link and start the debugger. Close all projects that might be open by selecting *Project / Close Project*.




The *HelloWorld* example downloads a program to your device that, when executed, prints the text *Hello World* on the display of your phyCORE[®] Development Board PXA270.

- To open the HelloWorld project select *File/Open/Project/Solution* from the Visual Studio 2005 menu bar.
- Browse to the folder *C:\PHYTEC\pC-PXA270 Acceleration Kit\WinCE\Demo Application\HelloWorld*
- Select the HelloWorld project *HelloWorld.vcproj*.
- Click *Open*.
- In the **Solution Platform** pull-down menu make sure that the *phycore_PXA270_AK (ARMV4I)* configuration is selected. Also make sure that *phycore_PXA270_AK ARMV4I Device* is selected in the **Target device** menu.



If these menus are not shown in your Visual Studio IDE, move your mouse to an empty space on the toolbar, press the right mouse button and select from the pop up menu the menus *Target* and *Device*.

Build the Project

- Build the target by either selecting the *Build* icon  on the build toolbar or in the main menu bar select *Build / Build HelloWorld*.
- If any source file of the project contains any errors, they will be shown in the *Output Window - Build* tab. Use the editor to correct the error(s) in the source code, save the file and repeat the build.
- If there are no errors, the code can be downloaded to your PXA270 device. For this to work you need to have established an Active Sync connection between your PC and your PXA270 device as described in *section 2.7*. When the connection is established select *Build/Deploy HelloWorld* from the main menu bar.
- The individual steps of the download procedure can be viewed in the *Output Window - Build* tab.
- Wait until the download is complete.
- The newly created application was now deployed on your PXA270 device. To start it select *My Device* on the target platform and go to the folder *Program Files/Helloworld* and double tap on “*Helloworld*”
- A window will open on your PXA270 device that will print a **Hello World** message.
- Click on the *Close* icon in the window to close the application.



You have successfully passed the Getting Started part of this QuickStart. In this chapter you learned how to open a project, build an executable and transfer and run this executable on the target hardware.

3 Getting More Involved

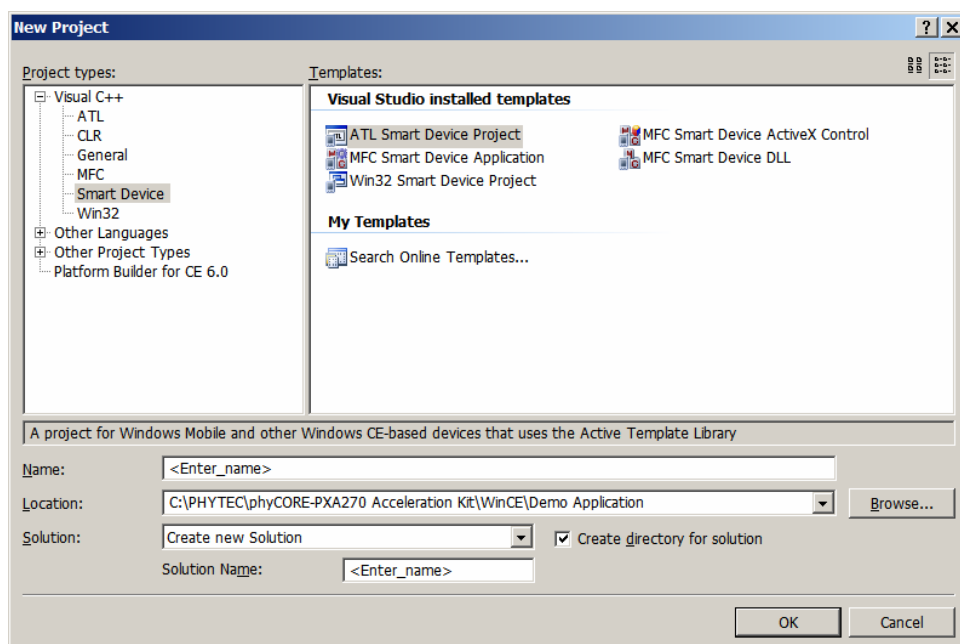


30 min

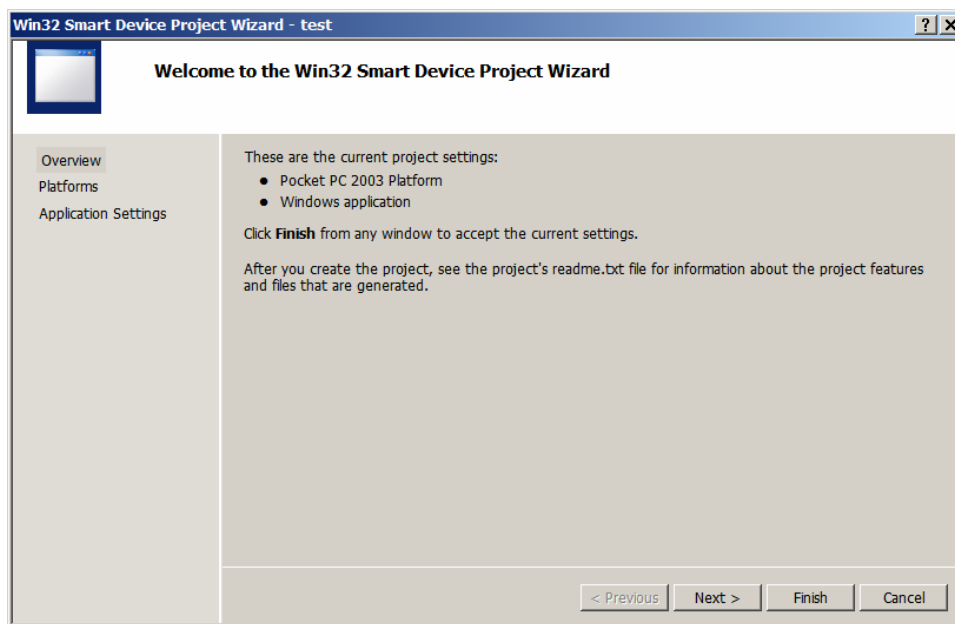
In this chapter you will learn how to configure the Visual Studio 2005 IDE (Integrated Development Environment), modify the source code from our example, create a new project and build and download a machine-readable output file to the target hardware.

3.1 Creating a New Project

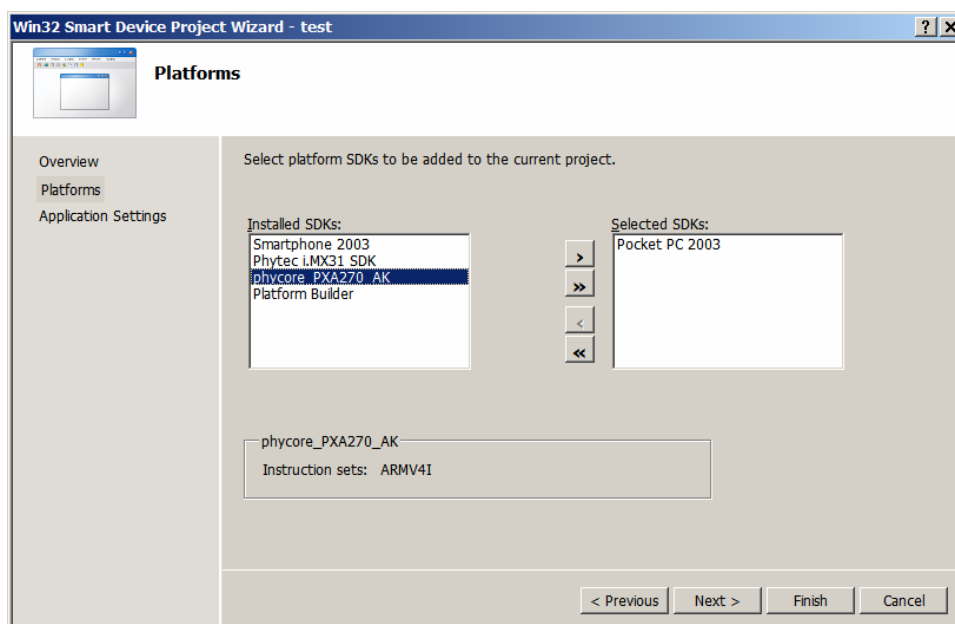
- To create a new project file select *File / New / Project* from the Visual Studio 2005 menu. This opens a dialog that will ask about the kind of project you wish to create.



- Open the *Visual C++* tree and select *Smart Device*.
- In the *Templates* window select *Win32 Smart Device Project*.
- In the text field *Name*, enter the name of the project you wish to create, e.g. *myHelloWorld*.
- Click *OK*.

