



***Z8051™ Family of 8-Bit Microcontrollers***

# **Z51F3220 Development Kit**

**User Manual**

UM024303-0312





**Warning:** DO NOT USE THIS PRODUCT IN LIFE SUPPORT SYSTEMS.

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# Revision History

Each instance in the Revision History table below reflects a change to this document from its previous version.

Date	Revision Level	Description	Page
Mar 2012	03	Added a G to end of part number to indicate RoHS compliance; added Figure 14.	<a href="#">18</a>
Mar 2012	02	Corrected filepaths in the Build and Run the Z51F3220 Demo Project section.	<a href="#">14</a>
Feb 2012	01	Original issue.	All

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# Introduction

This manual describes how to set up Zilog's Z51F3220 Development Kit (Zilog part number Z51F3220000ZCOG) and use it to evaluate your Z8051-based designs and applications.

The Kit features a development board consisting of five LEDs, five pushbuttons, a buzzer, four 7-segment LCD digits, port pin headers and a UART-to-USB port. The Board features the Z51F3220 MCU in a 44-pin MQFP package, plus a DBG connector to connect the Board to a host development PC using the Z8051 USB On-Chip Debugger (OCD) cable. For more details about the Z51F3220 MCU, please refer to the [Z51F3220 Product Specification \(PS0299\)](#).

This document guides you through the following tasks:

- [Install the Z8051 OCD Software and Documentation](#) – see page 6
- [Configure the Z8051 OCD and Z51F3220 Development Board](#) – see page 12
- [Build and Run the Z51F3220 Demo Project](#) – see page 14

Figure 1 displays an image of the Z51F3220 Development Kit.



Figure 1. The Z51F3220 Development Kit

## Kit Contents

Table 1 lists the contents of the Z51F3220 Development Kit.

Table 1. Z51F3220000ZCOG Contents

Item	Description	Quantity
1	Z51F3220 Development Board	1
2	Z8051 USB On-Chip Debugger (OCD)	1
3	Z8051 OCD Target Cable (10ckt)	1
4	USB Cable: A (male) to Mini-B	2
5	Z8051 OCD Software and Documentation CDROM	1
6	Z51F3220 Development Kit Insert (FL0139)	1



Figure 1 displays an image of the Z51F3220 Development Board.

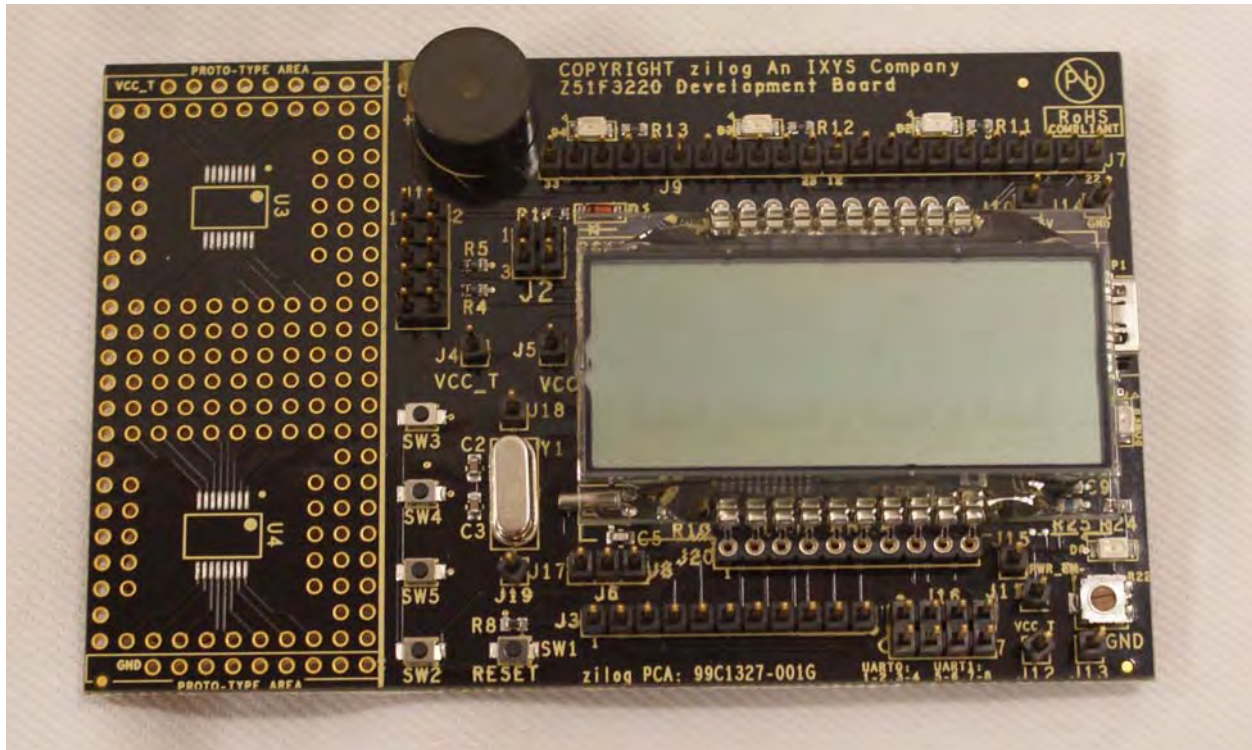


Figure 2. Z51F3220 Development Board

## Supported Operating Systems

The Z51F3220 Development Board and the Z8051 On-Chip Debugger support the following operating systems:

- Microsoft Windows XP
- Microsoft Windows Vista (32-bit/64-bit)
- Microsoft Windows 7 (32-bit/64-bit)

## Z51F3220 Development Board Block Diagram

Figure 3 displays a block diagram of the Z51F3220 Development Board.

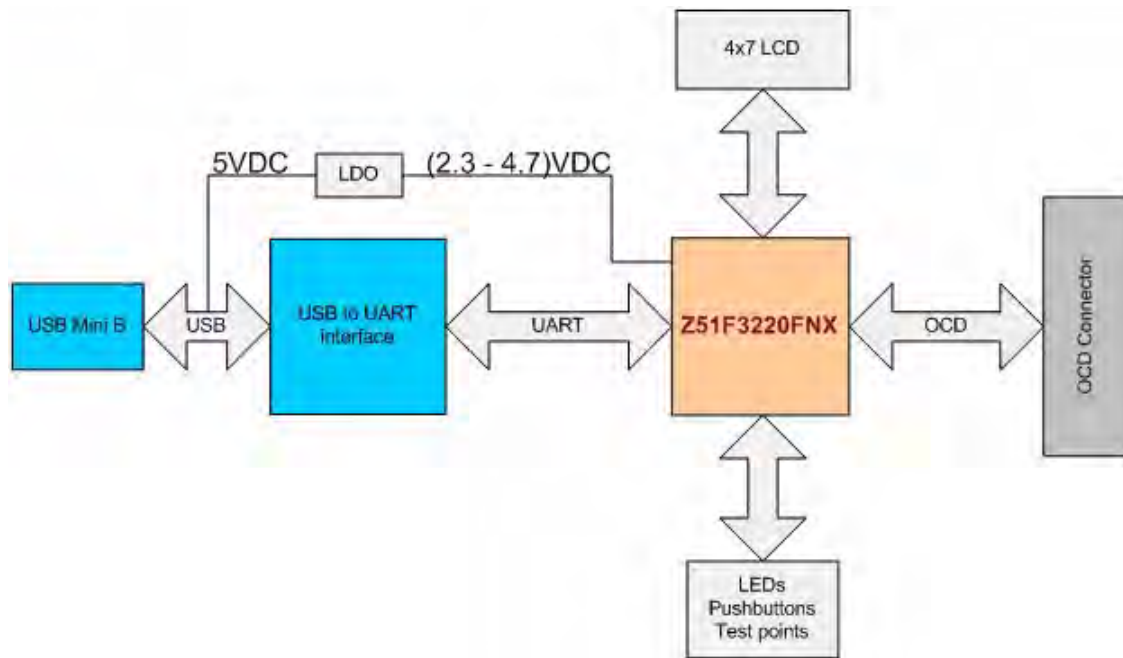


Figure 3. Block Diagram of the Z51F3220 Development Board

## Z51F3220 Development Board Description

The Z51F3220 Development Board consists of the following components:

- Z51F3220: U2, 44-pin MQFP chip
- 3 LEDs: Green (D2), Red (D3) and Yellow (D4) connected to the GPIO pins of the Z51F3220 MCU
- 1 green LED to indicate USB power: D5
- 1 red LED to indicate an overcurrent condition: D6
- 5 pushbuttons:
  - SW1: RESET
  - SW2–SW5: connected to the GPIO pins of the Z51F3220 MCU
- USB connector: P1
- OCD connector: J1
- USB-to-UART interface: U7

- USB interface providing power and communication to the Board through adjustable LD0: U5
- Power supply level that can be adjusted with potentiometer R22
- Overcurrent protection circuit on the Board: U6 and D6
- External source of reference voltage (2.5 V) for the on-chip ADC: VR1
- MCU current consumption measurement resistor R7 with test points J4 and J5
- Buzzer: U1
- 4-digit, 7-segment LCD panel
- Test points, headers and prototype area with two footprints

By default, the Z51F3220 Development Board is set up with preinstalled shunts on J16 jumper pins 1–2 and 5–6 to allow the interfacing of the Z51F3220 MCU's UART0 to the USB port. When the Board is connected to the USB port of the host PC, LED D5 will be ON. The default settings and functionalities of these shunts are listed in Table 2.

