



CYWB0224ABS/CYWB0224ABM

West Bridge[®] Astoria[™] Dual-SD RAID 1 Reference Design Guide

Doc. No. 001-55396 Rev. **

Cypress Semiconductor
198 Champion Court
San Jose, CA 95134-1709
Phone (USA): 880.858.1810
Phone (Intl): 408.943.2600
<http://www.cypress.com>

Copyrights

© Cypress Semiconductor Corporation, 2009. The information contained herein is subject to change without notice. Cypress Semiconductor Corporation assumes no responsibility for the use of any circuitry other than circuitry embodied in a Cypress product. Nor does it convey or imply any license under patent or other rights. Cypress products are not warranted nor intended to be used for medical, life support, life saving, critical control or safety applications, unless pursuant to an express written agreement with Cypress. Furthermore, Cypress does not authorize its products for use as critical components in life-support systems where a malfunction or failure may reasonably be expected to result in significant injury to the user. The inclusion of Cypress products in life-support systems application implies that the manufacturer assumes all risk of such use and in doing so indemnifies Cypress against all charges.

Trademarks

PSoC Designer™, Programmable System-on-Chip™, and PSoC Express™ are trademarks and PSoC® is a registered trademark of Cypress Semiconductor Corp. All other trademarks or registered trademarks referenced herein are property of the respective corporations.

Source Code

Any Source Code (software and/or firmware) is owned by Cypress Semiconductor Corporation (Cypress) and is protected by and subject to worldwide patent protection (United States and foreign), United States copyright laws and international treaty provisions. Cypress hereby grants to licensee a personal, non-exclusive, non-transferable license to copy, use, modify, create derivative works of, and compile the Cypress Source Code and derivative works for the sole purpose of creating custom software and or firmware in support of licensee product to be used only in conjunction with a Cypress integrated circuit as specified in the applicable agreement. Any reproduction, modification, translation, compilation, or representation of this Source Code except as specified above is prohibited without the express written permission of Cypress.

Disclaimer

CYPRESS MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Cypress reserves the right to make changes without further notice to the materials described herein. Cypress does not assume any liability arising out of the application or use of any product or circuit described herein. Cypress does not authorize its products for use as critical components in life-support systems where a malfunction or failure may reasonably be expected to result in significant injury to the user. The inclusion of Cypress' product in a life-support systems application implies that the manufacturer assumes all risk of such use and in doing so indemnifies Cypress against all charges.

Use may be limited by and subject to the applicable Cypress software license agreement.

Contents



1. Introduction.....	5
1.1 Introduction.....	5
1.2 Astoria Dual-SD RAID 1 Controller.....	5
Document Revision History	6
2. Reference Design Contents.....	7
2.1 Firmware Images.....	7
2.1.1 Dual-SD RAID1 Firmware.....	7
2.1.2 Dual-SD Firmware	7
2.2 Software	7
2.3 Driver	7
2.4 Documents	8
2.5 Hardware.....	8
3. CyDownload Utility Installation	9
4. Reference Design	15
4.1 Configuring Astoria as a Dual-SD RAID 1 Controller.....	15
4.2 Verifying the RAID 1 Functionality	17

1. Introduction



This document provides an overview of Astoria Dual-SD RAID 1 Reference Design, its contents and a step by step procedure to test the reference design.

1.1 Introduction

Astoria is a mass storage controller from Cypress's WestBridge product family. Astoria can support up to two SD/SDIO/MMC+ devices that enable system support for multiple types of storage and SDIO peripherals such as WiFi, Bluetooth, UWB, GPS, and DVB-H. Astoria can also support up to 16 NAND devices with up to 4 bit ECC. Built to connect to any embedded processor, Astoria uses a flexible processor interface that includes PNAND, ADMUX, SPI, and SRAM.

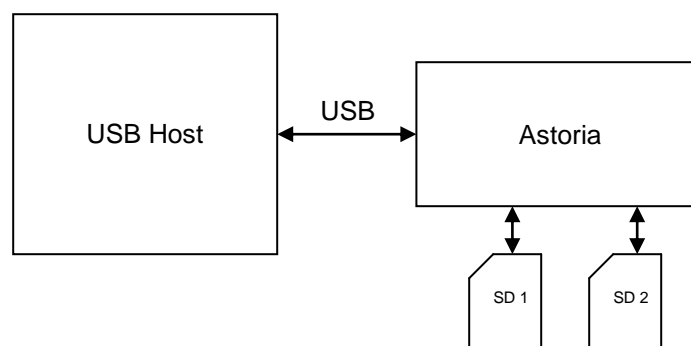
RAID, an acronym for Redundant Array of Inexpensive Disks, is a technology that enables systems with storage to achieve high reliability from low cost and less reliable storage components such as magnetic drives and Secure Digital (SD) cards. This higher reliability is achieved by arranging the storage components into arrays for redundancy. Redundancy is achieved by the following methods: 1) mirroring the data in multiple disks (copies of data in multiple drives) or by 2) writing parity data along with actual data across drives such that when one drive fails, the actual data can be retrieved from the second copy or can be calculated using the rest of the data and parity information.

When multiple physical disks are set up to use RAID technology, they are said to be in a RAID array. This array distributes data across multiple disks but the array is seen by the system as one single disk.

This Reference Design demonstrates the application of Astoria as a Dual-SD RAID 1 Controller.

1.2 Astoria Dual-SD RAID 1 Controller

Astoria implements a Dual-SD RAID 1 Controller where the data is mirrored on two SD cards. Astoria enumerates as a USB mass storage device at the host and this RAID array is presented as a single drive to the operating system.



Document Revision History

Revision	Issue Date	Origin of Change	Description of Change
**	September 04, 2009	PBV	Initial version of Reference Design Guide.

2. Reference Design Contents



This reference design contains software, driver, firmware images, and documentation required for the Astoria Dual-SD RAID 1 solution evaluation. The hardware for this application is part of the Astoria Development Kit (CYWBDVK002AB). This development kit is available at www.cypress.com.

2.1 Firmware Images

This reference design comes with two different firmware images for the Astoria Controller. They are located in the 'Firmware' folder at the location where the Reference Design is installed.