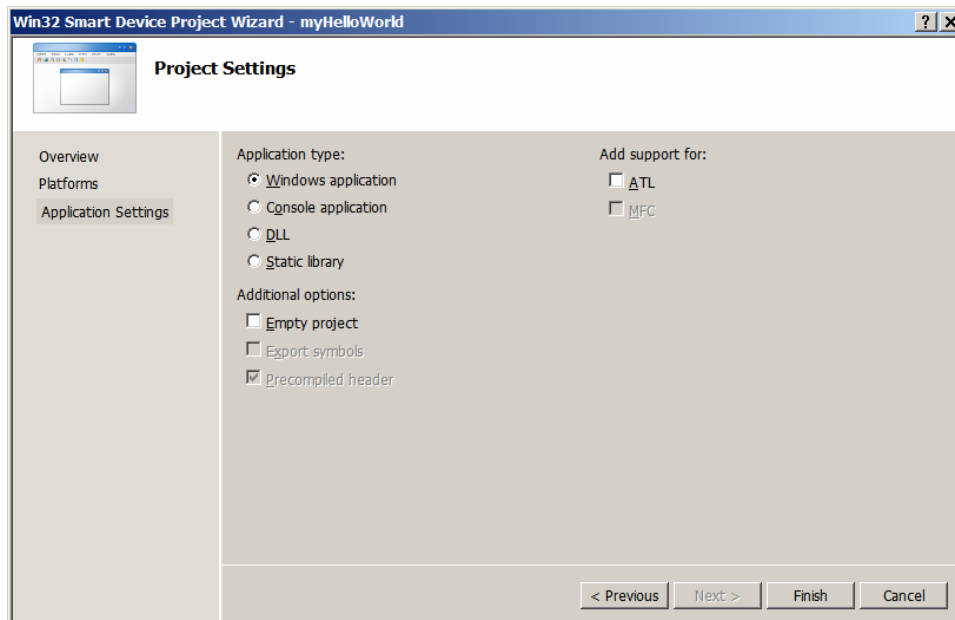


- Click *Next*.



- Click on the entry *phycore_PXA270_AK* in the field *Installed SDKs:* and press the > button. The *phycore_PXA270_AK* will appear in the *Selected SDKs* field.

- Select *Pocket PC 2003* in the field *Selected SDKs* and press the < button. This removes the Pocket PC 2003 SDK from the list of selected SDKs.
- Press *Next*

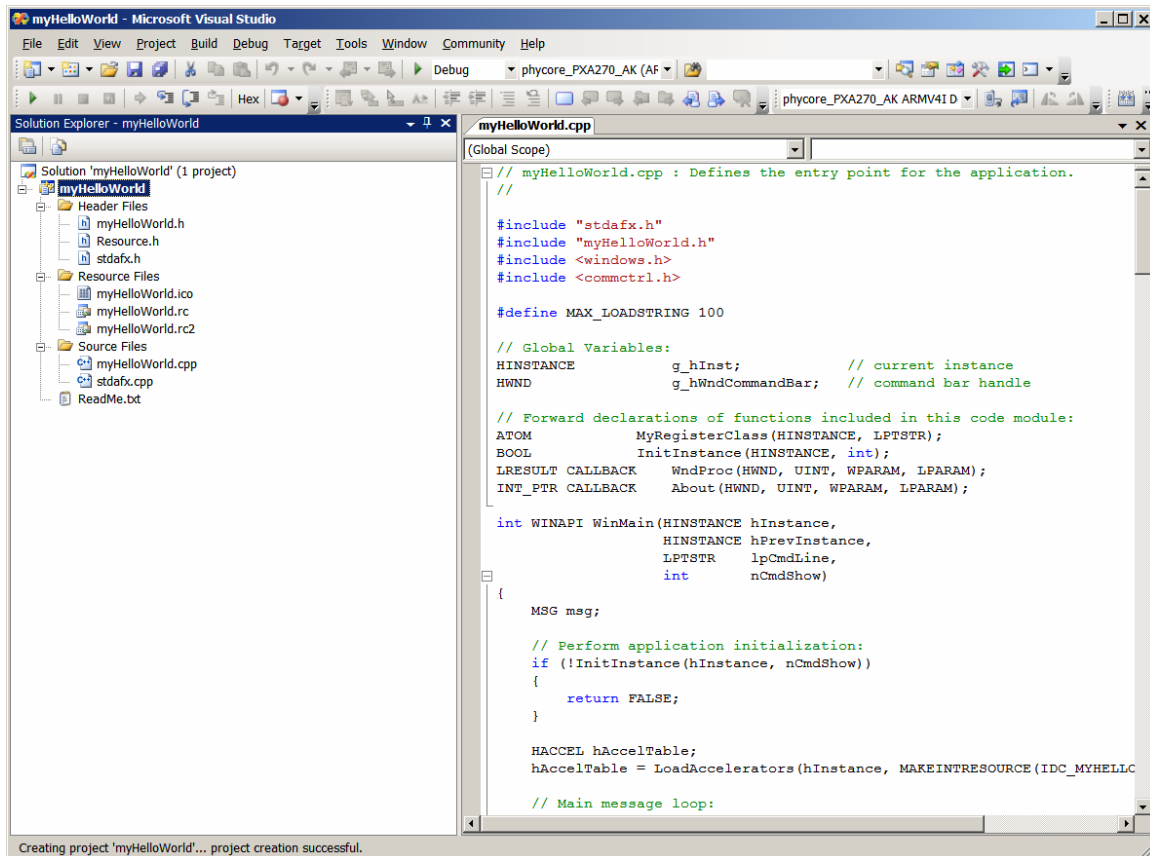


- Don't change the settings in this window and press *Finish*.

At this point you have created a new project for the PXA270 board. The next step is to modify the C source file before building your project. This includes compiling, linking, locating and creating the executable.

3.2 Modifying the Source Code

- Open up the *myHelloWorld* tree and *Source Files*. Double-click on *myHelloWorld.cpp* to open the file in the source code editor.



- Locate the following code section to make your HelloWorld program print the text **Hello World!** 5 times instead of just one.

```

case WM_PAINT:
    hdc = BeginPaint(hWnd, &ps);

```

- Replace this code section with the following:

```


case WM_PAINT:
    RECT rt;
    hdc = BeginPaint(hWnd, &ps);
    GetClientRect(hWnd, &rt);
    int i;
    for(i = 1; i <= 5 ; i++)
    {
        rt.top = rt.top + 30;

```

```


        DrawText(hdc, _T("Hello World!"), 12, &rt,
                DT_SINGLELINE | DT_VCENTER | DT_CENTER);
    }
    EndPaint(hWnd, &ps);
    break;

```

- Save the modified file by choosing *File / Save* or by clicking the floppy disk icon .

3.3 Building the Project

You are now ready to run the compiler and linker.

- Build the target by either selecting the *Build* icon  on the build toolbar or in the main menu bar select *Build / Build myHelloWorld*.
- If any source file of the project contains any errors, they will be shown in the *Output Window - Build* tab. Use the editor to correct the error(s) in the source code, save the file and repeat the build.
- If there are no errors, the code can be downloaded to your PXA270 device. For this to work you need to have established an Active Sync connection between your PC and your PXA270 device as described in *section 2.6*. When the connection is established select *Build/Deploy HelloWorld* from the main menu bar.
- The individual steps of the download procedure can be viewed in the *Output Window - Build* tab.
- Wait until the download is complete.
- The newly created application was now deployed on your PXA270 device. To start it select *My Device* on the target platform and go to the folder *Program Files/myHelloworld* and double tap on “myHelloworld”

A window will open on your PXA270 device that will print 5 **Hello World** message.



You have now modified source code, recompiled the code, created a downloadable file, and successfully executed this modified code.

4 Debugging

**40 min**

This Debugging section provides a basic introduction to the debug functions included in Visual Studio 2005. The most important features are described by using an existing example. For a more detailed description of the debugging features, please refer to the appropriate manuals provided by Microsoft.

4.1 Starting the Debugger

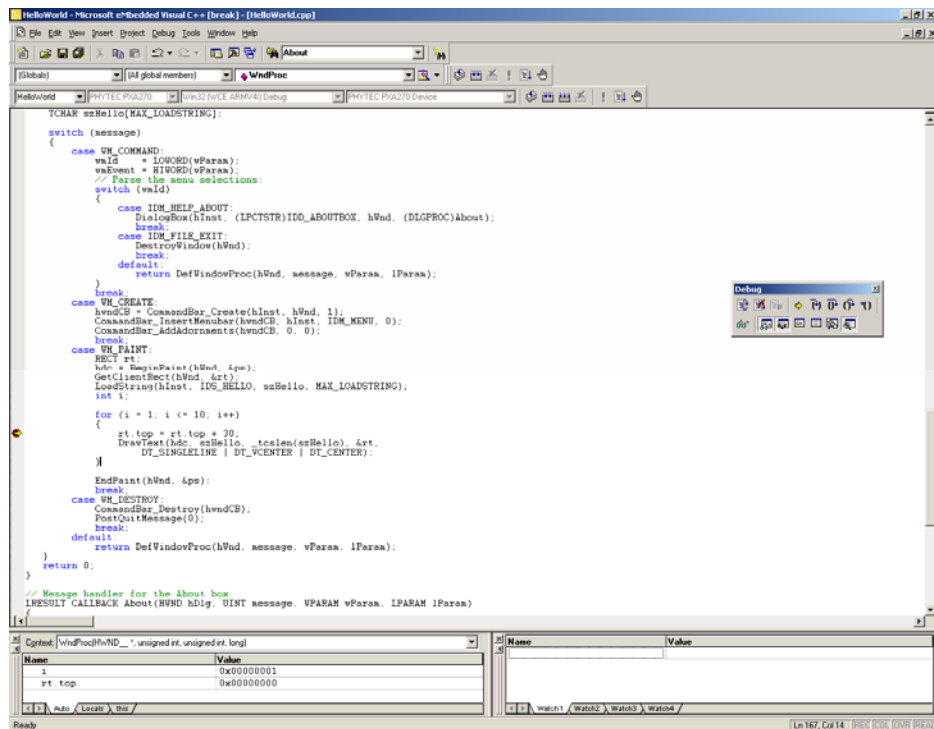
- Make sure that *Debug* is selected in the *Solution Configurations* pull-down menu.
- Open up the *myHelloWorld* tree and *Source Files*. Double-click on the *myHelloWorld.cpp* file to open the file in the source code editor.
- Locate the following code section and click on the line

```
rt.top = rt.top + 30;
```

- Select *Debug/Toggle Breakpoint* on the main menu bar or press F9 to set a breakpoint here. The red marker on the left-hand side of the selected line indicates the breakpoint.
- To start debugging with Visual Studio 2005, select *Debug/Start Debugging* or press F5.
- A progress bar will indicate the download process of the debug program.