**Table 2. Default Jumper Settings**

Headers	Pins	Functionality	Notes
J16	1–2, 5–6	UART0 to USB	Default
J16	3–4, 7–8	UART1 to USB	
J2	1–2	$V_{CC}$ is being measured by AN1	Default
J2	3–4	External $V_{REF}$ , 2.5V is used for ADC	Default

As indicated in the table, should you decide to use the the Z51F3220 MCU's UART1 block as the interface for your own project (currently not supported in this release), move the J16 shunts to positions 3–4 and 7–8.

By default, Input 1 of the ADC is used to measure the supply voltage. This measurement point is taken from a middle point in the voltage divider circuit that includes resistors R3 and R6; the scaling is performed by software so that the LCD always displays the actual voltage. For a visual representation, see the schematic diagram in [Figure 18](#) on page 23.

If a short on the Board should occur, or if its attached component(s) require more than 500mA, the overcurrent protection functionality will trigger the red LED D6 to illuminate. In this instance, power to the Board will be terminated, and the USB port of the PC will be protected from shorting.

Schematic diagrams of the Z51F3220 Development Board are presented [on pages 23 and 24](#) of this document.

The physical dimensions of the Board are 4.01" x 2.50" (101.8mm x 63.5mm).

# Install the Z8051 OCD Software and Documentation

The Z8051 On-Chip Debugger (OCD) interface is the interface by which your PC will communicate with the Z51F3220 MCU to download and execute code. In addition to the OCD, software such as development tools and sample applications will be installed.

Observe the following procedure to install the Z8051 On-Chip Debugger software and documentation on your computer.

1. Ensure that the OCD interface hardware is not connected to your PC.
2. Insert the Z8051 Software and Documentation CD into your computer's CD-ROM drive. The setup program launches automatically. If the setup program does not launch automatically, open Windows Explorer, browse to your CD-ROM drive, and double-click the file labeled Z8051\_<version\_number>.exe.

---

► **Note:** In this filename, <version\_number> refers to the version number of the OCD Software and Documentation release. For example, this version number may be 1.0.

---

3. Follow the on-screen instructions to complete the OCD software installation.

## Z8051 OCD Driver Installation

The driver programs for the Z8051 On-Chip Debugger are copied during the software and documentation installation. In the following procedure for Windows XP systems, ensure that the target side of the OCD will remain unconnected while you install these drivers. Refer to Figure 4 for guidance.

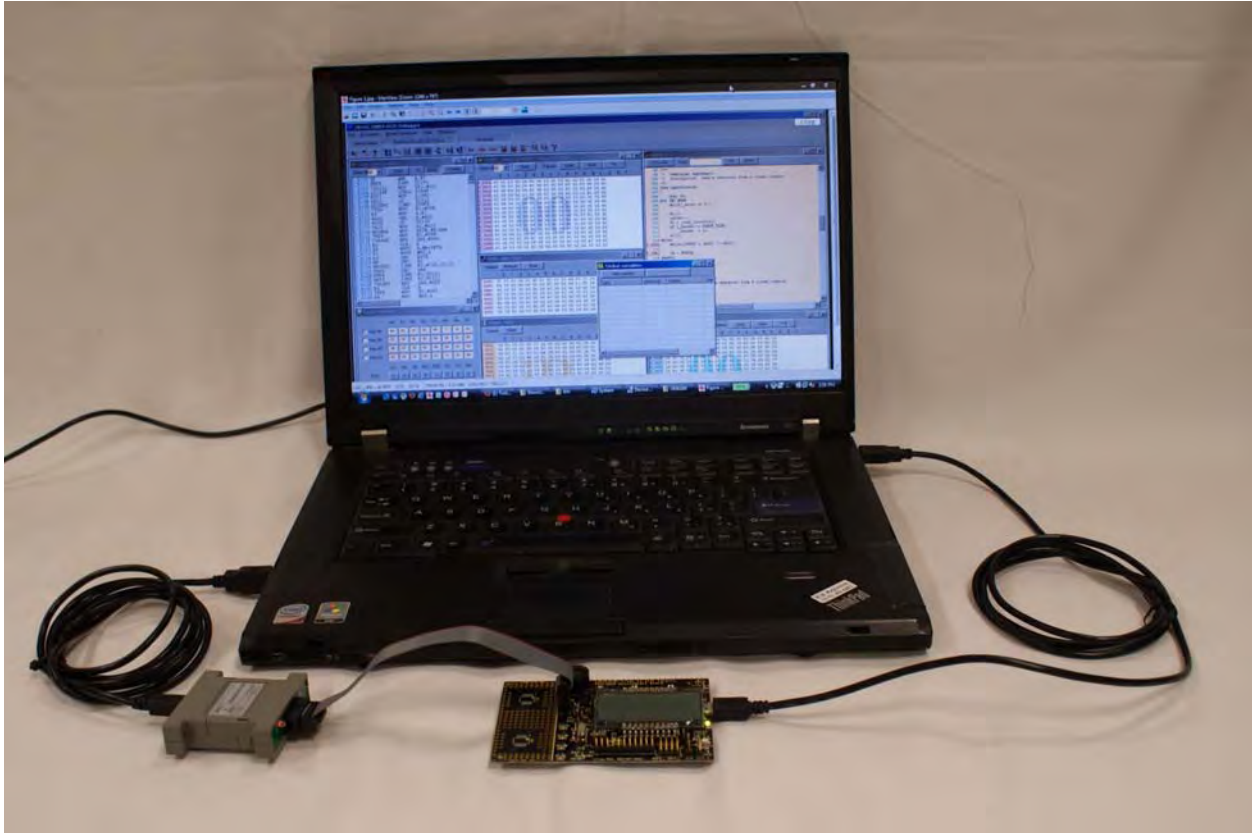


Figure 4. An Example Setup

---

► **Note:** If you are running Windows Vista, see [Appendix A](#) on page 25 to install your device drivers. If you are running Windows 7, see [Appendix B](#) on page 31.

---

1. Connect the OCD hardware to the USB port of your PC by connecting the A-Male end of one of the two USB A (male)-to-Mini-B cables with the host PC's USB port, and connect the Mini-B end to the OCD device.
2. After the PC detects the new hardware, it will display the **Found New Hardware Wizard** dialog box, shown in Figure 5. Select **Install from a list or specific location (Advanced)**; then click **Next**.





**Figure 5. The Found New Hardware Wizard Welcome Screen**

3. The next dialog box, shown in Figure 6, prompts you to enter a path or navigate to the directory in which the .inf file was installed. Depending on the type of computer you use (32-bit or 64-bit), use the **Browse** button to navigate to one of the following paths and click the **Next** button, leaving all other selections at their default settings.
  - On 32-bit machines, use the following path:  
`<Z8051 Installation>\Z8051_<version_number>\device drivers\OCD USB\x32`
  - On 64-bit machines, use the following path:  
`<Z8051 Installation>\Z8051_<version_number>\device drivers\OCD USB\x64`

---

► **Note:** On some installations, the Found New Hardware screen shown in Figure 5 may also display the text string, Zilog Z8051 USB OCD - No Firmware. This occurrence is normal and can be disregarded.