2.1.1 Dual-SD RAID1 Firmware

The Dual-SD RAID1 firmware is available in the 'Firmware' folder. The name of the image is '*Astoria_Dual_SD_RAID1.hex*'. When downloaded to Astoria, this image enumerates Astoria as one removable drive at the host. The data moved to this drive from the Operating System is mirrored on both SD Cards. The data is accessible even if one of the cards is corrupted or unavailable.

2.1.2 Dual-SD Firmware

The Dual-SD firmware is available in the 'Firmware' folder. The name of the image is '*Astoria_Dual_SD.hex*'. When downloaded to Astoria, this image enumerates Astoria as two removable drives at the host. This image is for verification of the RAID1 functionality.

2.2 Software

The utility (*CyDownload.exe*) required to download firmware images to Astoria is provided with this reference design. Installation executable for this utility is available in the 'Software' folder. Detailed instructions to install this utility are provided in the section [CyDownload Utility Installation](#) on page 7.

This folder also contains a WinDiff utility from Microsoft®. This utility can compare two files or folders and list the differences. This utility does not require installation. The folder comparison option of this utility is used to verify the file mirroring done by Astoria when configured as a RAID controller.

2.3 Driver

The driver for the CyDownload utility is available in the 'Driver' folder. The *CyUSB.sys* driver enables communication between the CyDownload Utility and the Astoria Development Kit Board. The Setup Information file for the driver, *CyUSB.inf*, is also available in 'Driver' folder.

2.4 Documents

This folder contains the Reference Design Guide which helps in getting started on this project. Other related documents available on www.cypress.com are:

1. [WestBridge Astoria data sheet](#)
2. [Schematic Review Checklist for WestBridge® Astoria™](#)

2.5 Hardware

This reference design uses the Astoria Development Board which is provided in the Astoria Development Kit (CYWBDVK002AB). This kit is available at www.cypress.com. The schematic, Gerber files, and BOM for the board are available with the Astoria Development Kit. For easy and quick reference, the schematic and BOM of the board is available with this reference design kit in the 'Hardware' folder. The following files are in the folder:

1. Astoria Development Kit Schematic (*Astoria_DVK_Schematic.pdf*)
2. Astoria Development Kit BOM (*BOM.xls*)

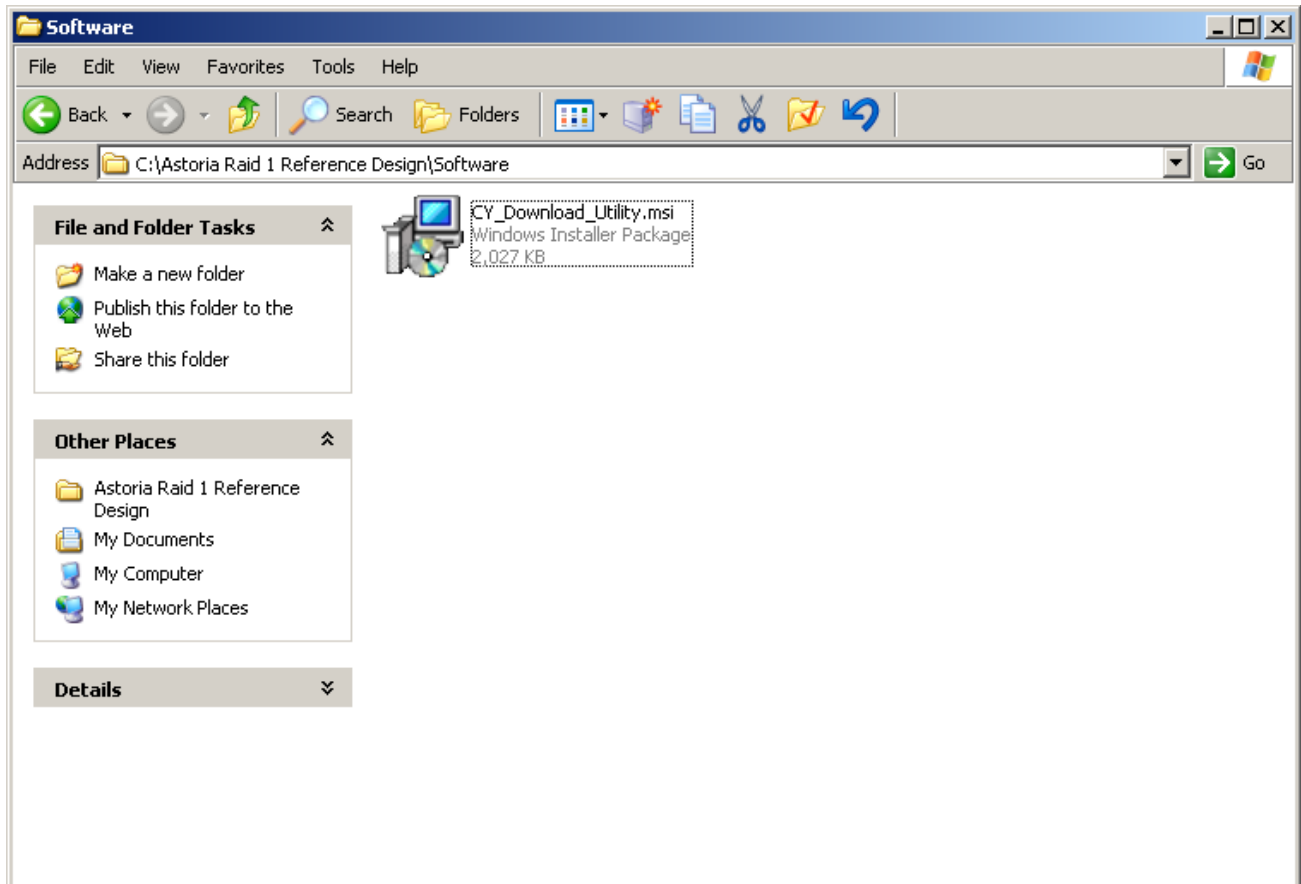
3. CyDownload Utility Installation



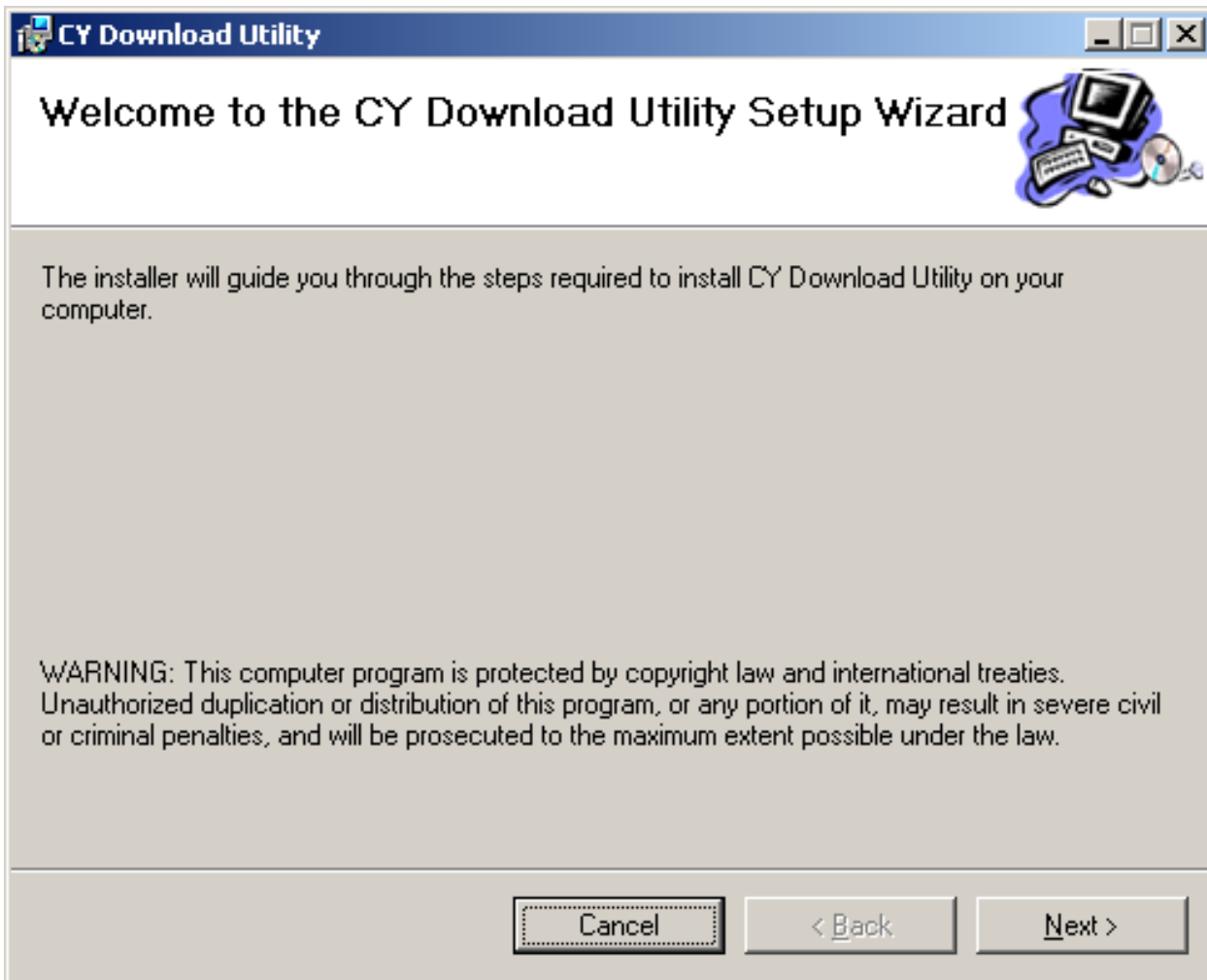
The CyDownload utility downloads the firmware to the Astoria RAM. This section gives detailed instructions on how to install the utility.

3.1 Installation Procedure

Step 1 – Locate the Installer in the ‘Reference Design’ Folder. The Installer is located in the ‘Software’ folder where the Reference Design is installed.