If a problem occurs during data transfer, an error message will be displayed. If this should occur, make sure you have established a connection between your PC and your PXA270 device as described in *section 2.5*.

If data transfer was successful, a screen similar to the one shown below will appear. The debug toolbar is displayed. In the lower part of the debug screen you will see the *Variables* and *Watch* windows.



```

TCHAR szHello[MAX_LOADSTRING];

switch (message)
{
    case WM_COMMAND:
        wParam = LOWORD(wParam);
        wParam = HIWORD(wParam);
        // Parse the menu selections:
        switch (wParam)
        {
            case IDM_HELP_ABOUT:
                DialogBox(hInst, (LPCSTR)IDD_ABOUTBOX, hWnd, (DLGPROC)About);
                break;
            case IDM_FILE_EXIT:
                DestroyWindow(hWnd);
                break;
            default:
                return DefWindowProc(hWnd, message, wParam, lParam);
        }
        break;
    case WM_CREATE:
        hWndCB = CommandBar_Create(hInst, hWnd, 1);
        CommandBar_InsertMenuBar(hWndCB, hInst, IDM_MENU, 0);
        CommandBar_AddAdornments(hWndCB, 0, 0);
        break;
    case WM_PAINT:
        RECT rt;
        hWnd = BeginPaint(hWnd, &ps);
        GetClientRect(hWnd, &rt);
        LoadString(hInst, IDS_HELLO, szHello, MAX_LOADSTRING);
        int i;
        for (i = 1; i <= 10; i++)
        {
            rt.top = rt.top + 30;
            DrawText(hdc, szHello, _tcslen(szHello), &rt,
                DT_SINGLELINE | DT_CENTER | DT_CENTER);
        }
        EndPaint(hWnd, &ps);
        break;
    case WM_DESTROY:
        CommandBar_Destroy(hWndCB);
        PostQuitMessage(0);
        break;
    default:
        return DefWindowProc(hWnd, message, wParam, lParam);
}
return 0;

// Message handler for the About box
LRESULT CALLBACK About(HWND hDlg, UINT message, WPARAM wParam, LPARAM lParam)
{
    //
}

```

Name	Value
i	0x00000001
rt.top	0x00000000



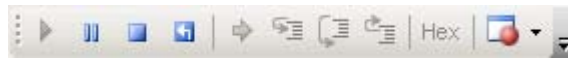
You may need to open, resize and /or move some windows to make your screen look similar to the screen capture. You can open inactive windows by choosing the desired window from the *Debug/Windows* pull-down menu.

The debugger will run up to the code section you have marked with a breakpoint and stop automatically. Notice the yellow arrow pointing to that breakpoint

You can click on *Debug/Toggle Breakpoint* or press F9 again to remove the breakpoint you have set.

4.2 Visual Studio 2005 Debug Features

- The *Debugger* window toolbar gives access to the following debug commands: *Restart*, *Stop Debugging*, *Break Execution*, *Show Next Statement*, *Step Into*, *Step Over*, *Step Out* and *Run to Cursor*.

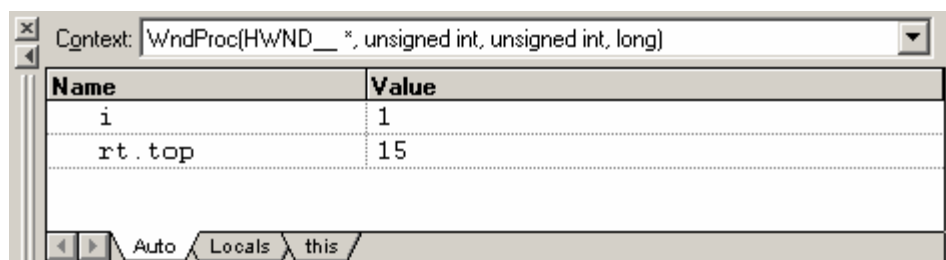


- The first button on the debugger toolbar is the *Start Debugging* button. This starts or continuous debugging.
- The *Break All* halts execution and the editor shows the current source code line.
- The *Stop Debugging* button stops the debugger and will lead you back to your project screen.
- The *Restart* button restarts the execution of the program from the beginning.
- The *Show Next Statement button* allows you to go through your program code line by code line.
- The first button allowing exact control of the program execution is the *Step Into* button. The *Step Into* command performs the execution of the command line to which the *Current-Statement Arrow* points. This can be a C command line or a single assembler line, depending on the current display mode. If the command line is a function call, *Step Into* jumps to the C function or subroutine, enabling you to explore the code contained in the accessed subroutine.
- The *Step Over* button is next on the debugger toolbar. The *Step Over* command executes the command line, to which the *Current-Statement Arrow* points. This can be a C command line or a single assembler line, depending on the current display mode. If the command line is a function call, the function will be executed without single stepping into the function.

- The next button is the *Step Out* button. *Step Out* is used to exit a function you are currently in. *Step Out* is very useful if you find yourself in a function you are not interested in and need to return quickly to your intended function.
- The *Hex* button toggles the display style of watch variables between hexadecimal and decimal.
- The last button pops up a menu where you can choose different windows useful for debugging, like watch windows, process information, memory information and calling stack.



4.3 Using the Visual Studio 2005 Debug Features

- The *Variables window – Auto* tab automatically shows the value of the local variable **i**. You can change the number base from decimal to hexadecimal by right clicking on the variable and selecting Hexadecimal Display.



- Click *Step Over* several times and watch the value of **i** count up.
- As you can see in the source code, the *for{}* loop will end if **i** becomes equal to 5. To leave the *for{}* loop, change the value of **i** by selecting the value, changing it to **10** and pressing **<Enter>**. Now repeat clicking on *Step Over* until you leave the loop.
- Remove the breakpoint by clicking into the source code line that has the breakpoint and press F9 or the *Insert/Remove Breakpoint* icon.
- Click in the source code, at **return 0;** and choose *Run to Cursor* from the *debug* toolbar. Your program will be executed until it reaches this line.

4.4 Running, Stopping and Resetting

- To run your program without stopping at any time, delete all breakpoints by clicking on the *Insert/Remove Breakpoint* icon.
- Click the *Go*  button.
- **Hello World!** will be displayed on the screen of your PXA270 device.
- You can use the *Stop Debugging*  button to stop program execution at any time.

4.5 Changing Target Settings for the "Executable Version"

After successfully debugging the program, next change the project and the target settings in order to create an executable file that can then be downloaded to and executed out of the memory on the phyCORE® - PXA270.

- Make sure the program execution is stopped.
- Exit the current debug session by selecting *Stop Debugging*.
- In the *Solution Configurations* pull down menu select 'Release'.
- Build and execute your project as described in 3.3.

You can now watch your final example execute and **Hello World!** being displayed on the LCD screen of your PXA270 device.



You have successfully finished the debug section of this QuickStart. You learned how to set breakpoints, run your program to a specific line of code and inspect variables.

5 Building an OS Image



50 min

In this section you will learn how to add your own application to a WinCE project, create a new image and download this image on the PXA270. We will use the application built and debugged in the chapters before as an example.

5.1 Installing phyCORE-PXA270 BSP

- To install the PXA270 Binary BSP open a file manager and navigate to:
C:\PHYTEC\pC-PXA270 Acceleration Kit\WinCE\Binary BSP V112\BSP
- Open *phyCore_PXA270_AK_BIN_Setup.msi*

5.2 Build the Image

In this example you will use the project we provided on the phyCORE-PXA270-Acceleration CD, which is already copied on your system.

- Browse to the folder *C:\PHYTEC\pC-PXA270 Acceleration Kit\WinCE\Binary BSP V112\OSDesign*.
- Copy the *phyCORE_PXA270_AK_BIN_DEMO* folder to *C:\WINCE600\OSDesigns* and then open the project *phyCORE_PXA270_AK_BIN_DEMO.pbxml*

When the project is loaded you should see the project in the *Solution Explorer* window.