---

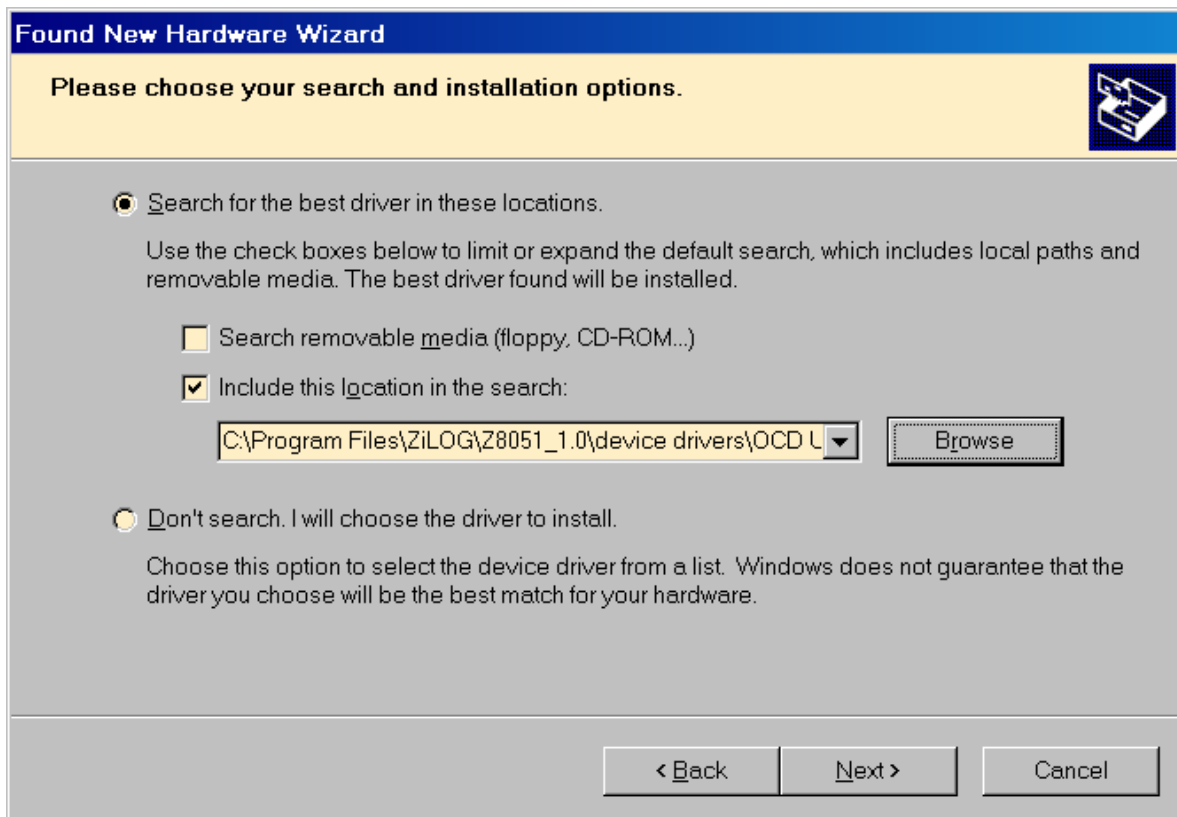


Figure 6. The Found New Hardware Wizard's Browse Screen

4. When Windows prompts you whether to continue the installation or stop, click the **Continue Anyway** button and wait until the installation is completed (Windows may prompt you more than once). When the installation is complete, click **Finish**.

## FTDI USB-to-UART Driver Installation

An FTDI USB-to-UART driver is required to allow your PC to communicate through its USB port to the on-chip UART of the Z51F3220 MCU. Observe the following procedure to perform these connections.

1. Ensure that the USB cable is not plugged in to the Z51F3220 Development Board's P1 connector.
2. Navigate to the following filepath and double-click the CDM20802\_setup.exe file to begin the driver installation.

<Z8051 Installation>\Z8051\_<version\_number>\device drivers\FTDI Uart

3. The installation process will begin and you should observe output similar to the following messages on the screen of your PC:

```
32-bit OS detected  
<installation path>\dpinstx86.exe  
Installation driver  
FTDI CDM driver installation process completed.
```

4. When the installation is complete, plug in the Mini-B connector of the second USB cable into the Board, and the larger A connector into the USB port of your PC. Again, refer to [Figure 4](#) on page 7 for guidance.
5. If the driver installation was successful, the *Ports (COM & LPT)* section of the Device Manager will display *USB Serial Port (COMx)* or similar message, as highlighted in Figure 7.



**Figure 7. A Successful USB-to-UART Driver Installation**



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► **Note:** To launch the Device Manager on Windows 7 systems, launch the Start menu, enter *device manager* in the **Search programs and files** field, and press the Enter key.

To open the Device manager on earlier Windows systems, navigate via the following path:

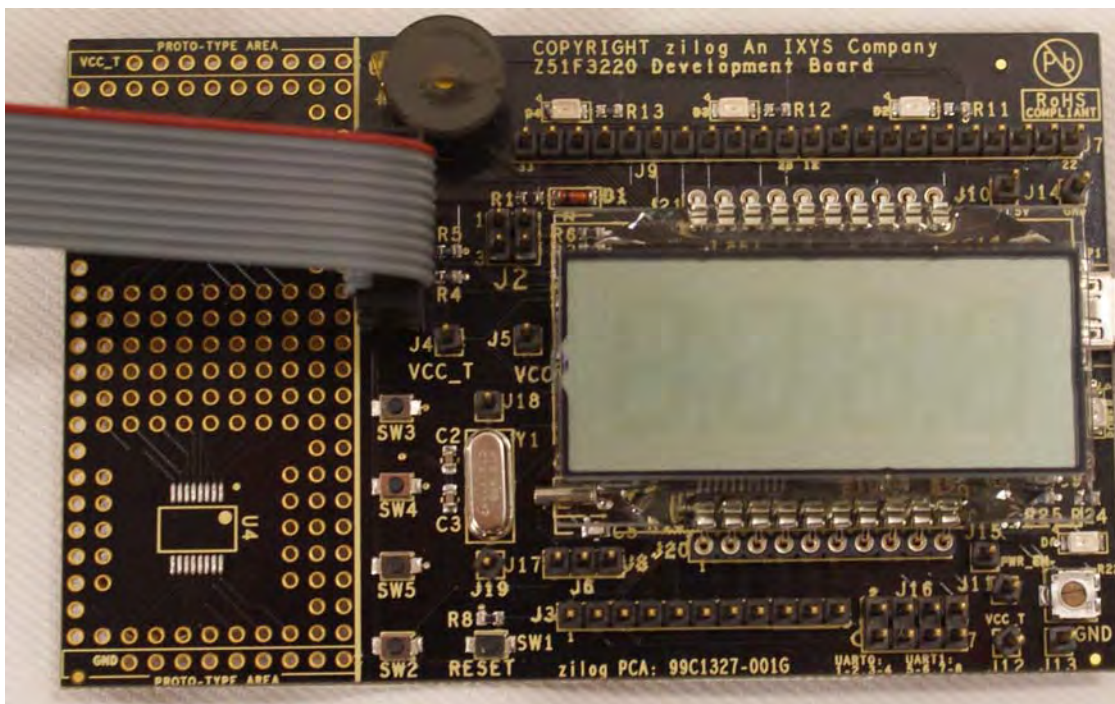
Start → Control Panel → System → Hardware → Device Manager → Ports (COM& LPT)

---

# Configure the Z8051 OCD and Z51F3220 Development Board

Observe the following procedure to set up and configure the Z8051 On-Chip Debugger and the Z51F3220 Board.

1. Connect the Z8051 On-Chip Debugger (OCD) to the host PC's USB port. If you haven't already performed your hardware connections, see the [Z8051 OCD Driver Installation](#) section on page 6.
2. Connect the Z8051 OCD 10-circuit cable connector to the Z51F3220 Board's J1 connector. Pin 1 of the cable connector is indicated by a red stripe, as shown in Figure 8.



**Figure 8. Connecting the 10-Circuit Cable to the Board**

3. Using the second USB-to-Mini-B cable, connect the standard USB end to the host PC's USB port.
4. Connect the other end of this second Mini-B cable to the Z51F3220 Board's P1 connector to apply power to the Board. Note that the green LED D5 is ON; see Figure 9.

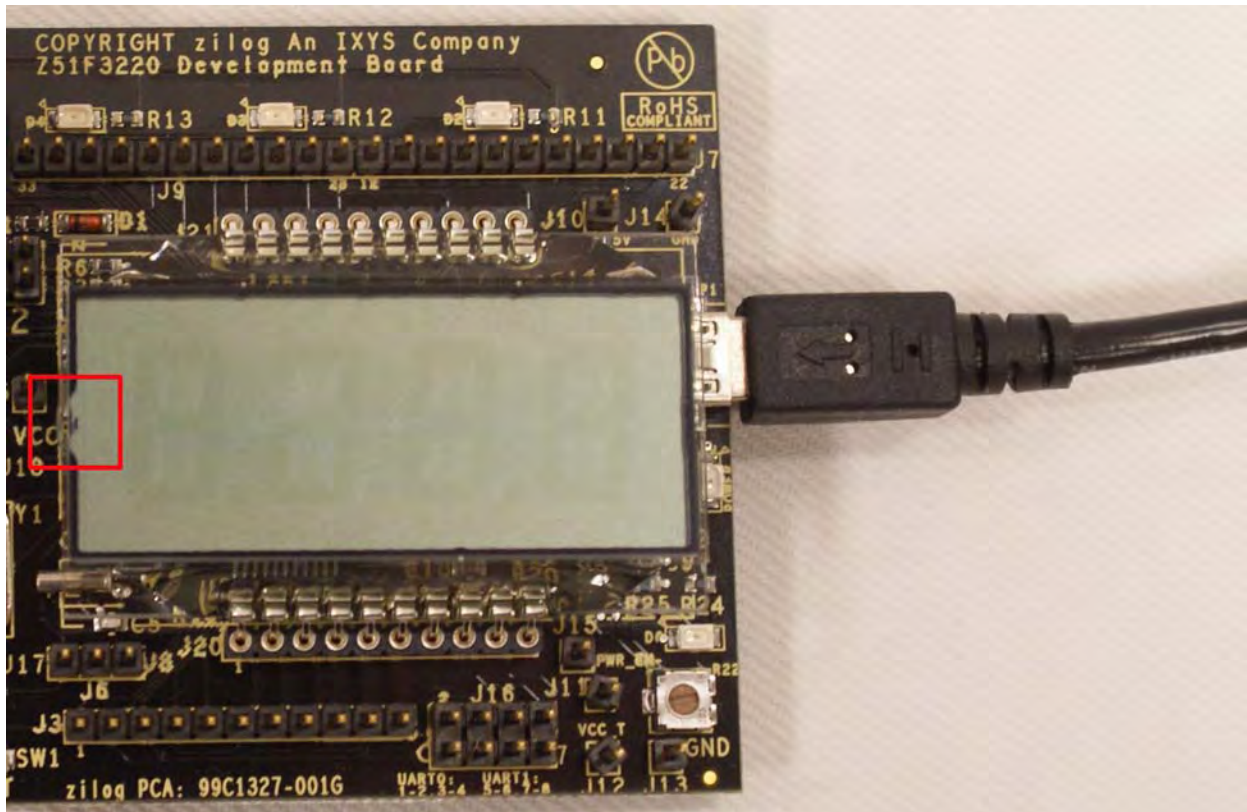


Figure 9. Connecting the USB Mini-B Cable to the Board

- 
- **Note:** In the event that you later remove the LCD panel from the Board, observe its orientation in Figure 9. The panel's small plastic notch should be located in the position indicated by the red square.
-

# Build and Run the Z51F3220 Demo Project

Observe the following procedure to build and run the Z51F3220 demo project.

