How to Switch to a Different Mass Storage Driver in a Windows®-Based Operating System

Introduction

The various Windows® operating systems require a USB Mass Storage Class (MSC) device driver to communicate to a USB connected mass storage device. Windows ME, Windows 2000 and Windows XP all have an MSC driver built into them and do not require a different driver. Windows 98SE does not have an MSC driver, so a custom driver must be provided. While Windows ME, Windows 2000, and Windows XP do not require a different driver, the user may have a need for added functionality not provided in the Microsoft® driver. In this case, since on enumeration the mass storage device will use the OS class driver, the user will need to specify a different driver to be used. This document's intended use is to explain to the user how to install and switch to a provided plug-and-play driver in these various operating systems. This document assumes that the user has a functional USB host controller, basic knowledge of the Windows operating system, and a plug-and-play driver for their device.

Getting Started

This document is intended to explain to the user how to make their operating system use the Cypress driver over a different driver. Because major systems vary slightly, this document is divided into a different section for each operating system (Windows 98SE, Windows ME, Windows 2000 and Windows XP). Screen shots are included in each section for your reference. Your screen will not necessarily look like the screen shots in this document because each user can configure their operating system differently. Before the Cypress driver can be used with a given device, the driver files must be modified to contain the connected device's Vendor Identifier (VID) and Product Identifier (PID). The VID is specific to each vendor and is distributed by USB-IF (www.usb.org). The PID is determined by the vendor and is usually different for each product the company produces. The Cypress plug-and-play driver can be downloaded from www.cypress.com. This download also includes instructions on how to modify the driver to contain your VID and PID along with custom strings.

Windows 98SE

Windows 98SE does not have a built-in MSC driver. Because of this, when a new piece of hardware is plugged into the USB host controller, the OS will bring up the new hardware window and ask the user to browse to the location of the driver. You must know the location of the plug-and-play driver files before you can continue.

1) New Hardware Window

When you plug the new hardware into the USB host controller, Windows 98SE will start the New Hardware Wizard. To install the new driver press the Next> button (see *Figure 1*).

Figure 1. Add New Hardware Wizard

2) Search for New Driver

The next step in the New Hardware Wizard will be to tell Window 98SE how to find the driver.

Choose "Search for the best driver for your device." Then press the Next button (see *Figure 2*).

Figure 2. Search for best driver

3) Specify A Location

Now that the OS knows it needs to search for a new driver, it will give you options of where it should look for the drivers. In this case, deselect everything except the “Specify a location” check box. Press the Browse button and navigate to the location where the modified driver is located (see *Figure 3*).

Figure 3. Specify a Location

4) Windows is Ready to Load New Driver

Once a valid driver location is selected, the Windows operating system will attempt to load the driver. This window is used to verify that the user has chosen the correct driver and to provide an opportunity to select a different driver. Press Next> (see *Figure 4*).

Figure 4. Windows is Ready to Load New Driver

5) Driver Installation is Finished

Once the operating system has finished successfully loading the driver from the location you have selected, you should see a box similar to the one shown in *Figure 5*. Press the Finish button to complete the installation process.

Figure 5. Complete driver installation

6) Verify Driver Installation in Device Manager

This concludes the installation procedures for a Windows 98SE system. To verify that the system is fully functional, you can inspect the device manager.[1] You should see something similar to the window shown in *Figure 6*. The actual string will vary depending on the device manufacturer and the contents of the driver information (.inf) file.

Note:

1. One way to view the Device Manager is to select My Computer with the right button of your mouse and then select Properties. Next select the Device Manager tab at the top of the window as shown in *Figure 6*.

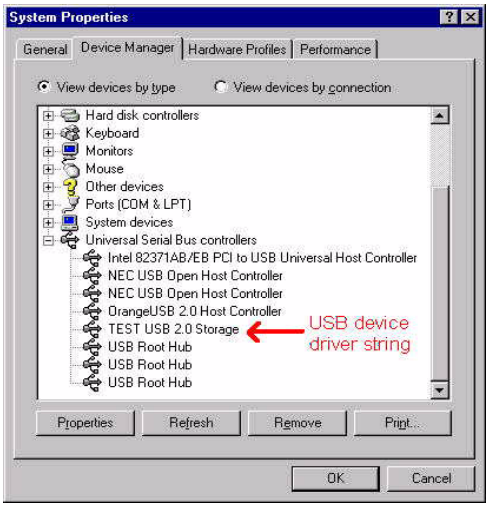

Figure 6. Driver Verification in Device Manager

Windows ME

Windows ME is a derivation of Windows 98SE, so there are several similarities. Of course the look and feel of the operating system is different, but another key addition to Windows ME is that it includes an MSC driver written by Microsoft. This means that running a mass storage device on Windows ME does not require any additional drivers. An exception to this is if you have an ISD-200 connected to an ATA hard disk drive (HDD) or a USS725-based mass storage device. The latest Cypress mass storage driver to support the USS725 was version 5.04. The latest version of the Cypress MSC driver to support the ISD-200 was version 5.16. If you want features included in the Cypress driver, you will need to tell the operating system what driver to use and where it can be found.