- From the *Solution Explorer* window open the Tree *phyCORE_PXA270_AK_BIN_DEMO\Parameter Files\phyCore_PXA270_ak_bin Development board: ARMV4I (Active)* and double click on *project.bib*. Under the **Files** section add the following line:

```
HelloWorld.exe "C:\PHYTEC\pC-PXA270 Acceleration  
Kit\WinCE\Example Application\HelloWorld\phycore_PXA270_AK  
(ARMV4I)\Debug" NK
```

This will add the executable HelloWorld.exe to the Windows directory of the target. The path tells the platform builder where to find the executable that should be added to the image and the parameter NK specifies the name of the memory region where it should be added to.

- To build a new image select *Build/Build /Solution* from the Visual Studio 2005 menu bar. The build process will take about 20 minutes, depending on your host platform hardware.



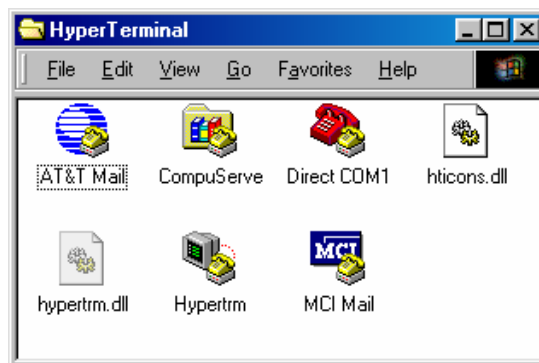
*You don't always have to do a complete build. If you just want to add a file to the image like in the example before, you can do this by selecting *Build\Copy Files to Release dir*. This copies all necessary files to the Release directory. Then you can build the image with *Build\Make Run-Time image*. This takes only about 5 minutes. Please refer to the Visual Studio 2005/Platformbuilder documentation for more information.*

5.3 Download an Image

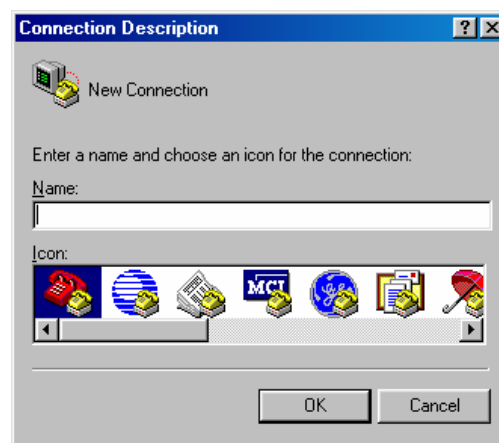
In the next step we want to download the image to the target.
For this step you need a terminal program like HyperTerminal.

- Start the HyperTerminal program within the *Programs/Accessories* bar.

The HyperTerminal main window will now appear:



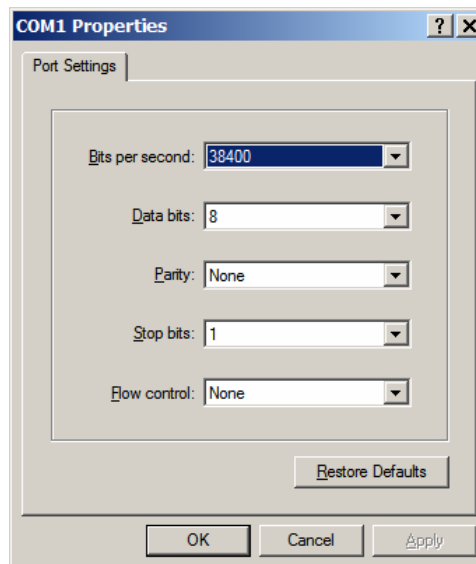
- Double-click on the HyperTerminal icon "*Hyperterm*" to create a new HyperTerminal session.
- The Connection Description window will now appear. Enter "COM Direct" in the *Name* text field.



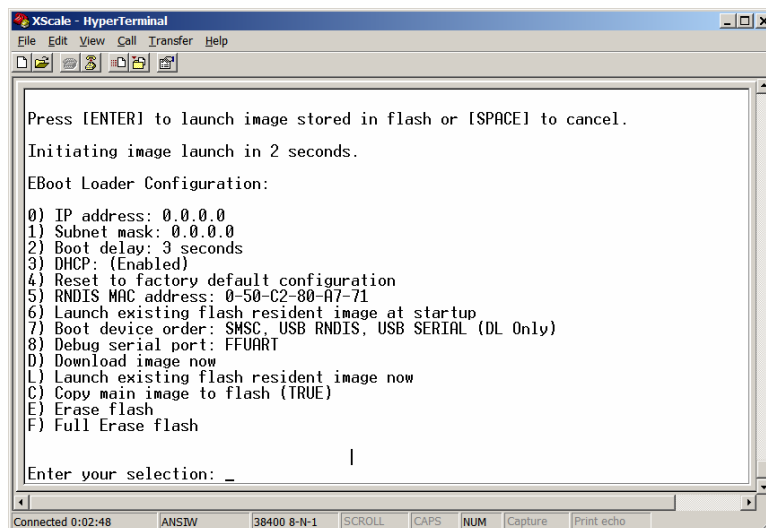
- Next click on *OK*. This creates a new HyperTerminal session named "COM Direct" and advances you to the next HyperTerminal window.



- The *COM Direct Properties* window will now appear. Specify *Direct to COM1/COM2* under the *Connect Using* pull-down menu (be sure to indicate the correct COM setting for your system).
- Click the *Configure* button in the *COM Direct Properties* window to advance to the next window (*COM1/COM2 Properties*).

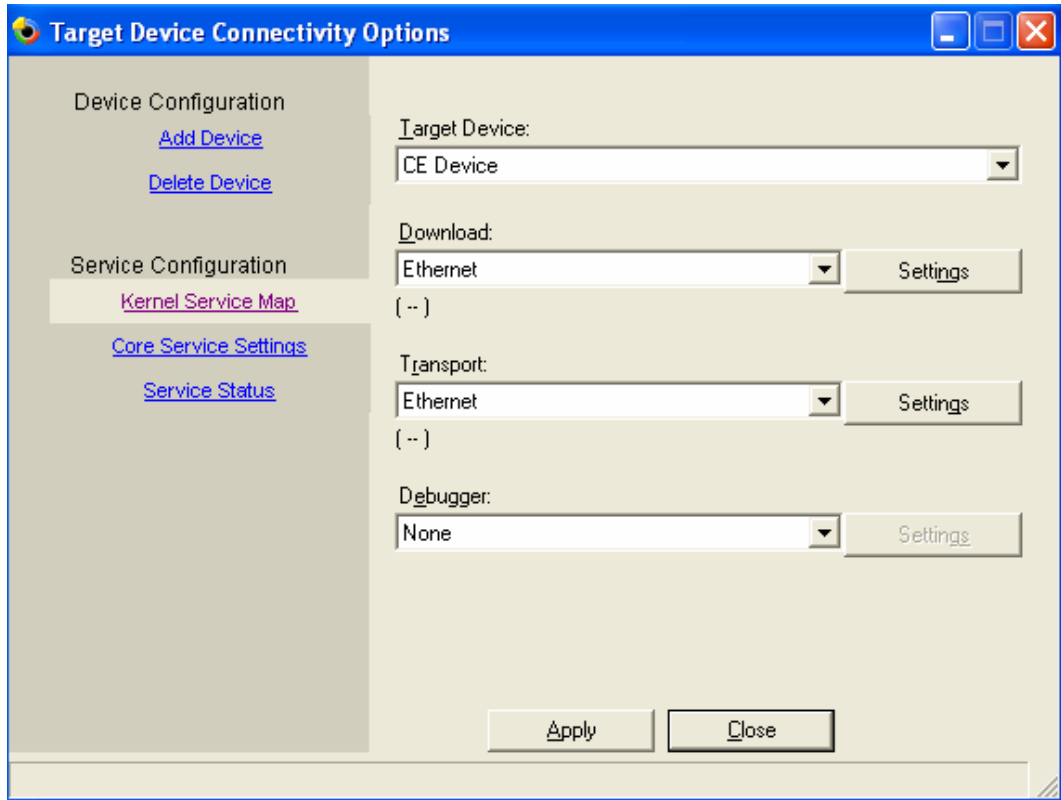


- Set the following COM parameters: Bits per second = 38400; Data bits = 8; Parity = None; Stop Bits = 1; Flow Control = None.
- Selecting *OK* advances you to the *COM Direct-HyperTerminal* monitoring window. Notice the connection status report in the lower left corner of the window.
- Connect the FF-UART (COM 1) to the PC via RS-232 null modem cable included in kit.
- Power up the baseboard by connecting the AC/DC adapter and pressing the ON/OFF button.
- You will now see some output messages from the bootloader in the HyperTerminal window. Press the SPACE bar to stop the bootloader.