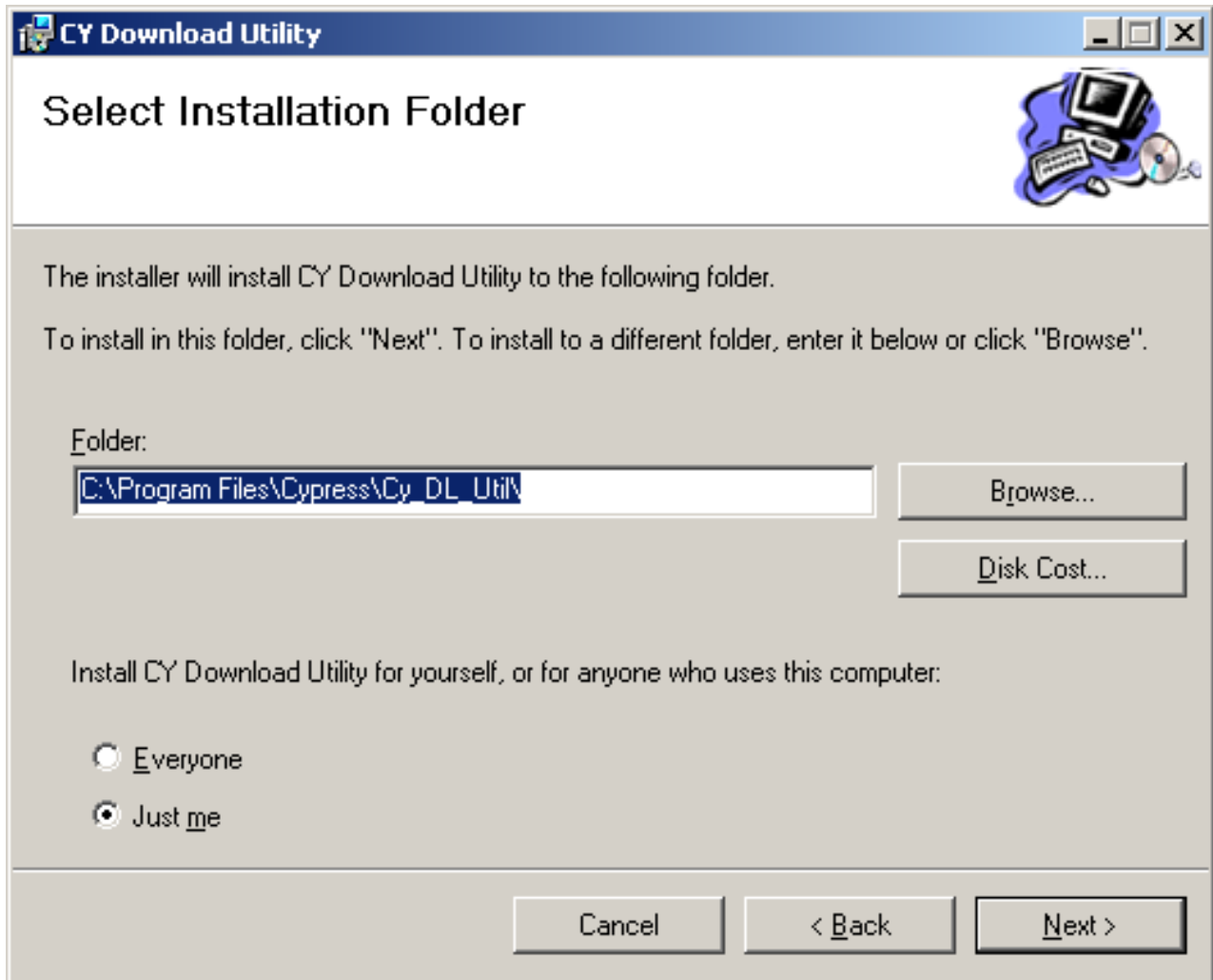


Step 2 – Installation Screen 1. Click Next.

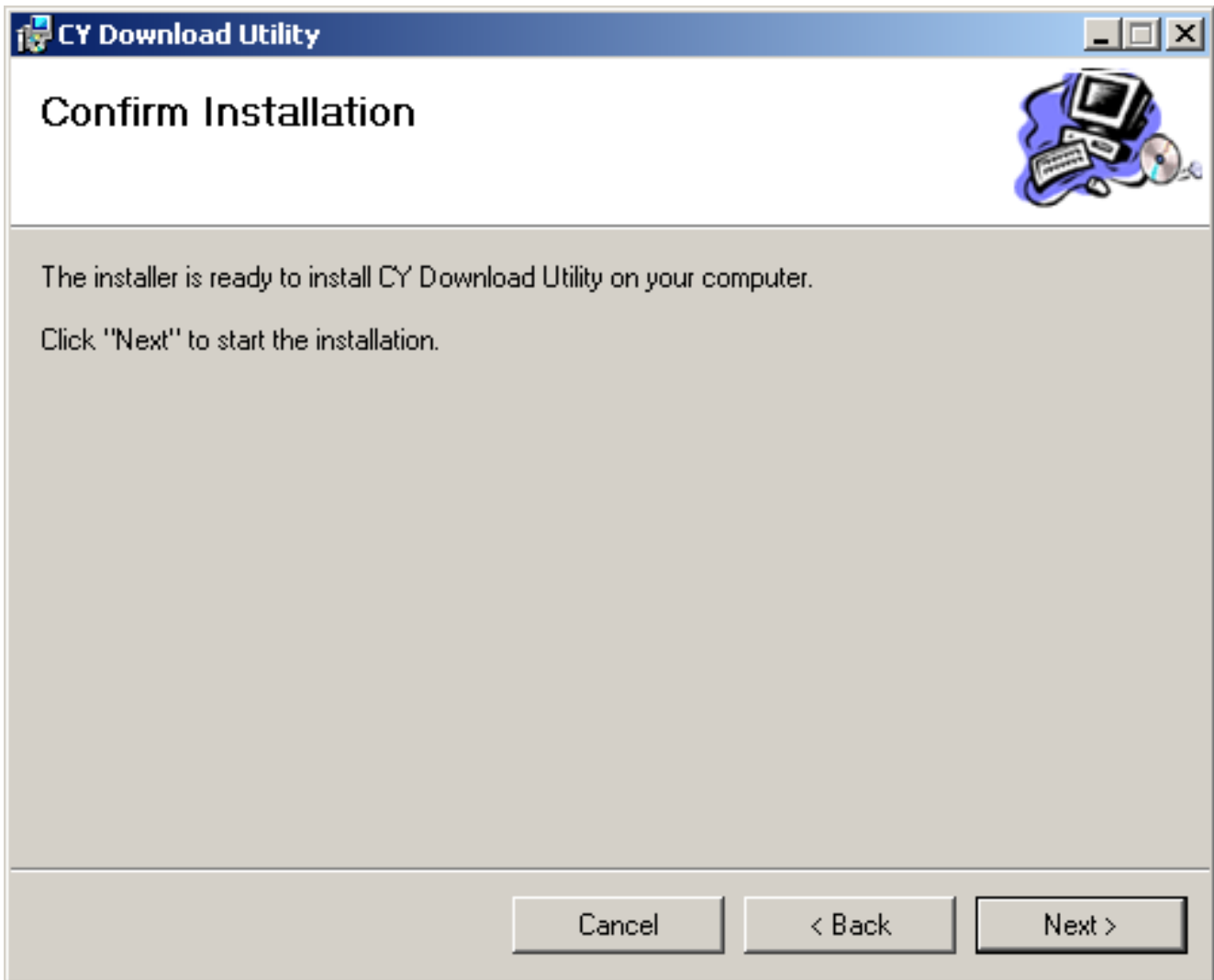


Step 3 – Installation Screen 2.