When you connect your USB mass storage device to the USB controller, Windows ME will load the Microsoft MSC driver by default and mount a drive letter for that device. The following instructions show how to change the driver that Windows ME uses for a particular device. These instructions assume that you have a functional Host controller card.

1) Open System Properties

The Device Manager will show a list all of the devices connected to the computer and will point to the driver the operating system is currently using for each device. One method used to access the Device Manger is to open the System Properties window. To do this, select My Computer on the desktop with your right mouse button. You should see a drop-down list where Properties is the last selection in the list. Select Properties as shown in *Figure 7*.

Figure 7. Accessing System Properties in Windows ME

2) Opening Device Manager

Once the System Properties window appears, select the Device Manager tab at the top of the window. Next, expand the USB controllers by clicking on the + sign to the left of Universal Serial Bus controllers. If your device has enumerated correctly with the MSC, it should look similar to *Figure 8*. Note the text “USB Mass Storage Device.” This is the text that will be displayed when the Microsoft MSC driver is loaded. To replace the Microsoft MSC with the Cypress driver, right click on “USB Mass Storage Device” and select Properties.

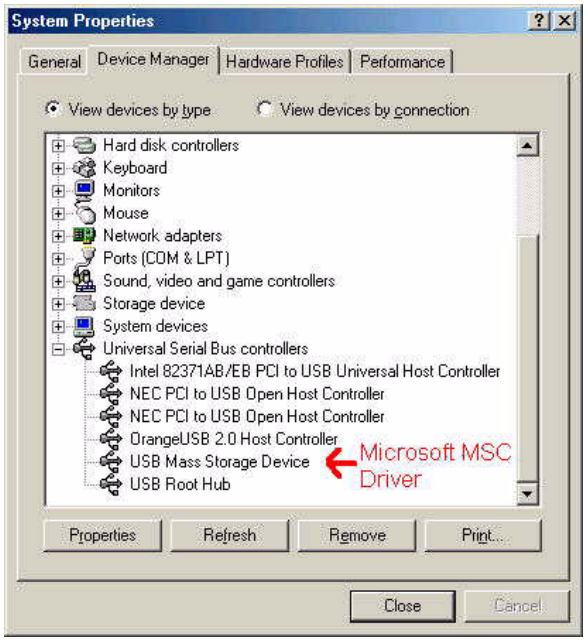

Figure 8. Device Manager with Windows ME MSC

3) Update Driver

Figure 9 shows the USB Mass Storage Device Properties. We are primarily interested in changing the driver, so click on the Update Driver button. This will start the Update Device Driver Wizard utility shown in *Figure 10*.

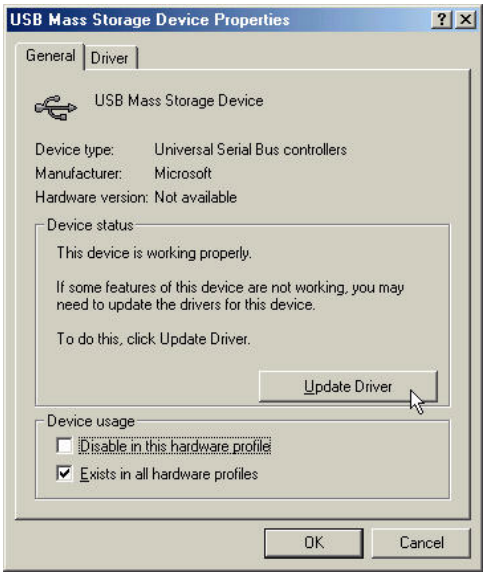

Figure 9. Update Driver Dialog Box

4) Specify the Driver Location

The next step is to point to the plug-and-play driver location. Check the appropriate box for the driver's location. If you do not know, check "Specify a location" and click on the Browse button to locate the driver. Once you have specified the location of the driver, click on the Next > button.

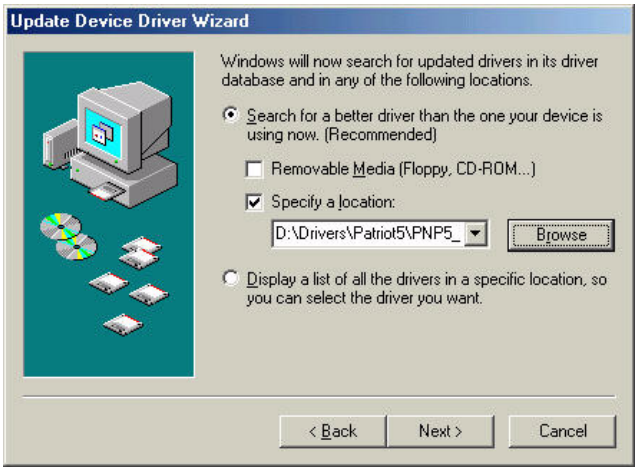

Figure 10. Update Device Driver Wizard (Specify a Location)

5) Driver Installation Complete

Assuming that the driver is set up for the VID/PID of the connected device, and that the driver is correctly modified for this VID/PID (see Getting Started), the driver should load correctly and display a window similar to the one in *Figure 11*.