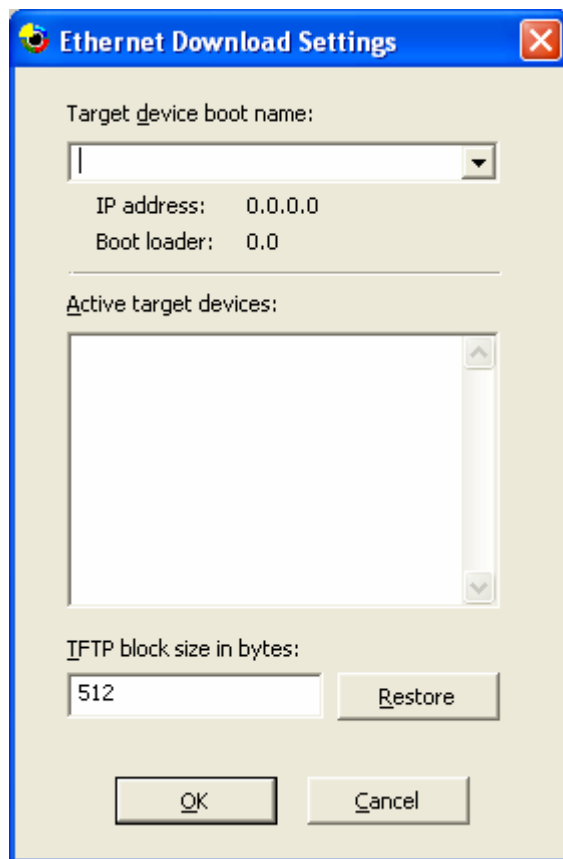


- Connect the cross-over Ethernet cable to connector X501 on the Acceleration board and the network card of your host PC.
- If you have a DHCP server installed on the host PC you can skip the next 2 steps.
- Press '3' to disable DHCP
- Press '0' to set the IP address of the device and '1' to change the network mask. Be sure these settings will fit to the network settings on your PC IP address.
- Be sure that "C" is set to "Copy main image to flash (TRUE)".

- Switch back to Visual Studio 2005, from the menu bar select *Target/Connectivity Option*.
- Select Ethernet for the *Download* and *Transport* settings from the drop down box.



- Click on the *Settings* button on the right of the *Download* Drop down box. A window will appear. Leave this window open.
- Change to the HyperTerminal window and press 'd' on the keyboard to start the download of the image
- You will see some output messages followed by a BOOTME message.
- Go back to Visual Studio. In the window *Ethernet download settings* a new entry should appear in the *Active target devices* list. Select the device and close the window.



- From the Visual Studio menu bar select *Target/Attach Device*. A download message with a status bar should appear and the download should start.

When the download is finished, the image should start. Calibrate the touch panel, then navigate to the folder *MyDevice\Windows*. There you find your HelloWorld application that can be executed.



You have successfully finished this QuickStart.

6 Summary

This QuickStart Instruction gave a general "Rapid Development Kit" description, as well as software installation advice and an example program enabling quick out-of-the box start-up of the phyCORE[®]-PXA270 in conjunction with WinCE.

In the "Getting Started" section you learned how to configure your host to provide a basis for working with your target platform. You installed the Rapid Development Kit software and you learned to copy and run a program on the target.

In the "Getting More Involved" section you got a step-by-step instruction on how to modify the example, create and build new projects and copy output files to the phyCORE -PXA270 using Visual Studio 2005.

The "Debugging" part of this QuickStart gave you information on setting up and using the debugger with Visual Studio 2005. You learned how to set breakpoints, watching and changing variables content.

In the "Building an Image" section you learned how to build a new image based on a preconfigured BSP and project.

Appendix A How to Re-install the Bootloader (eboot.nb0)



In order to install the bootloader to the phyCORE-PXA270 you must have a special Jtag adapter and parallel cable. The adapter and cable is not included in the Acceleration kit, but can be ordered separately from PHYTEC. The Jtag adapter part# is JA-001-PXA(\$29.00) and the parallel cable part# is FCL-112-006 (\$2.50). Please contact sales@phytec.com for more information.

A.1 System Setup

- Connect the JTAG adapter's 20-pin flat-band cable to the pin connector X702 on the Carrier Board.
- Connect the JTAG adapter to the LPT interface on your PC using a parallel cable.
- Connect the included 12 VDC power adapter to socket X1 on the Carrier Board.

A.2 Downloading eBoot

- Browse to and open (double click) the file *prog.bat* located in:
C:\PHYBasic\pC-PXA270\WinCE\JFlash_MM.

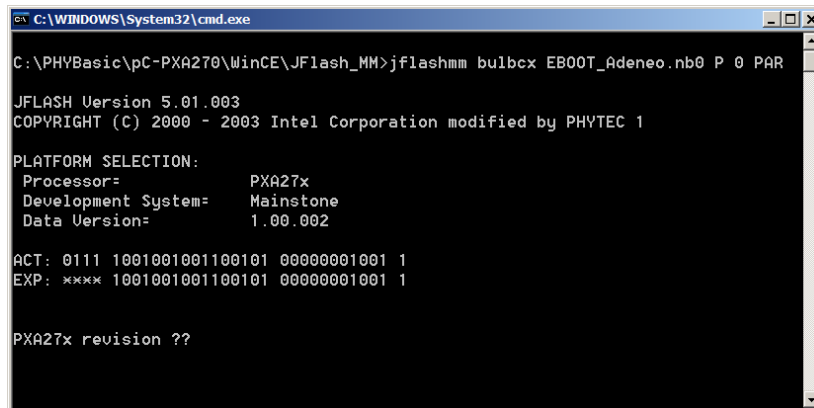
```
C:\WINDOWS\System32\cmd.exe
C:\PHYBasic\pC-PXA270\WinCE\JFlash_MM>jflashmm bulbcx EBOOT_Adeneo.nb0 P 0 PAR
JFLASH Version 5.01.003
COPYRIGHT (C) 2000 - 2003 Intel Corporation modified by PHYTEC 1

PLATFORM SELECTION:
Processor=      PXA27x
Development System= Mainstone
Data Version=  1.00.002

ACT: 0111 1001001001100101 00000001001 1
EXP: *** 1001001001100101 00000001001 1
```

- The batch file will invoke the *JFlash* program and show hardware recognition within the MS Command Prompt window.

- Check to make sure that the **ACT** (Actual) and **EXP** (Expected) values of the recognized PXA270 device are the same and then press <Enter>.



```
C:\WINDOWS\System32\cmd.exe
C:\PHYBasic\pC-PXA270\WinCE\JFlash_MM>jflashmm bulbcx EB00T_Adeneo.nb0 P 0 PAR

JFLASH Version 5.01.003
COPYRIGHT (C) 2000 - 2003 Intel Corporation modified by PHYTEC 1

PLATFORM SELECTION:
Processor=      PXA27x
Development System= Mainstone
Data Version=   1.00.002

ACT: 0111 1001001001100101 00000001001 1
EXP: **** 1001001001100101 00000001001 1

PXA27x revision ??
```

- Press <Enter> again.

- The **JFlash** utility will automatically recognize the Flash type installed on the phyCORE-PXA270. Enter "y" to skip programming of the last 43 percent of the image area.

```
C:\WINDOWS\System32\cmd.exe
C:\PHYBasic\pC-PXA270\WinCE\JFlash_MM>jflashmm bulbcx EBOOT_Adeneo.nb0 P 0 PAR

JFLASH Version 5.01.003
COPYRIGHT (C) 2000 - 2003 Intel Corporation modified by PHYTEC 1

PLATFORM SELECTION:
Processor=           PXA27x
Development System= Mainstone
Data Version=       1.00.002

ACT: 0111 1001001001100101 00000001001 1
EXP: *** 1001001001100101 00000001001 1

PXA27x revision ??

Found flash type: 28F128J3A
The last 43 percent of image file is all zeros
Would you like to save time by not programming that area? [y/n]:
```

- **eBoot** download will take approximately 2-3 minutes, when complete the command window will close.

```
C:\WINDOWS\System32\cmd.exe
C:\PHYBasic\pC-PXA270\WinCE\JFlash_MM>jflashmm bulbcx EBOOT_Adeneo.nb0 P 0 PAR

JFLASH Version 5.01.003
COPYRIGHT (C) 2000 - 2003 Intel Corporation modified by PHYTEC 1

PLATFORM SELECTION:
Processor=           PXA27x
Development System= Mainstone
Data Version=       1.00.002

ACT: 0111 1001001001100101 00000001001 1
EXP: *** 1001001001100101 00000001001 1

PXA27x revision ??

Found flash type: 28F128J3A
The last 43 percent of image file is all zeros
Would you like to save time by not programming that area? [y/n]: y
Erasing block at address 0
Starting programming
Using BUFFER programming mode...
Writing flash at hex address 7F80, 43.59% done
```

- Upon successful download of the **eBoot** loader, you may see several verify errors. These errors may be caused by possible timing issues with the **JFlash** utility and may be ignored. The command prompt window will close automatically when the download is complete.