1. Browse to the following location and double-click the `build_sdcc.bat` batch file to build the project:

`<Z8051 Installation>\Z8051_<version_number>\samples\Z51F3220\Demo\build_sdcc.bat`

---

► **Note:** Refer to the [Z8051 Tools Product User Guide \(PUG0033\)](#) for additional information about these project files and Small Device C Compiler (SDCC) development tools.

---

2. When the build is complete, the command window will prompt the user to press any key to continue. Proceed by pressing any key on your keyboard; as a result, a hex file for the demo will be created in the following path:

`<Z8051 Installation>\Z8051_<version_number>\samples\Z51F3220\Demo\demo.hex`

3. Set up the OCD and Development Board. If you have not already configured these items, please return to the [Configure the Z8051 OCD and Z51F3220 Development Board](#) section on page 12.
4. Run the Z8051 OCD software. From the **Start** menu, navigate to **All Programs** → **Zilog Z8051 Software and Documentation <version\_number>** → **Zilog Z8051 OCD <version\_number>**. Once launched, the program will display *Connected*, as shown in Figure 10.

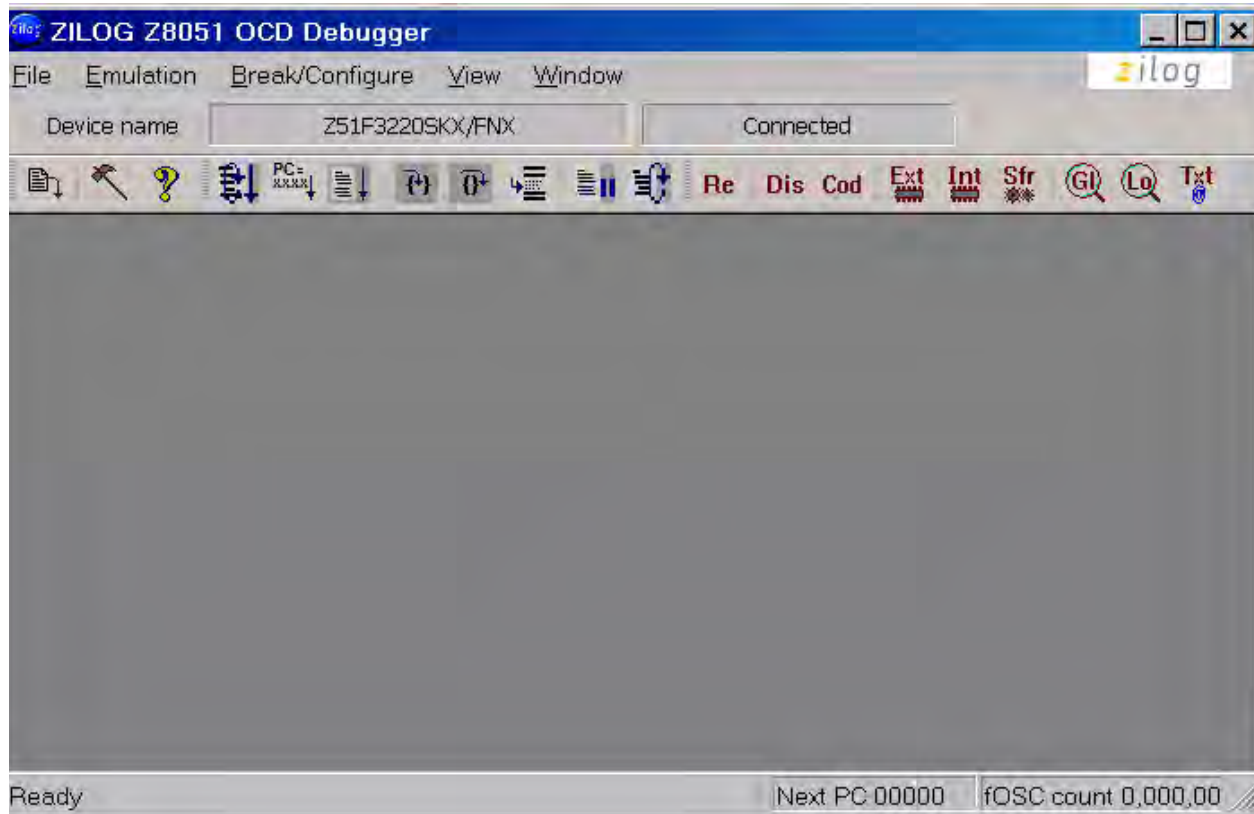


Figure 10. Initial OCD Screen

---

► **Note:** For a free download of the latest version of the OCD software, visit [the Zilog website](#) and navigate via the **Tools and Software** menu to **Software Downloads**.

---

5. In the Debugger window, select **Load Hex** from the **File** menu to display the Object File dialog, which is shown in Figure 11.



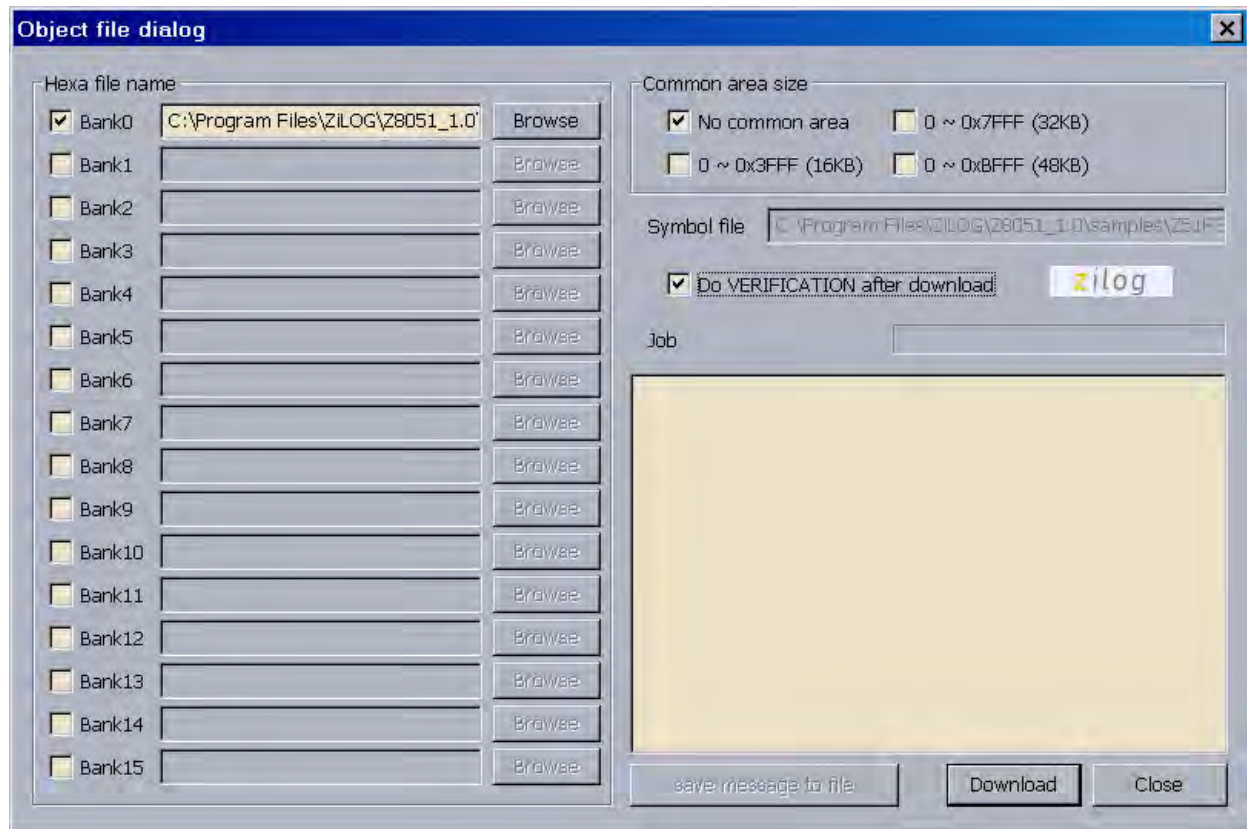


Figure 11. Object File Dialog

6. In the Object File dialog, browse to the hex file that you created in [Step 2](#) and click **Open**.
7. Click the **Download** button to open the Configuration dialog box, shown in Figure 12.