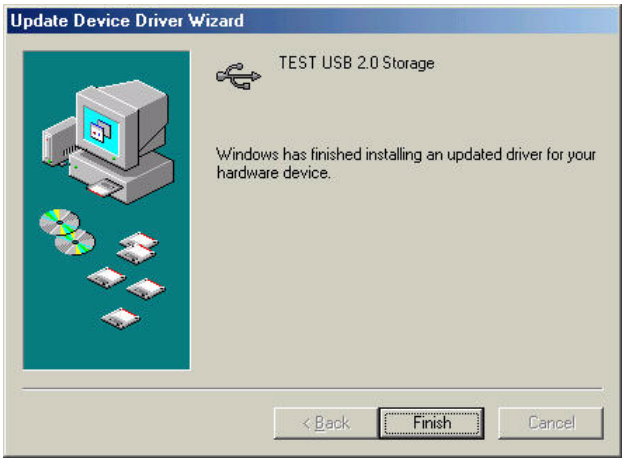

Figure 11. Completion of Driver Installation

6) Verify driver in Device Manager

Using steps 1 and 2, view the Device Manager again. You should now see the text associated with the VID/PID of the connected device displayed instead of the MSC string of USB Mass Storage Device. In this example, the text string associated with the connected device is TEST USB 2.0 Storage (see *Figure 12*).

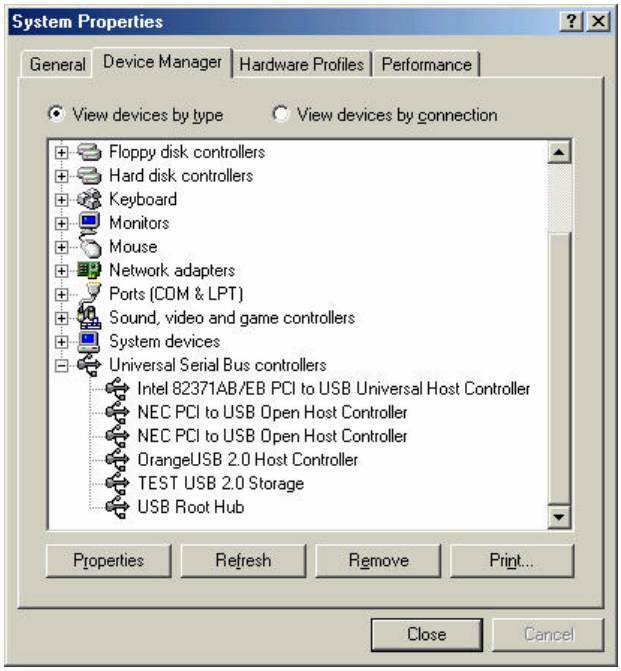

Figure 12. Device Manager Showing New Driver

Windows 2000

Windows 2000 is a derivation of Windows NT. A key addition to Windows 2000 is that it includes an MSC driver written by Microsoft. This means that running a mass storage device on Windows 2000 does not require any additional drivers. An exception to this is if you have an ISD-200 connected to an ATA hard disk drive, or a USS725-based HDD. In this case, the use of the Cypress driver is required for ATAPI-to-ATA translation. The latest Cypress Mass Storage driver to support the USS725 was version 5.04. The latest version of the Cypress MSC driver to support the ISD-200 with ATA devices was version 5.16. If you want features included in the Cypress driver, you will need to tell the operating system what driver to use and where it can be found.

When you connect your USB Mass Storage Device to the USB controller, Windows 2000 will load the Microsoft MSC by default and mount a drive letter for that device. The following instructions show how to change the MSC driver to the Cypress driver for a device. These instructions assume the system has a functional USB host controller installed.

1) Open System Properties

The first step in changing the driver is to open the Device Manager. There are several ways of doing this and any of them can be used. One method of doing this is to right click on My Computer with your mouse and select Properties, as shown in *Figure 13*.

Figure 13. Open System Properties

2) Open Device Manager

After step 1 is complete, the System Properties window will be displayed. Select the Hardware tab at the top of this window and press the Device Manager button, as shown in *Figure 14*. Note that there is also a Driver Signing button to the left of the Device Manager button. This can be used to change the level of warning the operating system will use when using an unsigned driver. The Cypress driver is an unsigned driver—if you are receiving warnings that you would like to eliminate, change the settings by pressing this button.