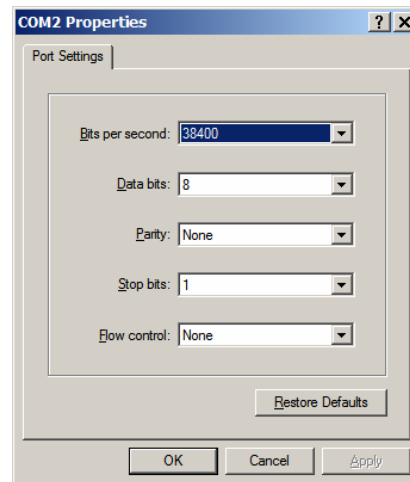


The **eBoot** loader has now been successfully downloaded and resides in the phyCORE-PXA270 on-board Flash memory.

B.2 Create HyperTerminal Session

- Connect the included RS-232 null-modem cable to an available COM port on your Windows PC and DB-9 (P1) of the phyCORE Carrier Board.

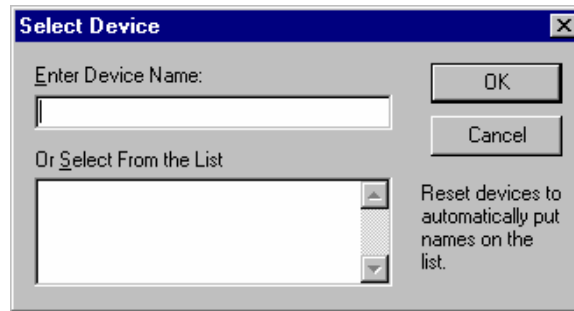
Create a new HyperTerminal session, indicate the correct COM setting for your system and set the parameters as follows: Bits per second = 38400; Data bits = 8; Parity = None; Stop bits = 1; Flow control = None.



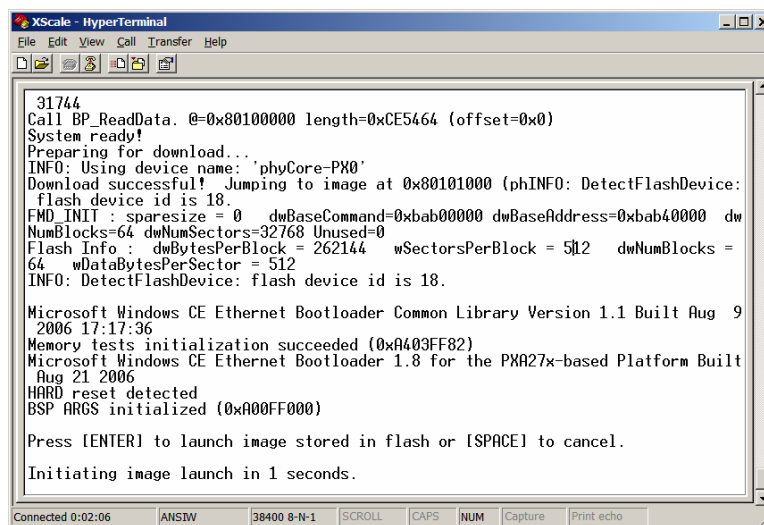
B.3 Download the Image

- Connect the RJ-45 socket at X23 on the Carrier Board to the host-PC using a cross-over Ethernet cable¹.
- Start **eShell** by double-clicking on the *eshell.exe* located in: `C:\PHYTEC\pC-PXA270 Acceleration Kit\WinCE\JFlash_MM`.
- The *Select Device* dialog box will appear on the screen.

¹: You may also use a straight Ethernet cable connected to a hub to establish network connection between the phyCORE-PXA270 hardware and the host-PC.

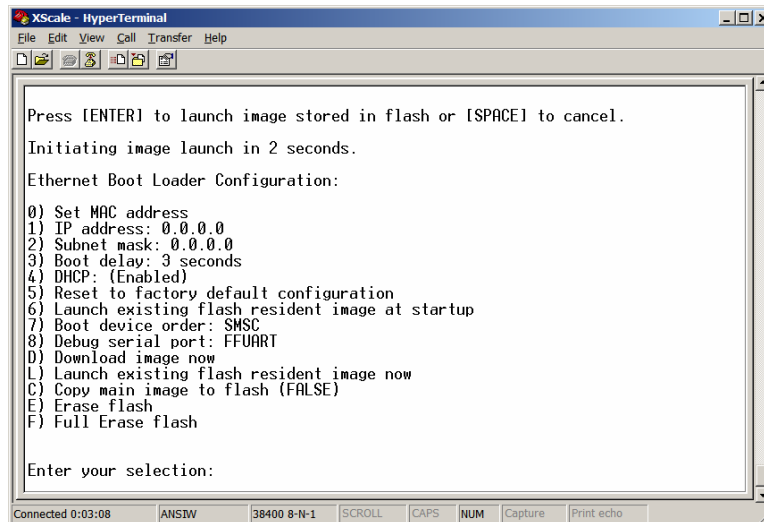


- Go back to the HyperTerminal session
- Reset the phyCORE-PXA270 module by disconnecting and re-connecting the power adapter and then pressing ON/OFF button on the Carrier Board¹. Verify proper execution of the **eBoot** loader by looking at the HyperTerminal window messages.



- Press <SPACE> to cancel auto launch of any WinCE image that might already be installed and enter the Boot Loader Configuration menu.
- The HyperTerminal window should now show the following messages and ask for a selection:

¹: It is recommended to wait about 10 seconds between disconnecting the power adapter and reconnecting it.



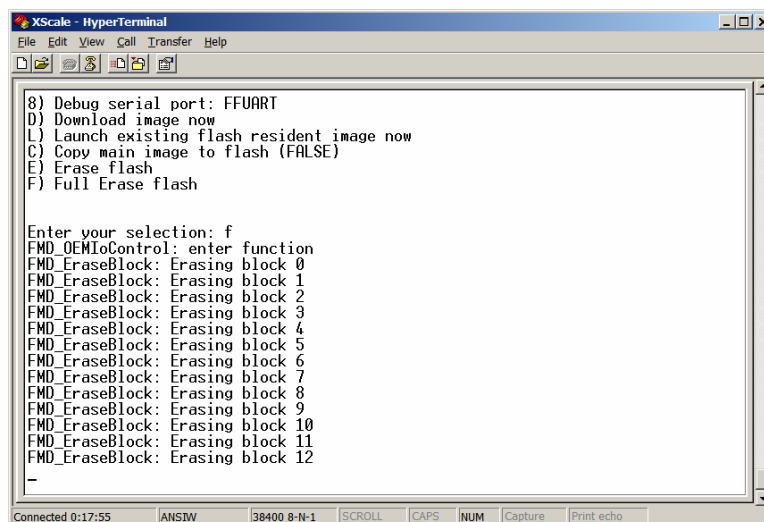
```
XScale - HyperTerminal
File Edit View Call Transfer Help
[Icons]

Press [ENTER] to launch image stored in flash or [SPACE] to cancel.
Initiating image launch in 2 seconds.
Ethernet Boot Loader Configuration:
0) Set MAC address
1) IP address: 0.0.0.0
2) Subnet mask: 0.0.0.0
3) Boot delay: 3 seconds
4) DHCP: (Enabled)
5) Reset to factory default configuration
6) Launch existing flash resident image at startup
7) Boot device order: SMSC
8) Debug serial port: FFUART
D) Download image now
L) Launch existing flash resident image now
C) Copy main image to flash (FALSE)
E) Erase flash
F) Full Erase flash

Enter your selection:

Connected 0:03:08  ANSW  38400 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

- At the *Enter your selection:* line type in "F" for "F) Full Erase flash". This will take a couple minutes to complete.



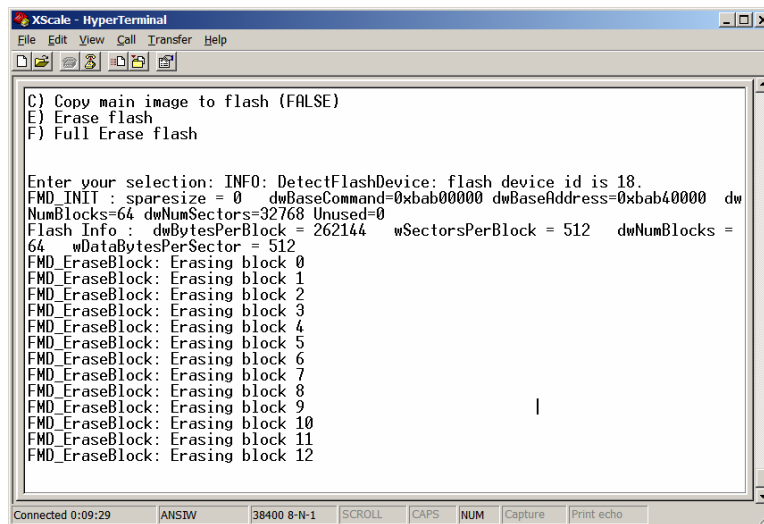
```
XScale - HyperTerminal
File Edit View Call Transfer Help
[Icons]

8) Debug serial port: FFUART
D) Download image now
L) Launch existing flash resident image now
C) Copy main image to flash (FALSE)
E) Erase flash
F) Full Erase flash