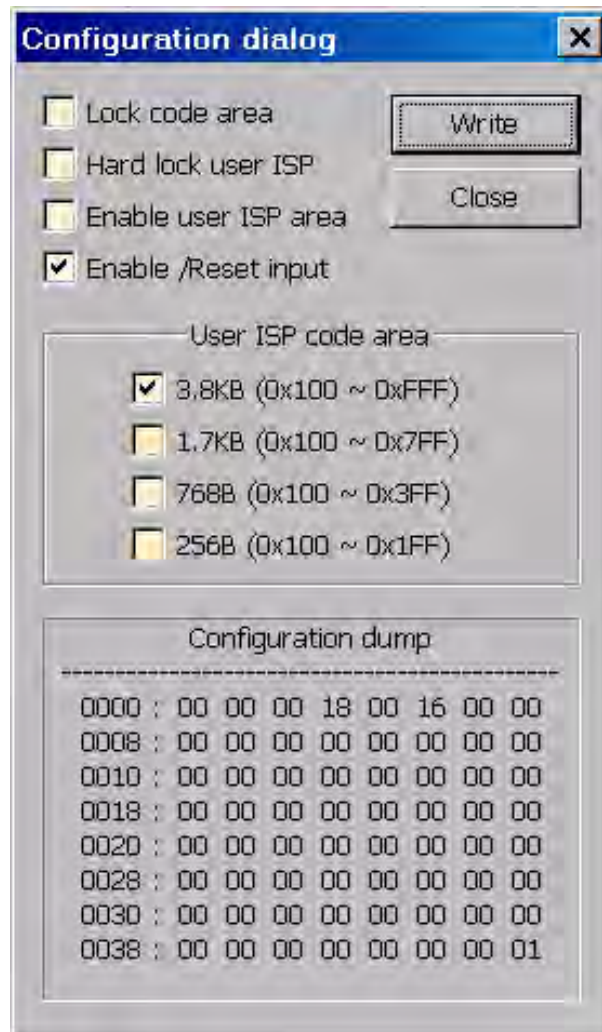
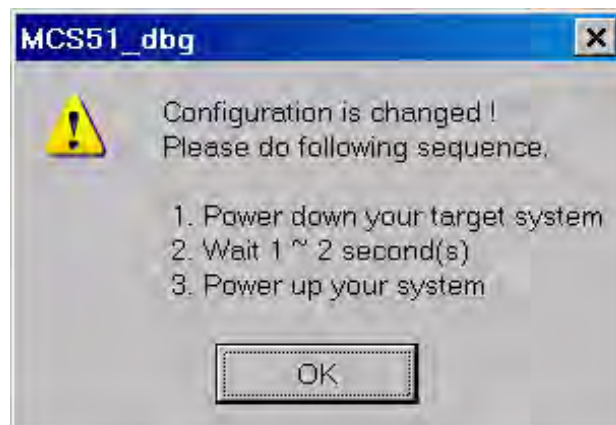


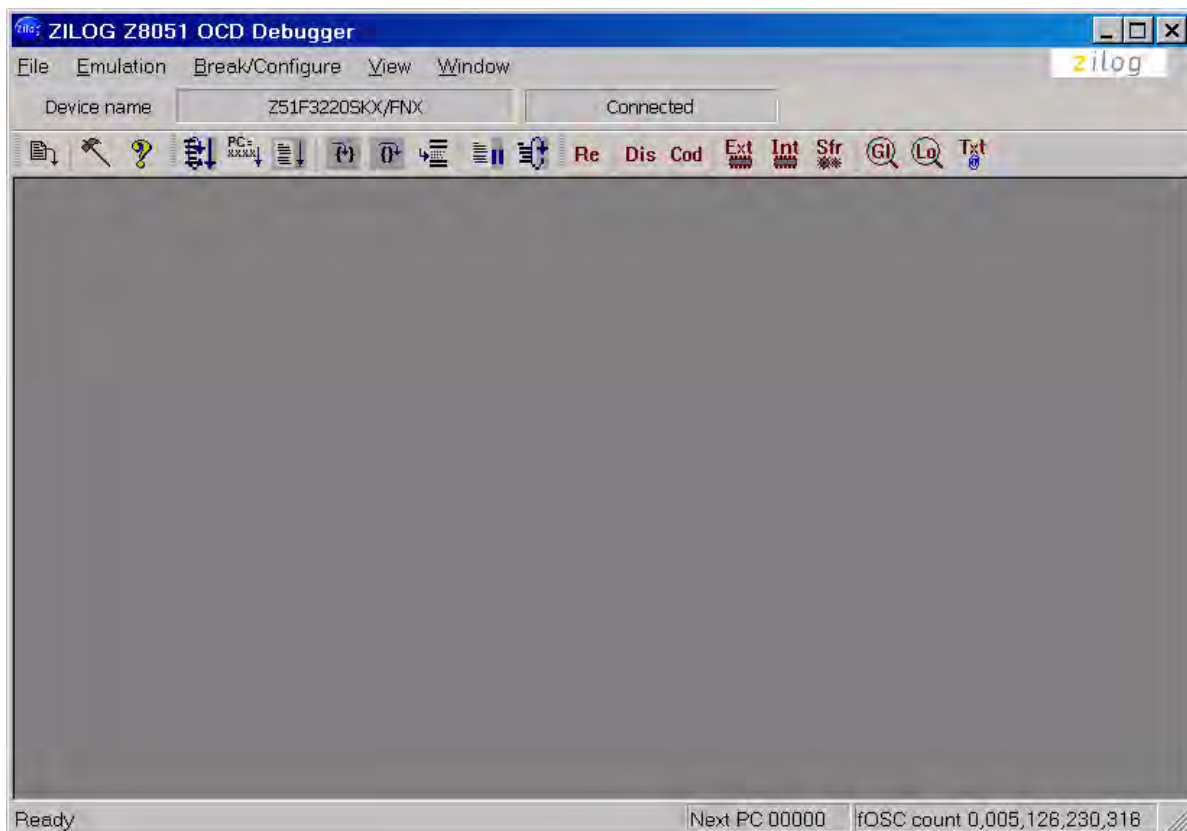
Figure 12. Configuration Dialog

8. Select **Enable/Reset input** and click the **Write** button to open the Configuration Is Changed dialog. A typical OCD display, if child windows are open, is shown in Figure 13.



**Figure 13. Configuration Is Changed Dialog**

9. Click **OK** to open the On-Chip Debugger's main window. A typical OCD display is shown in Figure 14; Figure 15 shows an OCD window with child windows open.



**Figure 14. A Typical On-Chip Debugger Window**



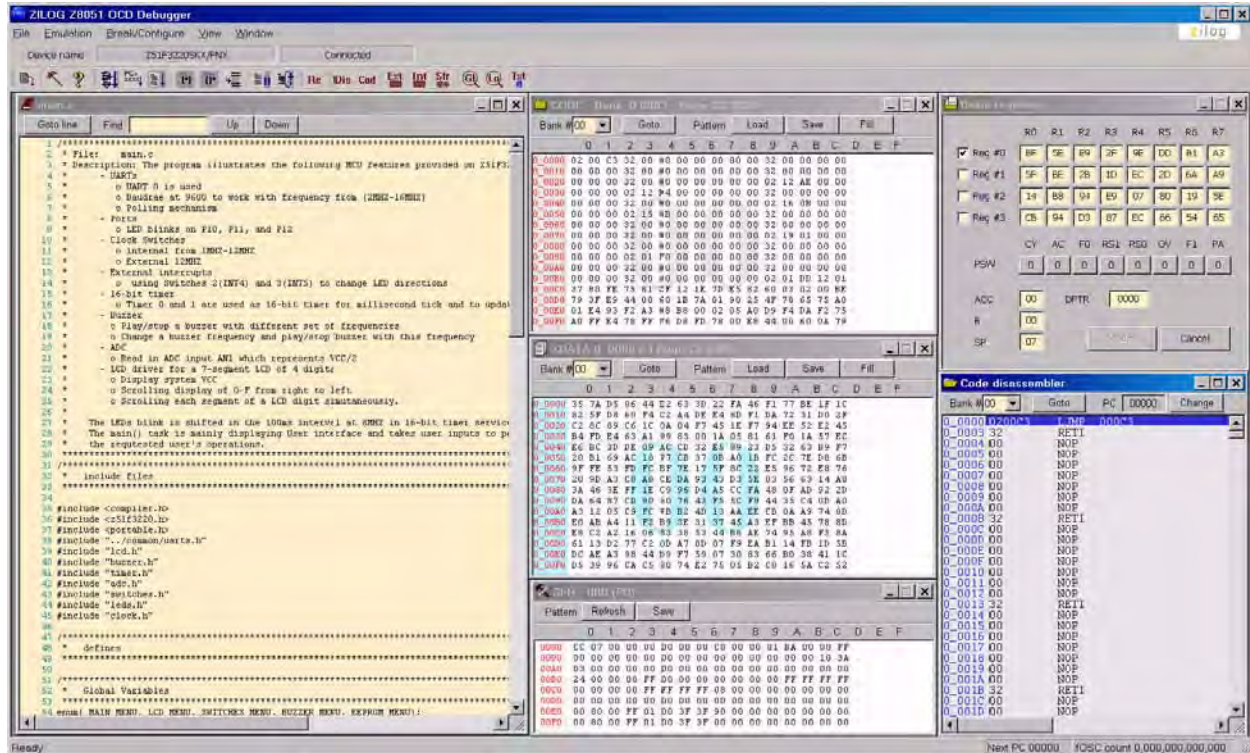


Figure 15. A Typical On-Chip Debugger Window with Child Windows Open

► **Note:** Use the View menu to open the child windows.