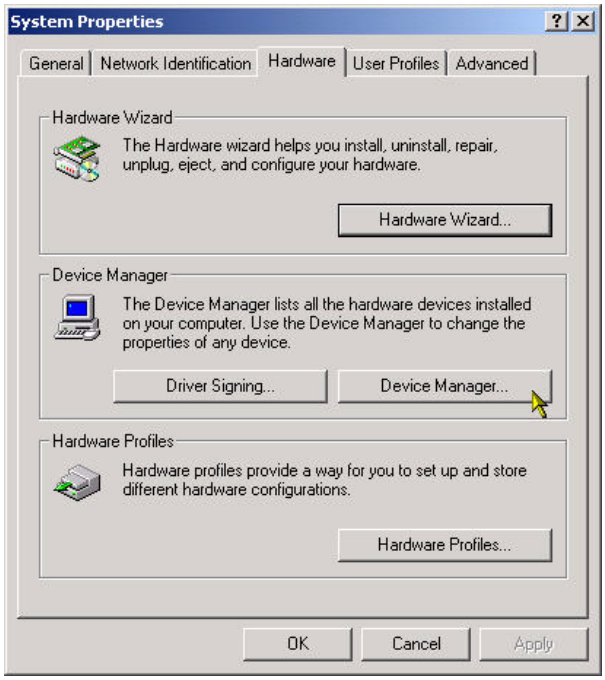

Figure 14. Opening Device Manager

3) Expand the USB controllers

Expand the Universal Serial Bus controllers folder by selecting the + next to "Universal Serial Bus controllers." If the MSC is loaded, you should see the string "USB Mass Storage Device." If this line is not displayed, your device may not be functioning correctly. Note in *Figure 15* that there are two devices connected to the USB bus. One is using the Microsoft MSC driver (USB Mass Storage Device) and the other is using the Cypress driver (USB Storage Adapter V3(TPP)).

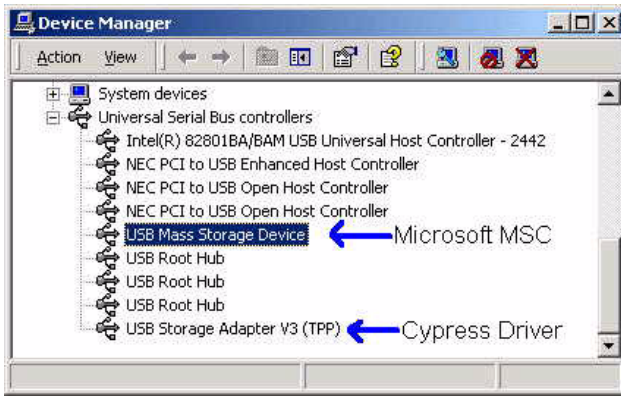

Figure 15. Device Manager in Windows 2000

4) Update Driver

1. Right click on "USB Mass Storage Device" in the Device Manager.
2. Select Properties and the USB Mass Storage Device Properties window will appear (see *Figure 16*).
3. Select the Driver tab at the top of the window.

4. Press the Update Driver… button.
5. After the Update Driver... button is pressed, a new window will be displayed welcoming you to the upgrade Device Driver wizard. Press the Next> button.

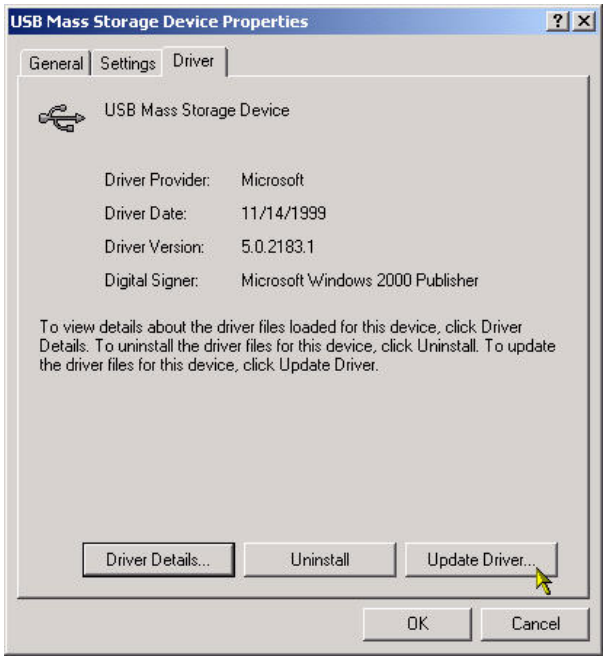

Figure 16. USB Mass Storage Device Properties

5) Search for Driver

The next step is to tell the OS where the new driver is located. Select “Search for a suitable driver for my device (recommended)” and then press the Next> button (see *Figure 17*).

Figure 17. Search for new driver

Note that if the other option was chosen, “Display a list of the known drivers for this device so I can choose a specific driver,” a window similar to the one in *Figure 18* will be displayed showing the various drivers that the OS knows about that can be used with this device. This is an excellent place to switch between various drivers after they are installed on the computer. For example, after you have installed the Cypress driver, you will have at least two choices. In the example in *Figure 18*, the device had two instances of the Cypress driver installed along with the Windows 2000 driver. If you wanted to install yet a different driver, you could press the Have Disk button and navigate to the driver files.