Enter your selection: f
FMD_OEMIoControl: enter function
FMD_EraseBlock: Erasing block 0
FMD_EraseBlock: Erasing block 1
FMD_EraseBlock: Erasing block 2
FMD_EraseBlock: Erasing block 3
FMD_EraseBlock: Erasing block 4
FMD_EraseBlock: Erasing block 5
FMD_EraseBlock: Erasing block 6
FMD_EraseBlock: Erasing block 7
FMD_EraseBlock: Erasing block 8
FMD_EraseBlock: Erasing block 9
FMD_EraseBlock: Erasing block 10
FMD_EraseBlock: Erasing block 11
FMD_EraseBlock: Erasing block 12
-

Connected 0:17:55  ANSW  38400 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

- After **eBoot** completes the Full Erase, reset the board by disconnecting and re-connecting power. Wait until the boot loader has finished the Flash formatting process. Several “FMD_EraseBlock:” messages will display in the HyperTerminal window as **eBoot** formats the Flash memory blocks for the WinCE image and Flash space for file and application storage. This process will take approximately 2 minutes, during which the following messages will appear in the HyperTerminal window:



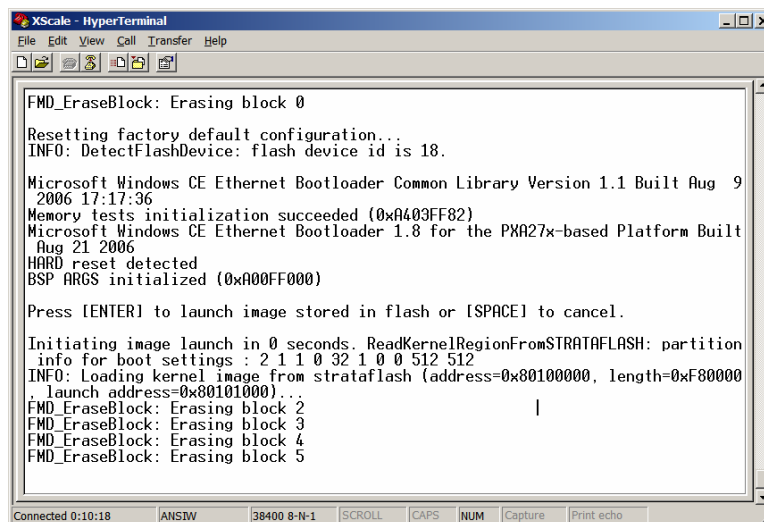
```

XScale - HyperTerminal
File Edit View Call Transfer Help
C) Copy main image to flash (FALSE)
E) Erase flash
F) Full Erase flash

Enter your selection: INFO: DetectFlashDevice: flash device id is 18.
FMD_INIT : sparesize = 0 dwBaseCommand=0xbab00000 dwBaseAddress=0xbab40000 dw
NumBlocks=64 dwNumSectors=32768 Unused=0
Flash Info : dwBytesPerBlock = 262144 wSectorsPerBlock = 512 dwNumBlocks =
64 wDataBytesPerSector = 512
FMD_EraseBlock: Erasing block 0
FMD_EraseBlock: Erasing block 1
FMD_EraseBlock: Erasing block 2
FMD_EraseBlock: Erasing block 3
FMD_EraseBlock: Erasing block 4
FMD_EraseBlock: Erasing block 5
FMD_EraseBlock: Erasing block 6
FMD_EraseBlock: Erasing block 7
FMD_EraseBlock: Erasing block 8
FMD_EraseBlock: Erasing block 9
FMD_EraseBlock: Erasing block 10
FMD_EraseBlock: Erasing block 11
FMD_EraseBlock: Erasing block 12

Connected 0:09:29 ANSIV 38400 8-N-1 SCROLL CAPS NUM Capture Print echo

```



```

XScale - HyperTerminal
File Edit View Call Transfer Help
FMD_EraseBlock: Erasing block 0

Resetting factory default configuration...
INFO: DetectFlashDevice: flash device id is 18.

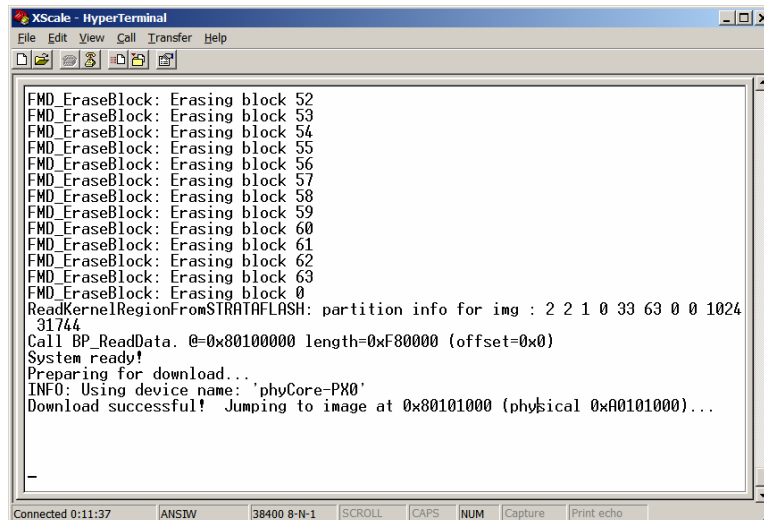
Microsoft Windows CE Ethernet Bootloader Common Library Version 1.1 Built Aug 9
2006 17:17:36
Memory tests initialization succeeded (0xA403FF82)
Microsoft Windows CE Ethernet Bootloader 1.8 for the PXA27x-based Platform Built
Aug 21 2006
HARD reset detected
BSP ARGS initialized (0xA00FF000)

Press [ENTER] to launch image stored in flash or [SPACE] to cancel.

Initiating image launch in 0 seconds. ReadKernelRegionFromSTRATAFLASH: partition
info for boot settings : 2 1 1 0 32 1 0 0 512 512
INFO: Loading kernel image from strataflash (address=0x80100000, length=0xF80000
, launch address=0x80101000)...
FMD_EraseBlock: Erasing block 2
FMD_EraseBlock: Erasing block 3
FMD_EraseBlock: Erasing block 4
FMD_EraseBlock: Erasing block 5

Connected 0:10:18 ANSIV 38400 8-N-1 SCROLL CAPS NUM Capture Print echo

```

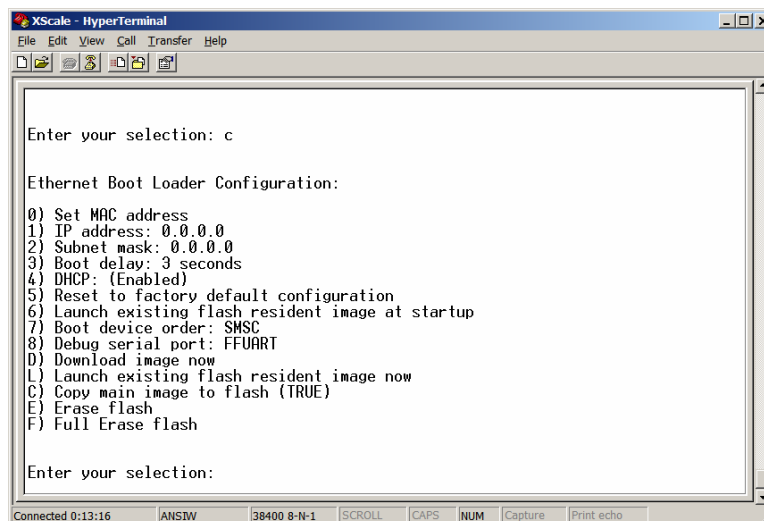


```
XScale - HyperTerminal
File Edit View Call Transfer Help
[Icons]

FMD_EraseBlock: Erasing block 52
FMD_EraseBlock: Erasing block 53
FMD_EraseBlock: Erasing block 54
FMD_EraseBlock: Erasing block 55
FMD_EraseBlock: Erasing block 56
FMD_EraseBlock: Erasing block 57
FMD_EraseBlock: Erasing block 58
FMD_EraseBlock: Erasing block 59
FMD_EraseBlock: Erasing block 60
FMD_EraseBlock: Erasing block 61
FMD_EraseBlock: Erasing block 62
FMD_EraseBlock: Erasing block 63
FMD_EraseBlock: Erasing block 0
ReadKernelRegionFromSTRATAFLASH: partition info for img : 2 2 1 0 33 63 0 0 1024
31744
Call BP_ReadData. @=0x80100000 length=0xF80000 (offset=0x0)
System ready!
Preparing for download...
INFO: Using device name: 'phyCore-PX0'
Download successful! Jumping to image at 0x80101000 (physical 0xA0101000)...

-
Connected 0:11:37  ANSIV  38400 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

- When the Flash formatting is complete you will see “Download successful! Jumping to image at 0x801000 (physical 0xA0101000)...”.
- Reset the phyCORE-PXA270 module by disconnecting and re-connecting power and press <SPACE> to enter the Boot Loader Configuration menu.
- At the *Enter your selection:* line type in "C" to change the Boot Loader Configuration to show "C) Copy main image to flash (True)".