- Click the **Reset & Go** toolbar icon, shown in Figure 16. As a result, LEDs D2, D3 and D4 on the Z51F3220 Board will blink in sequence and the LCD panel will display the current voltage applied to the Board.



Figure 16. Reset & Go Toolbar Icon

---

► **Note:** Similar projects that you can use as references are listed in [Table 3](#) on page 22.

---

## HyperTerminal Configuration

A communications program such as HyperTerminal can be used on Windows XP systems to view the messages from the Z51F3220 Development Board. The following procedure examines how to configure HyperTerminal for the Z51F3220 demo project.

---

► **Note:** The HyperTerminal application is not available in Windows Vista and Windows 7 systems. If you are using either of these operating systems, consider using/installing different communication software, such as Tera Term. Please refer to the documentation for the particular emulation software you use to configure it for communication with the Z51F3220 Development Board.

---

1. In HyperTerminal, select the COM port assigned to the USB-to-UART interface cable that is connected to the P1 connector on the Development Board.

---

► **Note:** This COM port can be determined from the Device Manager, as described in the [FTDI USB-to-UART Driver Installation](#) section on page 9.

---

2. Configure this port to reflect the following settings:
  - 9600bps
  - 8 data bits
  - No parity
  - 1 stop bit
  - No flow control
3. Click the **Call** button to connect to the Z51F3220 Board. Upon connection, you should be able to see the Demo program menu shown in Figure 17.

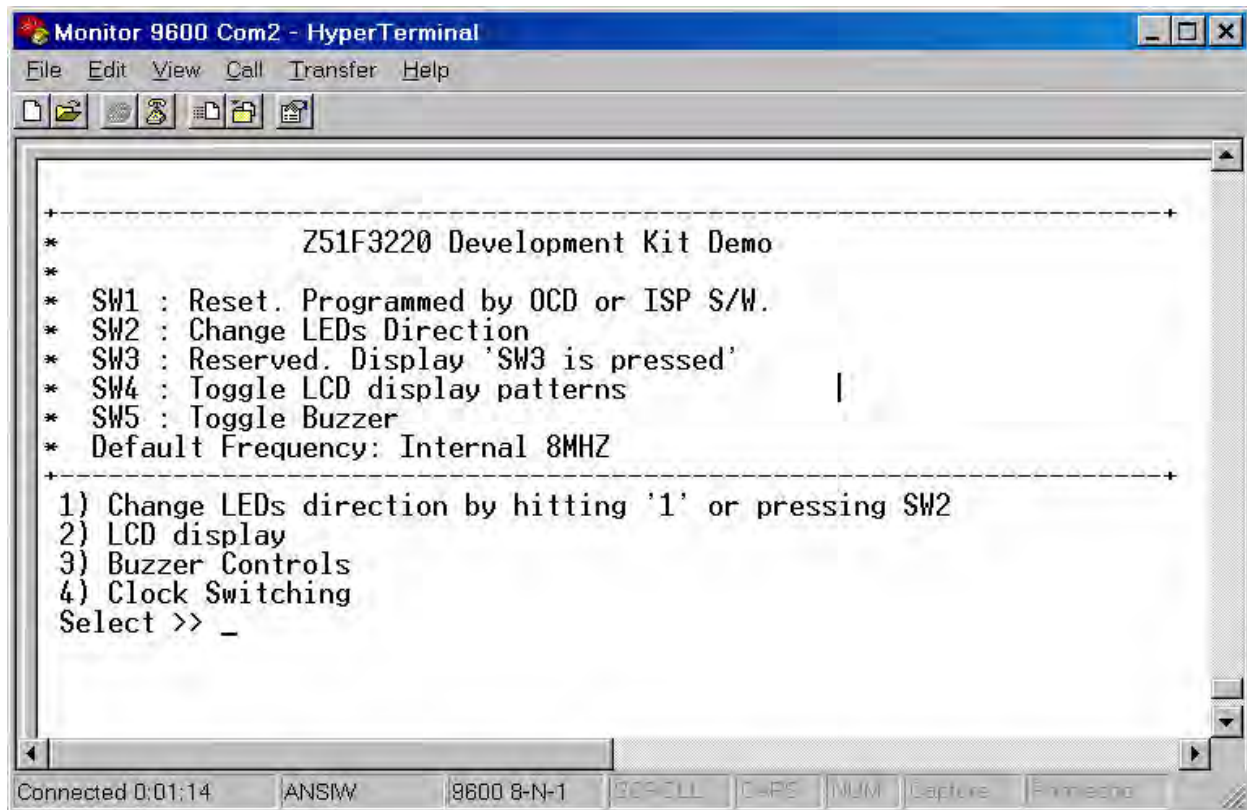


Figure 17. Demo Program Menu in HyperTerminal

At this point, you have successfully run the Z51F3220 demo project, but you are welcome to continue evaluating the demo in HyperTerminal. For additional information about how to create, edit, run and debug this project, please see the [Z8051 Tools Product User Guide \(PUG0033\)](#) and/or the [Z8051 On-Chip Debugger and In-System Programmer User Manual \(UM0240\)](#).

► **Note:** Turn off the power by removing the USB cable from the P1 connector on the Development Board.

# Sample Projects and Documentation

A number of sample projects are included on the CD that ships with the Z51F3220 Development Kit, and their locations, listed in Table 3, will be accessible upon installation.

**Table 3. Z51F3220 Development Kit Sample Projects**

Description	Location
Demo	samples\Z51F3220\Demo
Led Blink	samples\Z51F3220\Led_Blink
	samples\Z51F3220\Led_Blink_Asm

A number of Z8051-related documents are included in the Z51F3220 Development Kit, and their locations, listed in Table 4, will be accessible upon installation. You can also find current versions of each of these documents on the [Zilog website](#).

**Table 4. Z51F3220 Development Kit Documentation**

Description	Document	Location
Z51F0410 Product Specification	PS0295	Documentation\Chip_Documentation
Z51F0811 Product Specification	PS0296	Documentation\Chip_Documentation
Z51F3220 Product Specification	PS0299	Documentation\Chip_Documentation
Z51F3221 Product Specification	PS0300	Documentation\Chip_Documentation
Z51F6412 Product Specification	PS0303	Documentation\Chip_Documentation
Z51F0410 Product Brief	PB0237	Documentation\Chip_Documentation
Z51F3220 Product Brief	PB0238	Documentation\Chip_Documentation
Z51F3220 Product Brief	PB0239	Documentation\Chip_Documentation
Z51F3221 Product Brief	PB0240	Documentation\Chip_Documentation
Z51F6412 Product Brief	PB0241	Documentation\Chip_Documentation
Z8051 OCD and ISP User Manual	UM0240	Documentation\Tools_Documentation
Z51F0811 Evaluation Kit User Manual	UM0242	Documentation\Tools_Documentation
Z51F3220 Development Kit User Manual	UM0243	Documentation\Tools_Documentation
Z8051 Tools Product User Guide	PUG0033	Documentation\Tools_Documentation

# Schematic Diagrams

Figures 18 and 19 display schematic diagrams of the Z51F3220 Development Board.