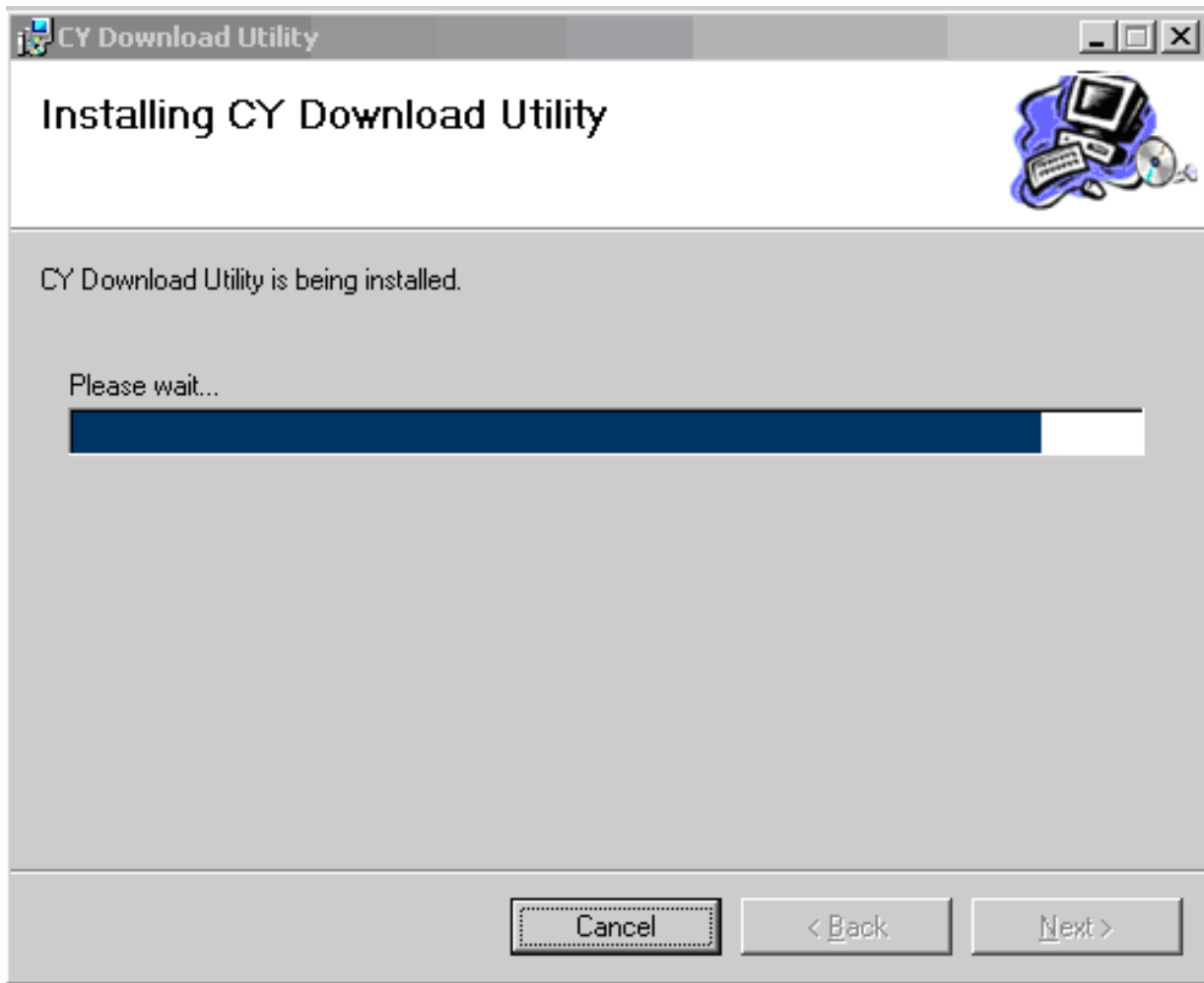
A default path is provided for the utility. The user can browse and select the desired location on the installation screen. Then click Next.



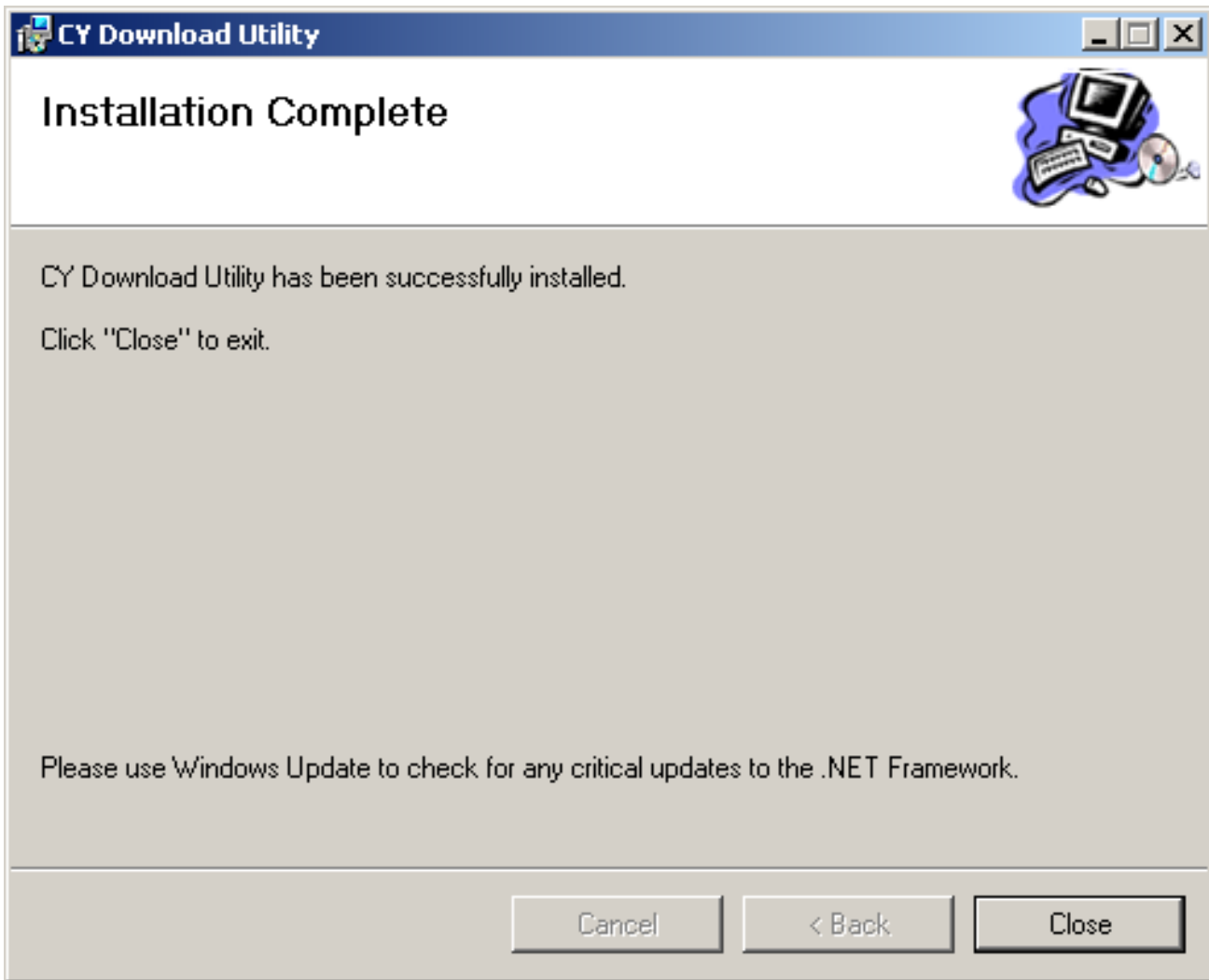
Step 4 – Click Next to start installation.