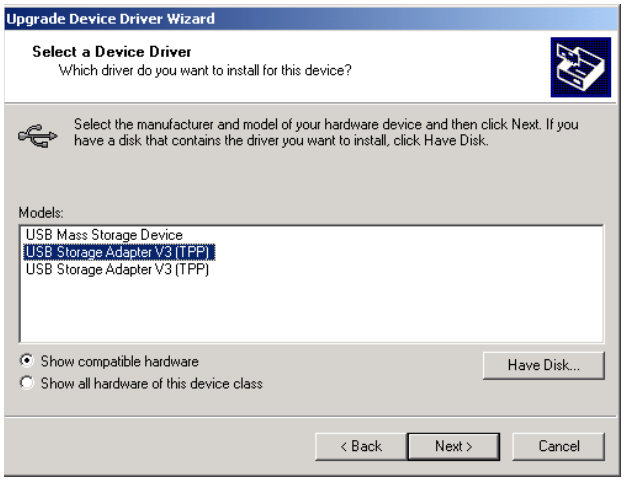

Figure 18. Select a Device Driver

6) Locate Driver Files

Assuming you chose “Search for a suitable driver for my device” in step 5 and you know where you have placed the plug-and-play driver, make sure the only box with a check mark is “Specify a location,” as shown in *Figure 19*.

Press the Next> button.

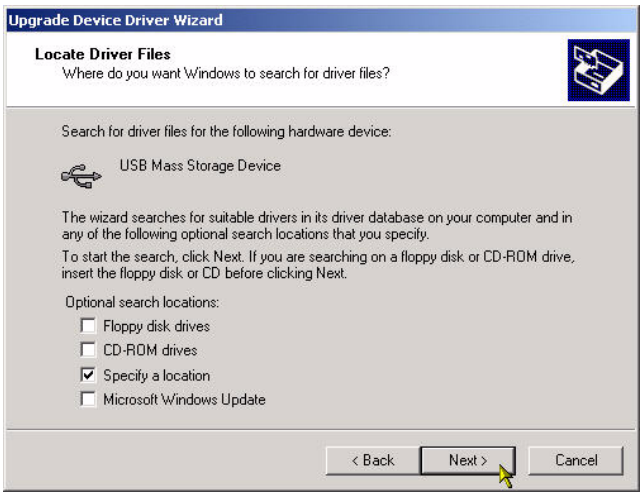

Figure 19. Check Specify a Location

7) Browse to the Driver Location

You are now given the opportunity to browse to the location of the driver.

1. Press the browse button and browse to the directory where you modified the .inf file for your VID and PID.

Figure 20. Browse to Driver Files

2. Press the Open button and then the OK button and follow the instructions on the screen. You will experience a short delay while the operating system updates its registry and reenumerates the connected device.
3. You can now Close the driver update window. You may have to restart your computer at this time depending on the current status of the OS when the driver was installed.

8) Verify Driver Switch in Device Manager

The device manager window should now show the new strings that you have chosen and placed in the .inf file, as shown in *Figure 21*.

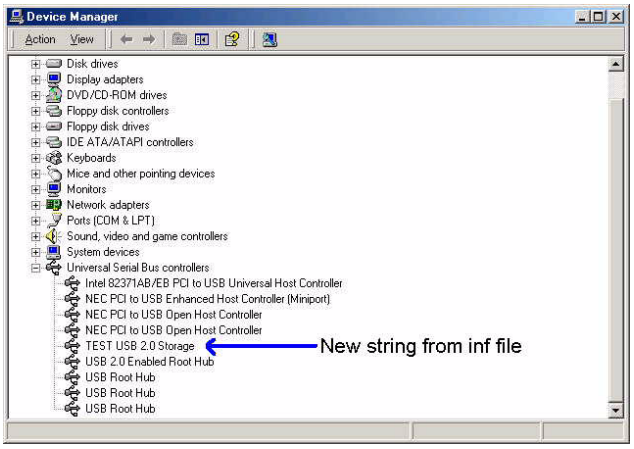

Figure 21. Device Manager with New Driver String

Windows XP

Windows XP is a derivation of Windows NT/2000. A key addition to Windows 2000 was that it included an MSC driver written by Microsoft. Windows XP also has its own MSC. This means that running a mass storage device on Windows XP does not require any additional drivers. An exception to this is if you have an ISD-200 or USS725 connected to an ATA HDD. In this case, the driver is necessary for ATAPI-to-ATA translation. The latest Cypress Mass Storage driver to support the USS725 was version 5.04. The latest version of the Cypress MSC driver to support the ISD-200 with an ATA device was version 5.16. If you want additional features included in the Cypress driver, you will need to tell the operating system what driver to use and where it can be found. Windows XP will always try to use a signed driver if possible. Since the Cypress drivers do not have the digital signature, Windows XP will choose the Microsoft MSC over the Cypress driver unless specified by the user. Individual OEM customers can go through the process of getting the driver signed and make the necessary changes to the .cat and .inf files. The driver signing process is covered in a separate application note.