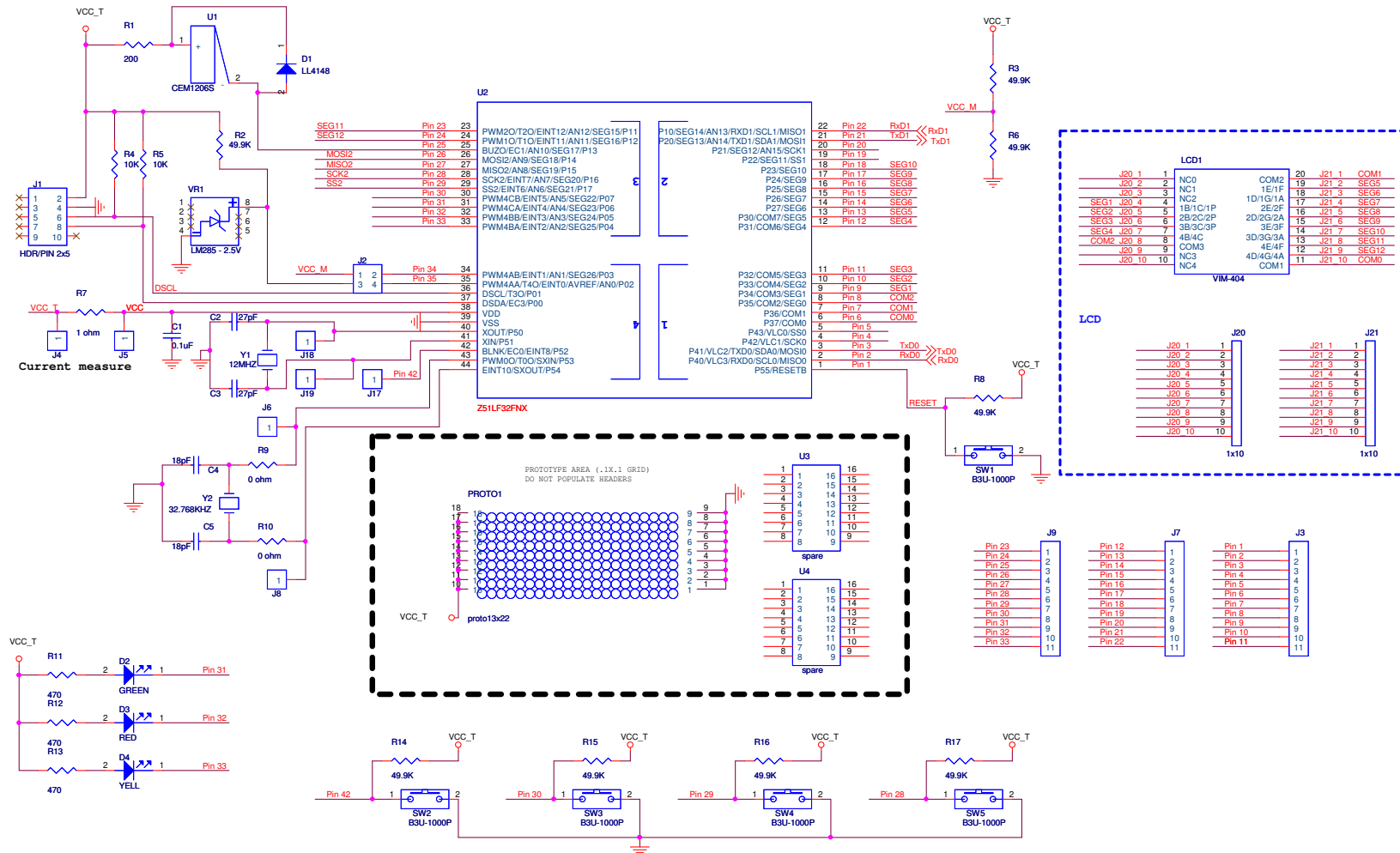


Figure 18. Z51F3220 Development Board, #1 of 2

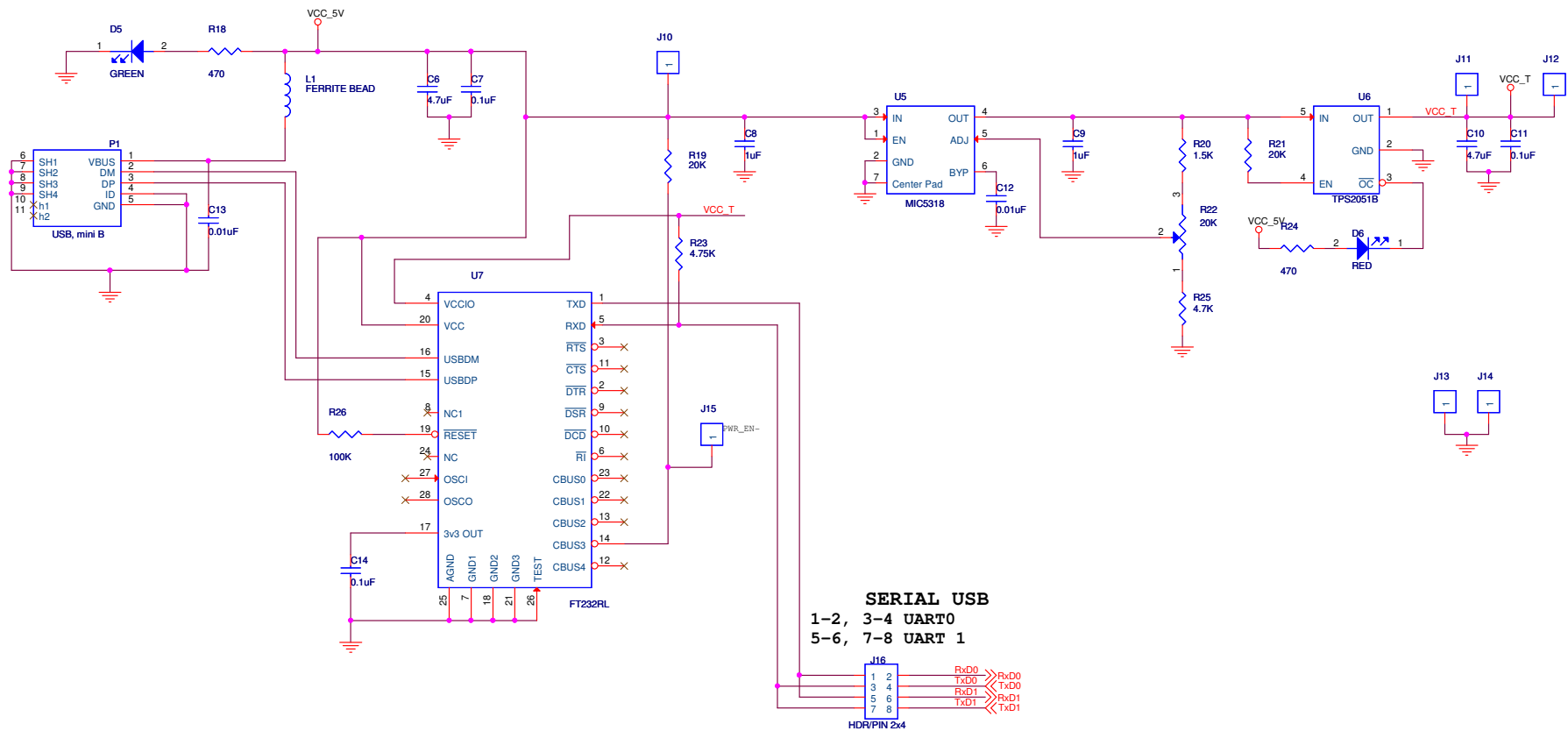


Figure 19. Z51F3220 Development Board, #2 of 2



## Appendix A. OCD Driver Installation on Windows Vista Systems

The driver programs for the Z8051 On-Chip Debugger are copied to the development PC during the software and documentation installation. In the following procedure for PCs running Windows Vista 32- and 64-bit operating systems, ensure that the target side of the OCD will remain unconnected while you install these drivers. Refer to [Figure 4](#) on page 7 for guidance.

1. Connect the OCD hardware to the USB port of your PC by connecting the A (male) end of one of the two USB A (male)-to-Mini-B cables with the development PC's USB port. Connect the Mini-B end to the OCD device.
2. After the PC detects the new hardware, it will display the Found New Hardware Wizard dialog box, shown in Figure 20. Click **Locate and install driver software (recommended)**.

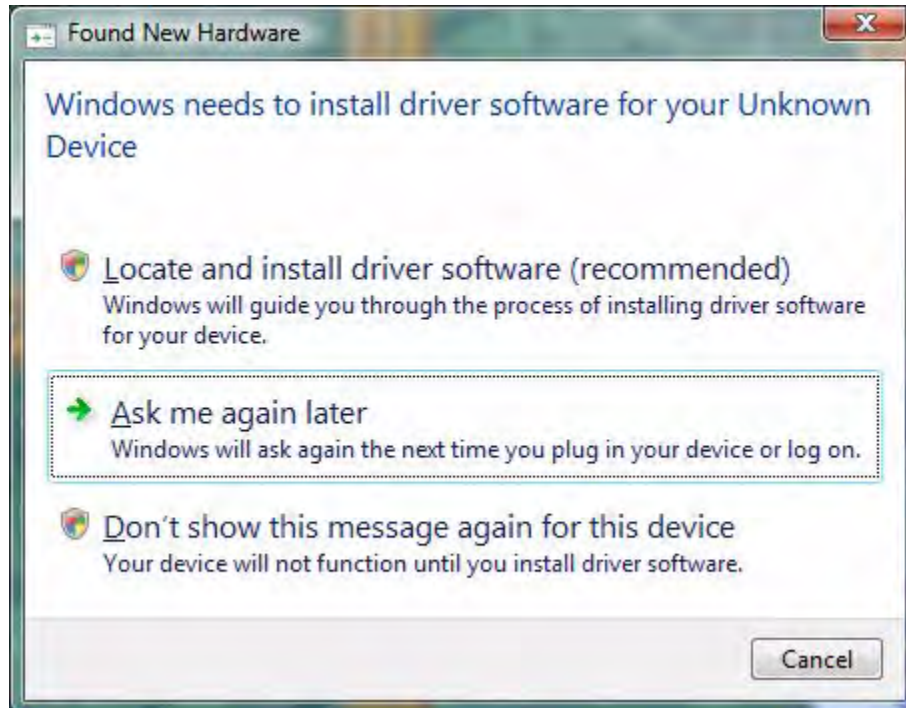


Figure 20. Found New Hardware Dialog, Windows Vista

3. Depending on your development PC's User Account Control settings, Windows may ask for permission to continue the installation. Click **Continue**.
4. When the **Insert the Disc** dialog appears, as shown in Figure 21, select **I don't have the disc. Show me other options**. Click the **Next** button to display the dialog that follows, which is shown in Figure 22.