Step 5 – The utility installation window opens.



Step 6 – Click Close to complete installation.



4. Reference Design



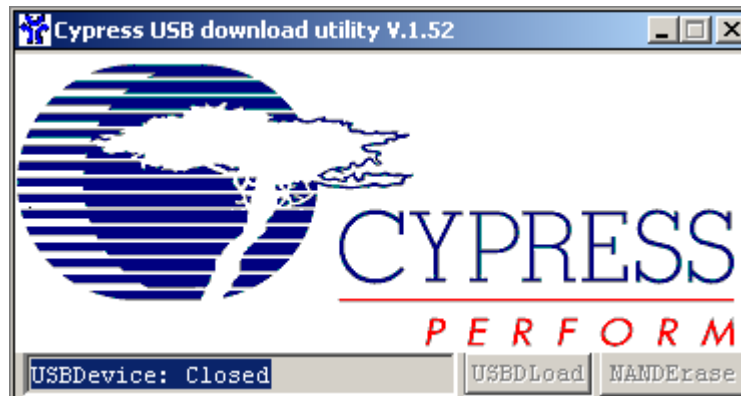
Evaluating the Reference Design involves two steps. First, Astoria is configured as the Dual-SD RAID1 Controller with two SD Cards connected. When connected, the device appears as one removable drive in the Operating System. Any file operation done on this drive is mirrored on both SD Cards.

Second, the RAID1 functionality is verified. Astoria is configured as a Dual SD Controller. When connected to the Host, two removable drives come up. The data in both drives can be verified for mirroring operation done in step 1.

4.1 Configuring Astoria as a Dual-SD RAID 1 Controller

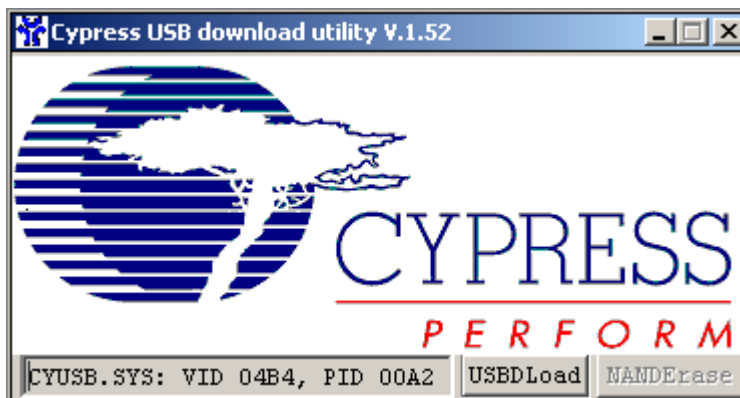
This section gives step by step instructions to configure Astoria as a Dual-SD RAID1 Controller. Two SD cards should be inserted into the slots available on the board for testing. If the cards are not of identical size, the size of the smaller card will be the size of the drive in RAID1 mode. If at least one card is not formatted, the drive appears unformatted in the PC in the RAID mode.

Step1 – Run the CyDownload Utility. A link to the utility can be found at Start >All Programs > Cypress > USB > Cy Download Utility.

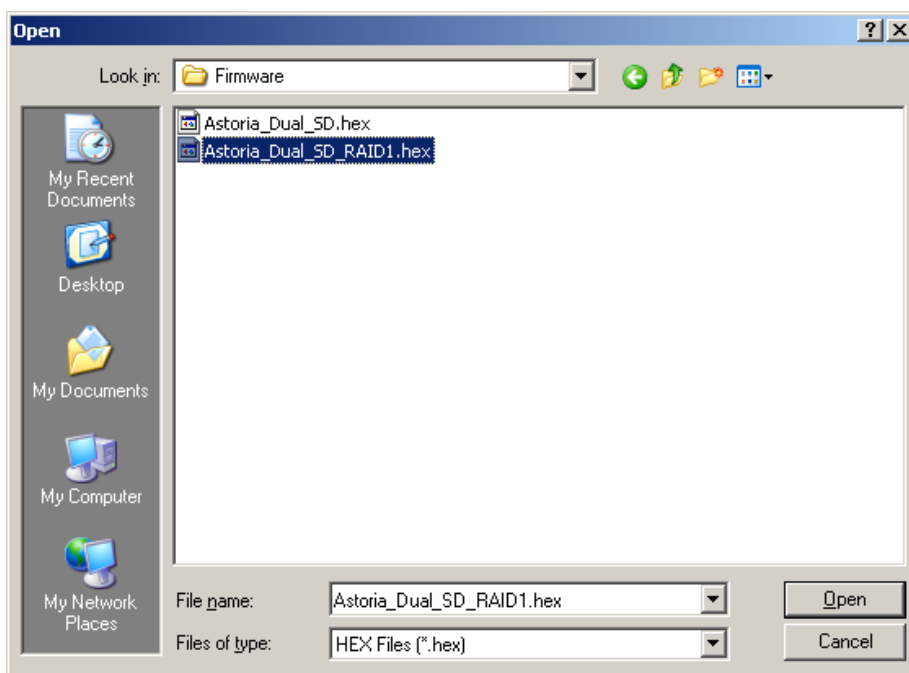


Step2 – Connect Astoria Development Board to PC with two SD Cards in the SD Card Slots.

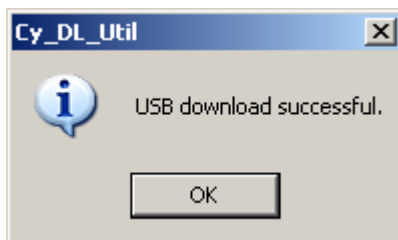
Step 3 – Wait for the utility to detect the Development Board.