```
XScale - HyperTerminal
File Edit View Call Transfer Help
[Icons]

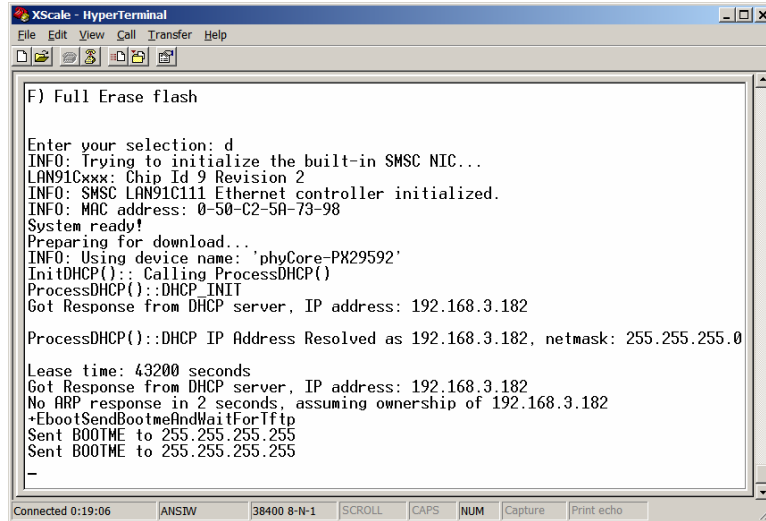
Enter your selection: c

Ethernet Boot Loader Configuration:

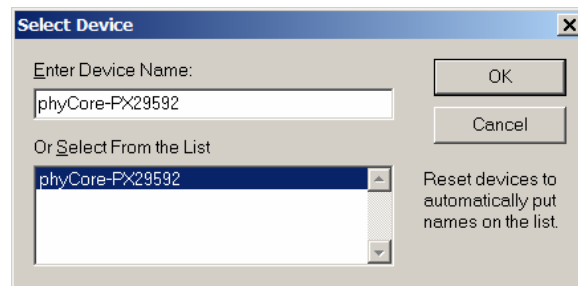
0) Set MAC address
1) IP address: 0.0.0.0
2) Subnet mask: 0.0.0.0
3) Boot delay: 3 seconds
4) DHCP: (Enabled)
5) Reset to factory default configuration
6) Launch existing flash resident image at startup
7) Boot device order: SMSC
8) Debug serial port: FFUART
D) Download image now
L) Launch existing flash resident image now
C) Copy main image to flash (TRUE)
E) Erase flash
F) Full Erase flash

Enter your selection:
```

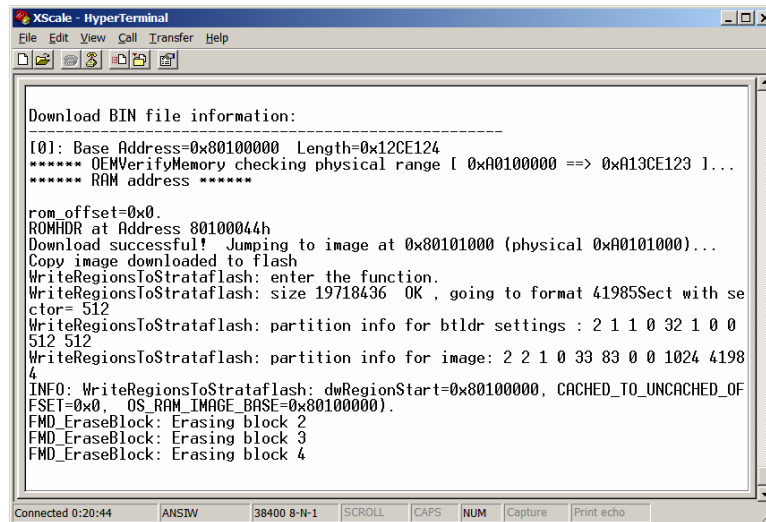
- Enter **D** to “Download image now”.



- Switch back to the "Select Device" dialog box in your **eShell** window. The name of the new module detected by the software will now appear in the dialog window. This may take several seconds to appear. Select the new name and confirm with the **OK** button.



- Select **NK.bin** in the following window and click **Open**. The WinCE image is located in: **C:\PHYTEC\pC-PXA270 Acceleration Kit\WinCE\JFlash_MM**
- **eBoot** will display several “FMD_EraseBlock:” messages while writing the WinCE image to memory. The download process takes approximately 2 minutes. The status is displayed in the HyperTerminal window.



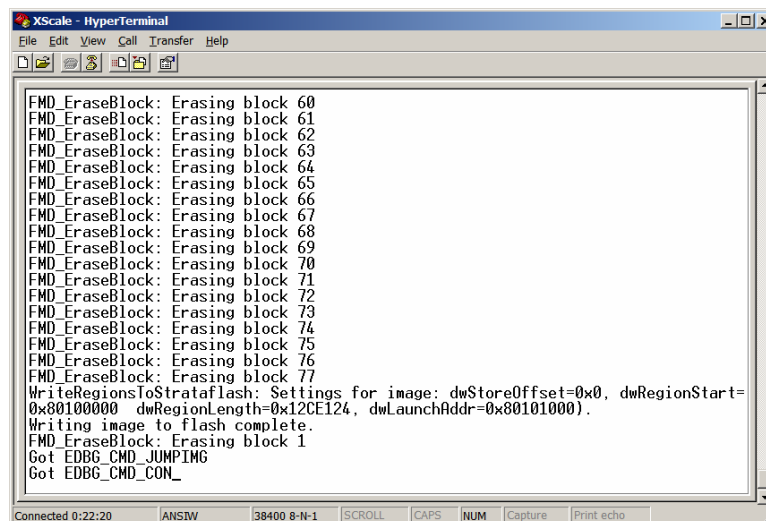
```

XScale - HyperTerminal
File Edit View Call Transfer Help
Download BIN file information:
-----
[0]: Base Address=0x80100000 Length=0x12CE124
***** OEMVerifyMemory checking physical range [ 0x80100000 ==> 0xA13CE123 ]...
***** RAM address *****

rom_offset=0x0.
ROMHDR at Address 80100044h
Download successful! Jumping to image at 0x80101000 (physical 0x80101000)...
Copy image downloaded to flash
WriteRegionsToStrataflash: enter the function.
WriteRegionsToStrataflash: size 19718436 OK , going to format 41985Sect with sector= 512
WriteRegionsToStrataflash: partition info for bldr settings : 2 1 1 0 32 1 0 0
512 512
WriteRegionsToStrataflash: partition info for image: 2 2 1 0 33 83 0 0 1024 4198
4
INFO: WriteRegionsToStrataflash: dwRegionStart=0x80100000, CACHED_TO_UNCACHED_OF
FSET=0x0, OS_RAM_IMAGE_BASE=0x80100000).
FMD_EraseBlock: Erasing block 2
FMD_EraseBlock: Erasing block 3
FMD_EraseBlock: Erasing block 4

```

- When complete, the following will appear:



```

XScale - HyperTerminal
File Edit View Call Transfer Help
FMD_EraseBlock: Erasing block 60
FMD_EraseBlock: Erasing block 61
FMD_EraseBlock: Erasing block 62
FMD_EraseBlock: Erasing block 63
FMD_EraseBlock: Erasing block 64
FMD_EraseBlock: Erasing block 65
FMD_EraseBlock: Erasing block 66
FMD_EraseBlock: Erasing block 67
FMD_EraseBlock: Erasing block 68
FMD_EraseBlock: Erasing block 69
FMD_EraseBlock: Erasing block 70
FMD_EraseBlock: Erasing block 71
FMD_EraseBlock: Erasing block 72
FMD_EraseBlock: Erasing block 73
FMD_EraseBlock: Erasing block 74
FMD_EraseBlock: Erasing block 75
FMD_EraseBlock: Erasing block 76
FMD_EraseBlock: Erasing block 77
WriteRegionsToStrataflash: Settings for image: dwStoreOffset=0x0, dwRegionStart=
0x80100000 dwRegionLength=0x12CE124, dwLaunchAddr=0x80101000).
Writing image to flash complete.
FMD_EraseBlock: Erasing block 1
Got EDBG_CMD_JUMPING
Got EDBG_CMD_CON_

```

- The "Got EDBG_CMD_CON" message will be displayed in HyperTerminal as shown above. It will then take about 2-3 minutes to finish reformatting the Flash and boot up. Once this is complete the WinCE 6.0 desktop will be displayed on the Sharp LCD screen mounted on the back of the phyCORE-PXA270 Carrier Board.

The WinCE 6.0 boot procedure will only take this long after the initial image download. Subsequent start up will only take 15 to 20 seconds.



Congratulations! You have successfully downloaded the WinCE demo image to the phyCORE-PXA270 over Ethernet. PHYTEC also offers Full Adeneo WinCE 6.0 BSP as source or binary. For more information please contact PHYTEC at sales@phytec.com.

**Document: WinCE-Kit with phyCORE®-PXA270 QuickStart
Instructions**
Document number: L-708e_0, December 2007

How would you improve this manual?

Did you find any mistakes in this manual? _____ page

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