When you connect your USB Mass Storage Device to the USB controller, Windows XP will load the Microsoft MSC driver by default and mount a drive letter for that device. The following instructions show how to change the MSC driver to the Cypress driver for a device. These instructions assume that the system has a functional USB host controller installed.

1) Open System Properties

There are several ways to get to the System Properties in Windows XP. *Figure 22* shows a convenient method to open System Properties.

1. Left-click with your mouse on Start.
2. Right-click with your mouse on My Computer
3. Move the mouse cursor down to Properties and select it.

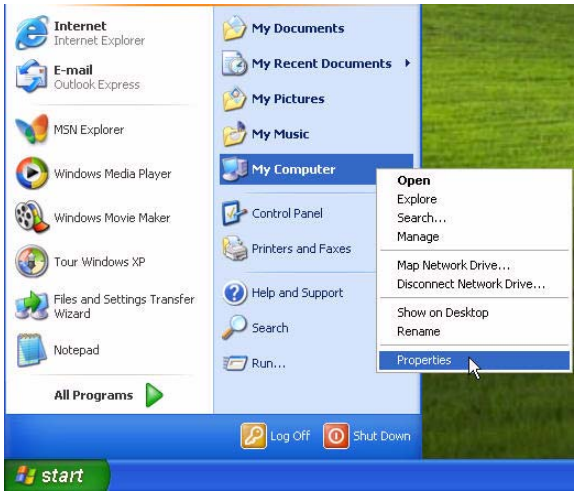

Figure 22. Getting to System Properties

2) Open Device Manager

1. In the System Properties sheet, select the Hardware tab at the top of the window.
2. Press the Device Manager button in the middle of the window (See *Figure 23*).
3. Note also the Driver Signing button. This selection gives the user the option of changing the level of warning for unsigned drivers. The Cypress driver is not a signed driver and you will receive a warning when loading the driver.

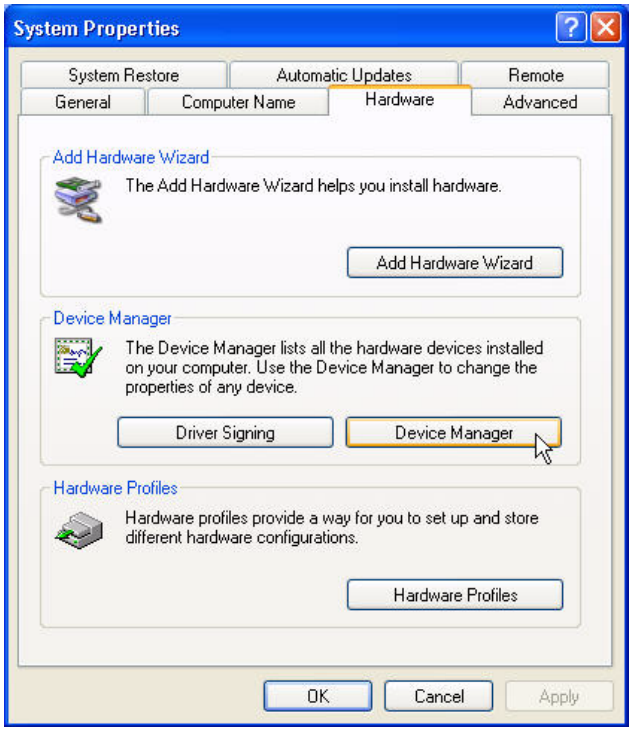

Figure 23. Opening Device Manager

Figure 24 shows a typical Device Manager with the Universal Serial Bus Controllers section expanded. Note that in this window, no Mass Storage Devices are enumerated on the system.

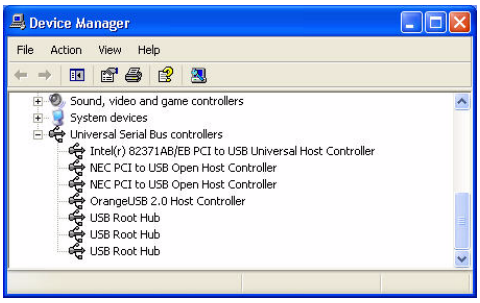

Figure 24. Device Manager Before Mass Storage

3) Open Device Driver Properties

Figure 25 is again the Device manager. In this case, the device has been enumerated with the Microsoft MSC driver (USB Mass Storage Device). The actual driver is called usbstor.sys and is located in the Windows\System32\Drivers directory. To change the driver that will be used, we need to get to the driver properties. To do this right click on “USB Mass Storage Device” and select Properties.