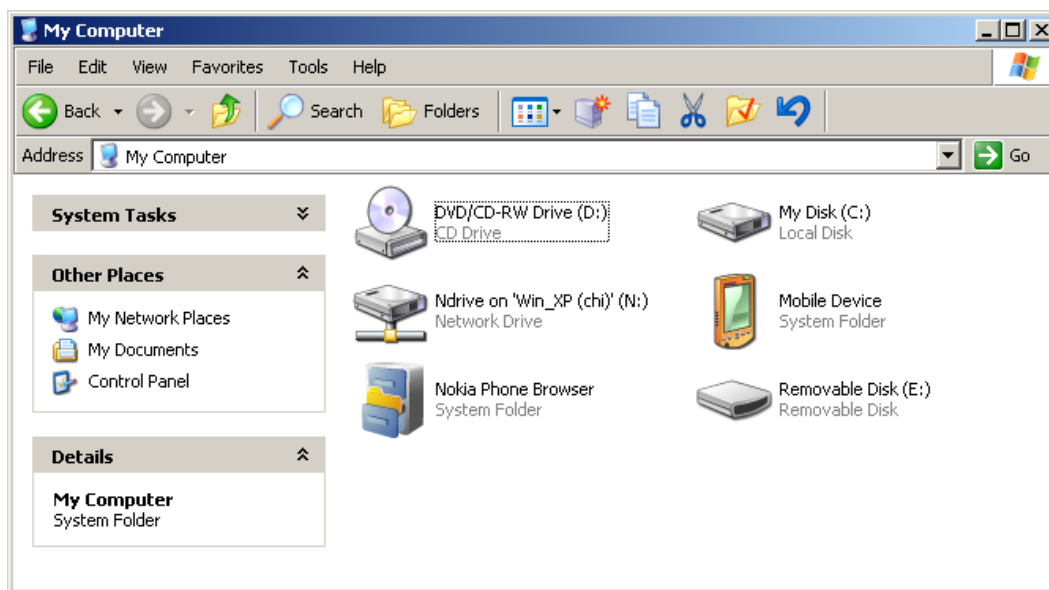
Step 4 – Download Dual-SD RAID1 Firmware (Astoria_Dual_SD_RAID1.hex). Click 'Download' to point the utility to the hex file.



Step 5 – Click OK after downloading the firmware. A removable drive comes up in the computer.



Step5 – If the drive is not formatted, format the drive. Copy a set of known files to the drive.



Step 6 – Disconnect the board from the PC.

4.2 Verifying the RAID 1 Functionality

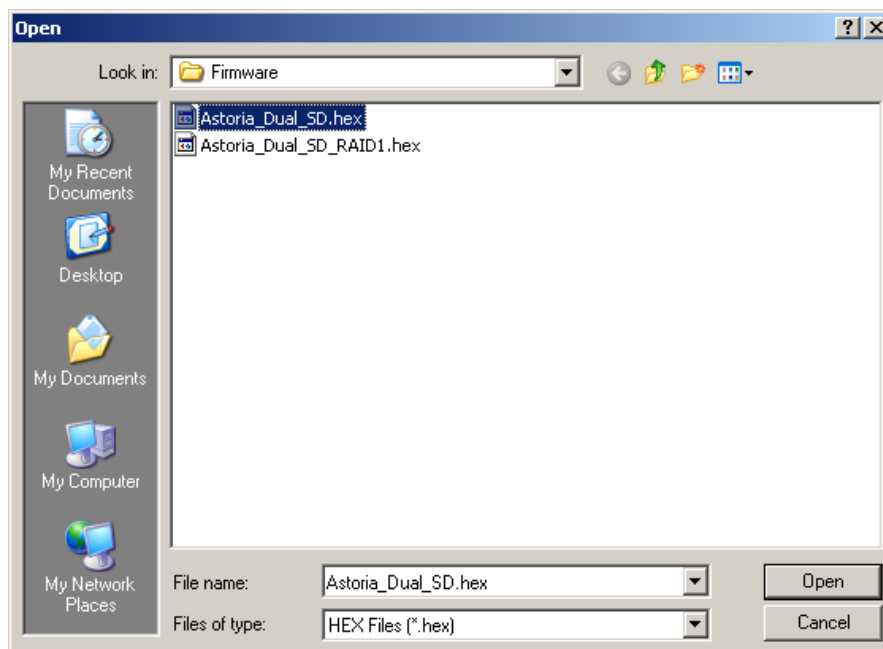
Follow these instructions to verify the RAID 1 functionality:

Step 1 – Connect the Astoria Development Board to PC with the same SD Cards used in the previous process.

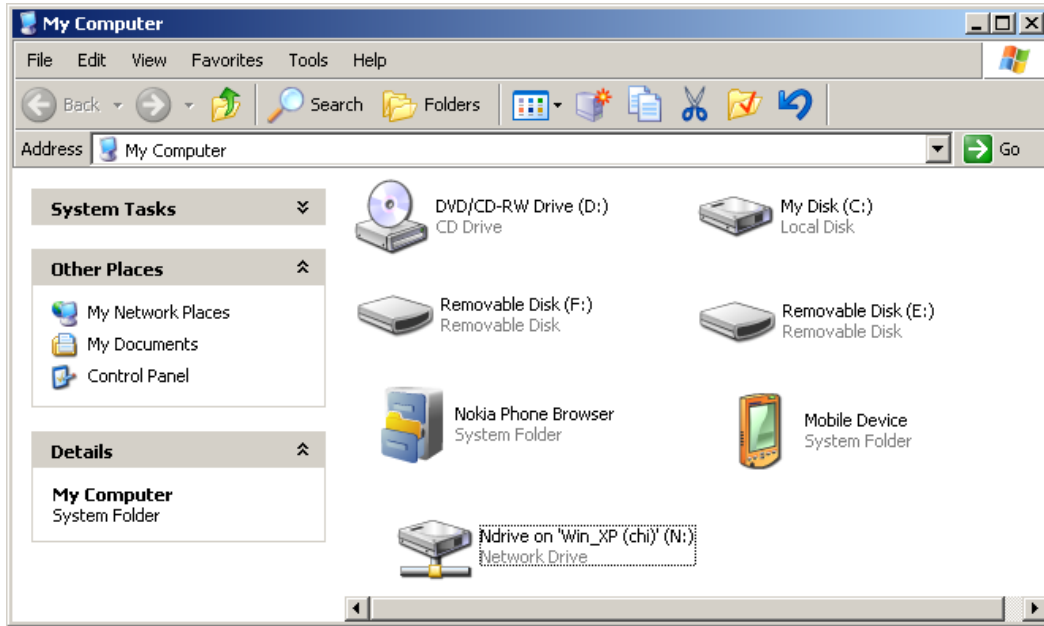
Step 2 – Run the CyDownload Utility. A link to the utility can be found at Start >All Programs > Cypress > USB > Cy Download Utility.

Step 3 – Wait for the utility to detect the Development Board.

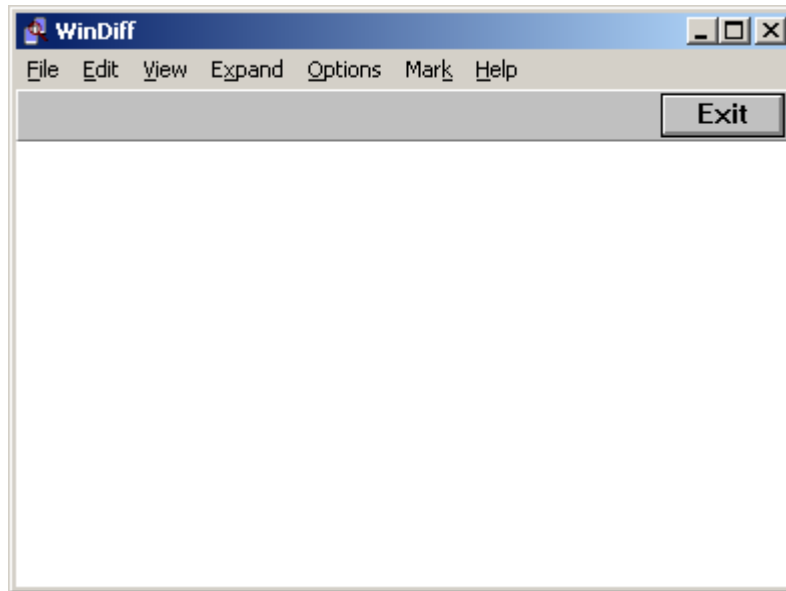
Step 4 – Download Dual-SD Firmware (Astoria_Dual_SD.hex). Click 'Download' to point the utility to the hex file.



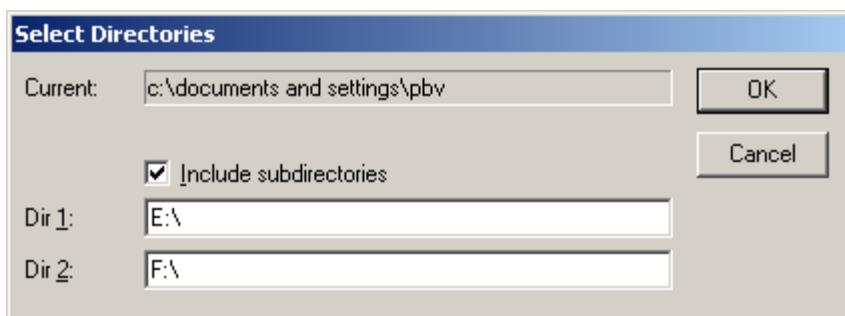
Step 5 – Verify that two removable drives come up in the host.



Step 6 – Run WinDiff utility from the 'Software' Folder of the Reference Design installation directory.

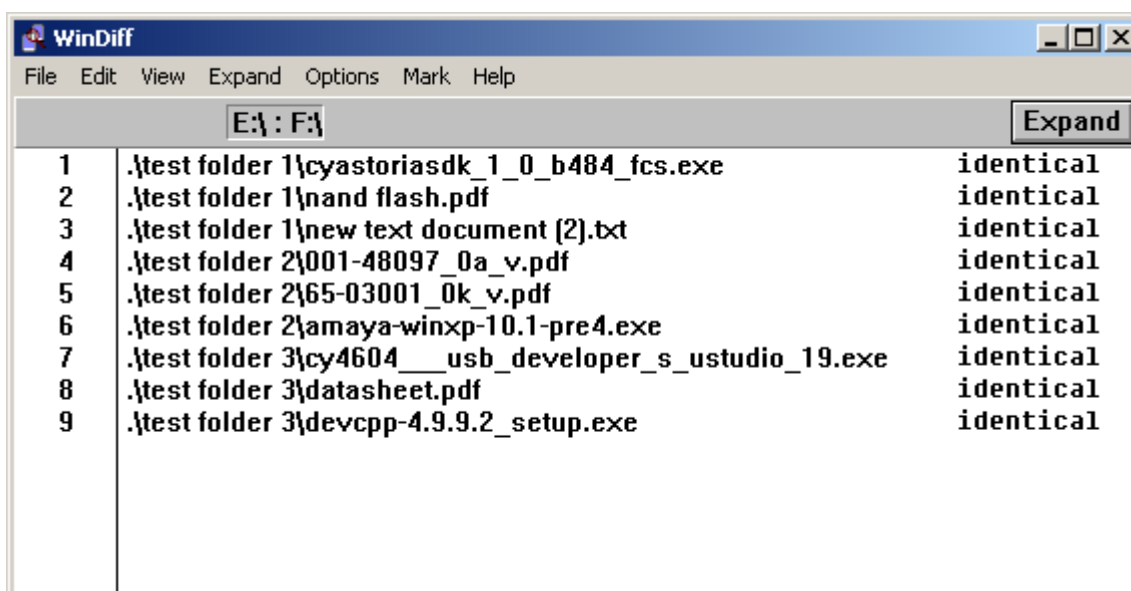


Step 7 – Select the two drives to compare the contents by File > Compare Directories.



Select the drives in Dir 1 and Dir 2 by typing in the Drive. Click Ok.

Step 8 – The directories are compared and the results are listed.



Note The folder paths and files listed are those used to prepare this document.