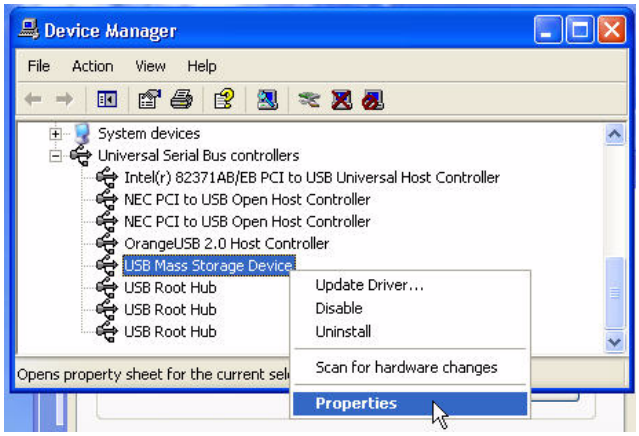

Figure 25. Device Manager with Device Enumerated with Microsoft XP MSC

4) Update Driver

Once the USB Mass Storage Device Properties window appears, select the Driver tab at the top of the window. In this window, you can get Driver Details such as the revision of a driver; you can also update the driver. In our case, you want to update the driver (see *Figure 26*). When you press Update Driver, the Update Wizard shown in *Figure 27* will be displayed.

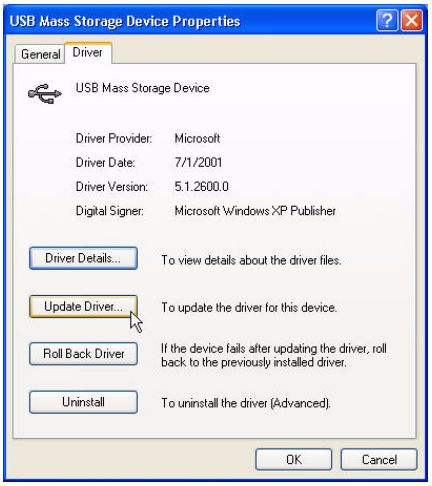

Figure 26. Update Driver

5) Update Wizard

The next step is to point the wizard to the location at which the driver is located. In this case, we need to point to a specific location. Choose the selection “Install from a list or specific location (Advanced)” and then press the Next > button.

Figure 27. Hardware Update Wizard

6) Choose Search and Installation Options

Now you should see a dialog box similar to that in *Figure 28*. In this example, we do not want the operating system to search for a driver. Instead, we want to point to a particular driver to install. To do this, choose the option "Don't search, I will choose the driver to install" and press the Next > button.

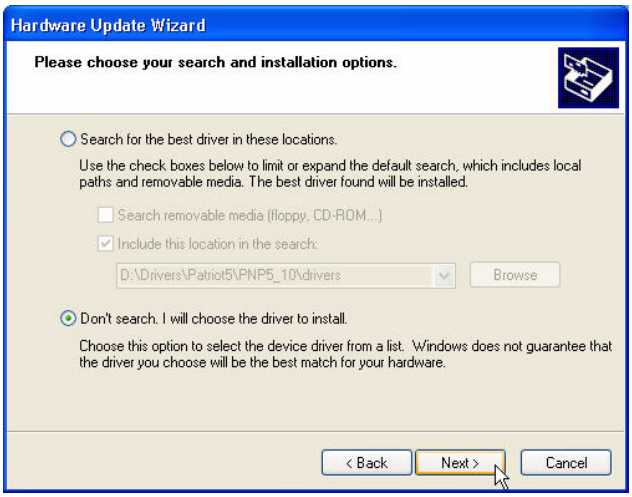

Figure 28. Choose Install Options

7) Select Driver to Install

The next dialog box to be displayed should look similar to the one in *Figure 29*. If the operating system knows about another driver that is associated with this device, it will also be displayed in this window. In this example, the only driver available is the class driver built into the operating system (usbstor.sys). When two or more drivers are installed for a device, this is where you would switch between the two. In this example, we are installing a new driver so you would press the "Have Disk" button.

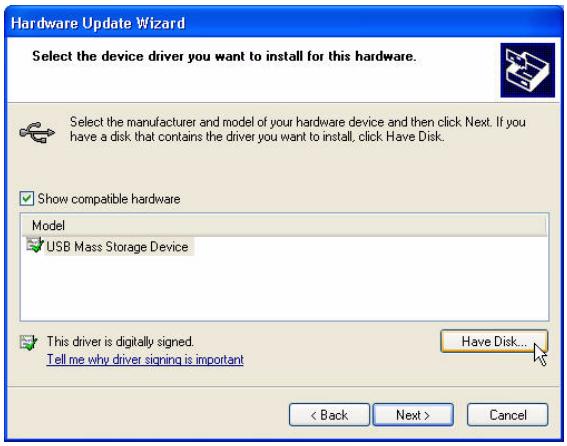

Figure 29. Select Driver to Install – Have Disk

8) Navigate to Driver

After pressing the "Have Disk" button, a dialog box similar to *Figure 30* will be displayed. Press the "Browse" button to navigate to the directory where you have place the modified driver.

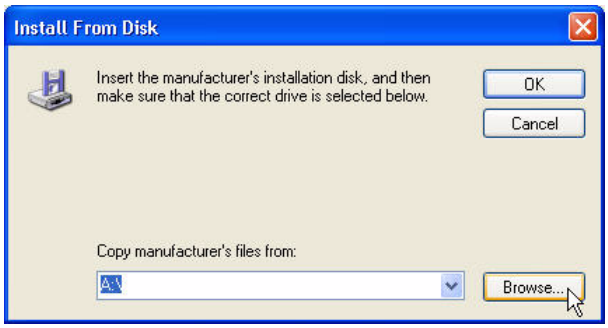

Figure 30. Navigate to Driver Directory

9) Install the Driver

After you have told the hardware wizard where the driver is located, the Select driver window will be displayed again except this time it will have your driver string from the .inf file displayed. *Figure 31* shows an example of this where the string "Test USB 2.0 Storage" is the string associated with the VID/PID in the .inf file. Note the warning in the window telling the user that the driver is not signed. The Cypress driver has been tested for signability but it is the responsibility of each customer to get their version of the driver signed, if necessary. While Cypress has tested the driver in Windows XP, it is also the responsibility of the customer to verify the driver with their hardware. Press the "Next >" button.

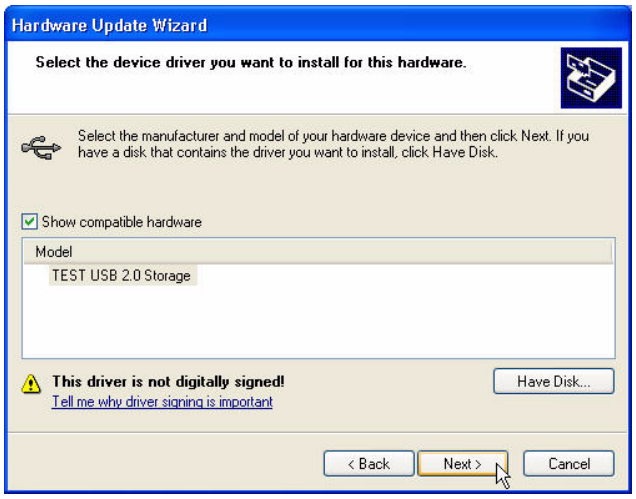

Figure 31. Select Driver to Install

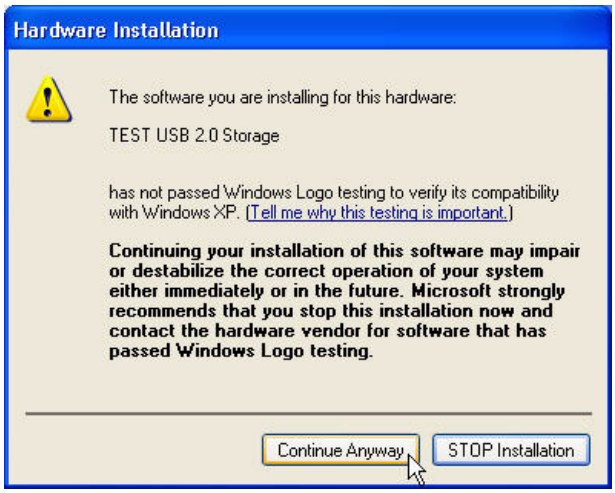

Figure 32. Install Driver Even Without Signature

10) Choose Continue Anyway Option

A Hardware Installation warning dialog box will be displayed if the driver does not have a digital signature (see *Figure 32*). As previously mentioned, Cypress has tested the driver thoroughly and has not found any defect that should prevent the user from continuing with the installation.

11) Verify driver in Device Manager

Once the driver is installed, you can open the device manager again and verify that the new driver string is displayed (See *Figure 33*).

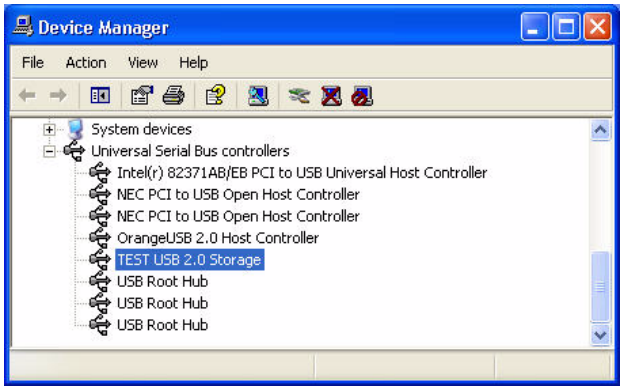

Figure 33. Device Manager after new driver is installed

Approved AN042 8/15/03 kkv