Figure 21. Install Device Driver Dialog, Windows Vista



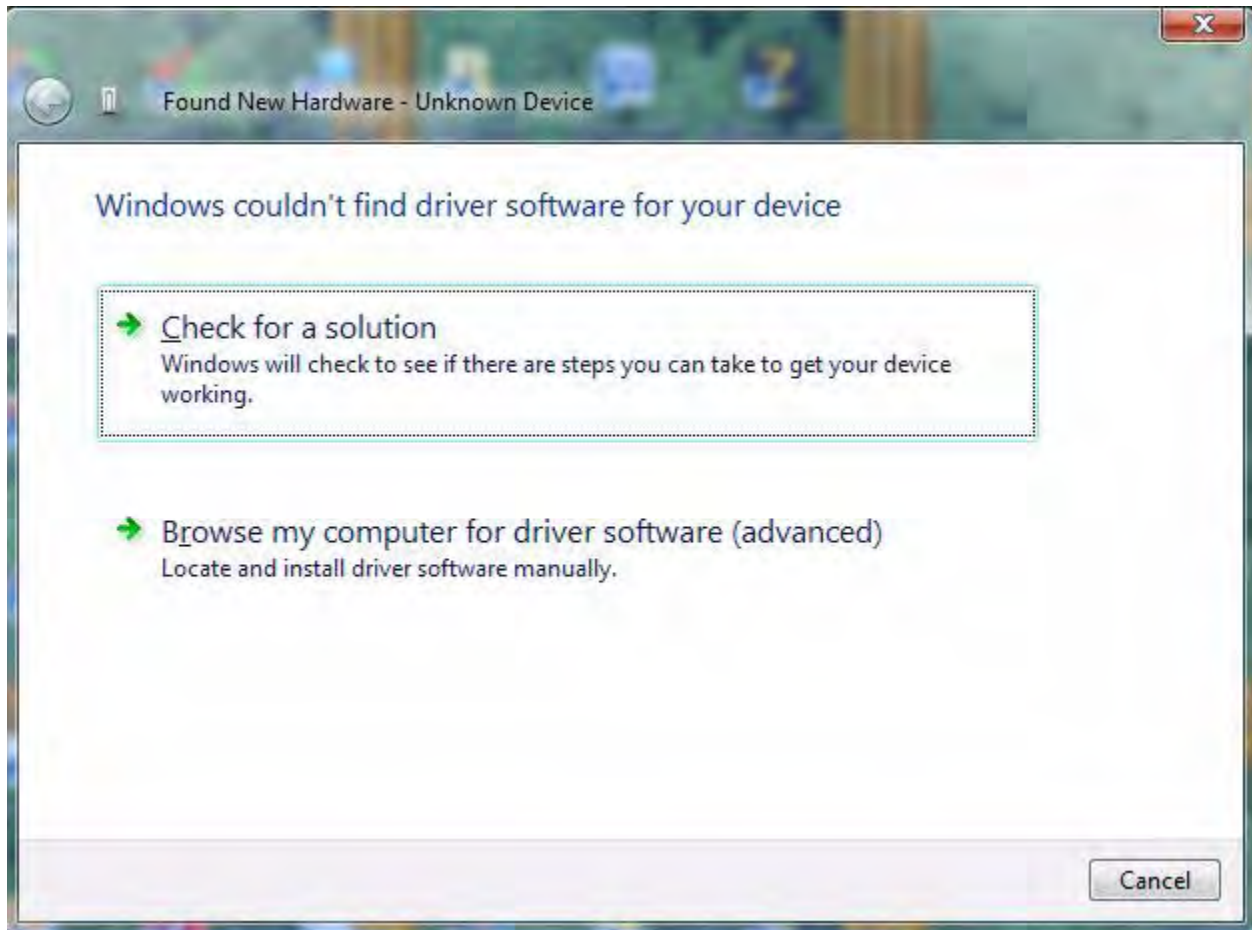


Figure 22. Couldn't Find Driver Dialog, Windows Vista

5. Select **Browse my computer for driver software (advanced)** to display the dialog shown in Figure 23, which prompts you to key in or browse for the location of the .inf file. Depending on the type of computer you use (32-bit or 64-bit), use the **Browse** button to navigate to one of the following paths, then click the **Next** button.
  - On 32-bit machines, use the following path:  
<Z8051 Installation>\Z8051\_<version\_number>\device drivers\OCD USB\x32
  - On 64-bit machines, use the following path:  
<Z8051 Installation>\Z8051\_<version\_number>\device drivers\OCD USB\x64

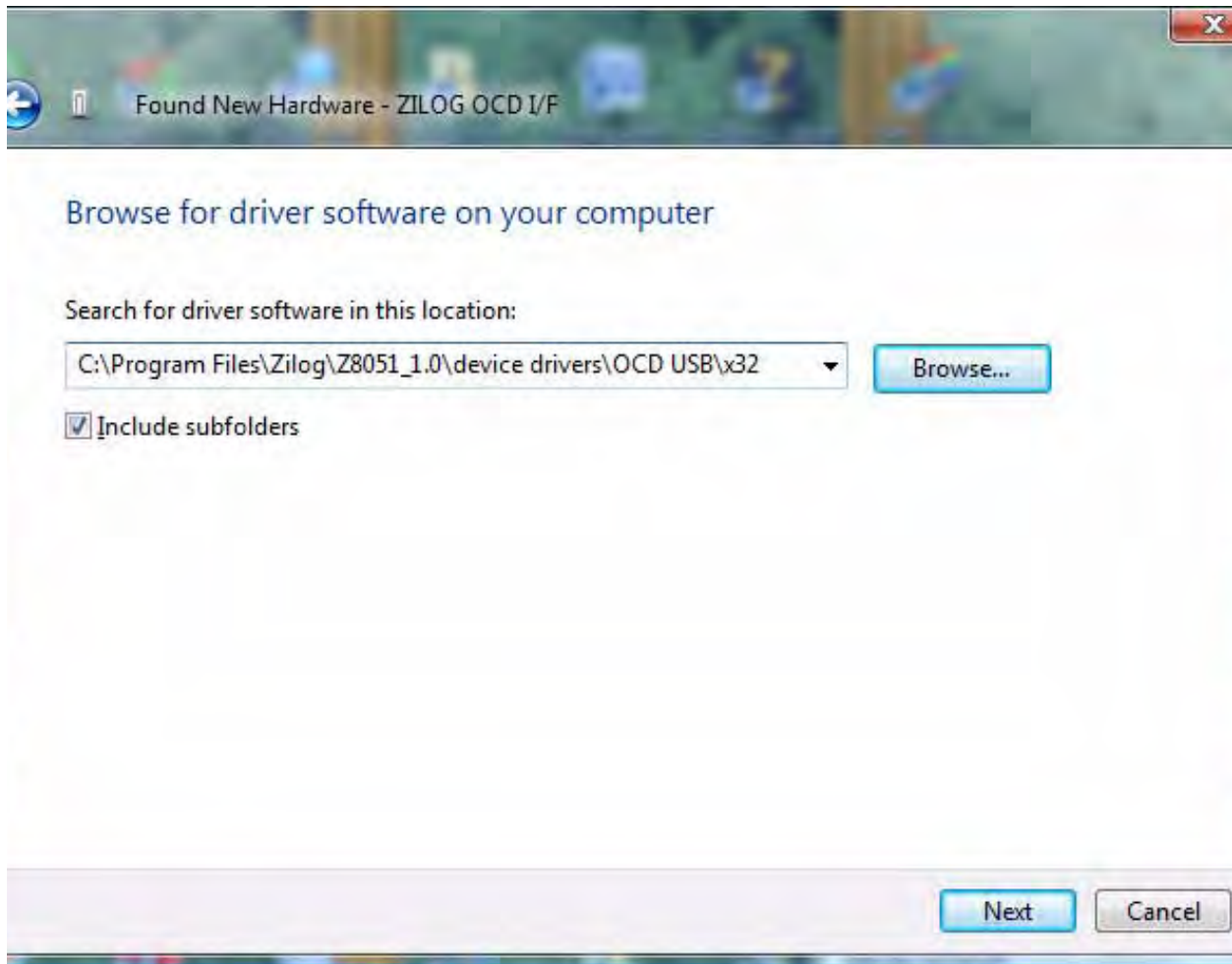


Figure 23. Browse For Driver Dialog, Windows Vista

6. When Windows prompts you whether to install or not install, click **Install this driver software anyway** and wait until the installation is completed (Windows may prompt you more than once).

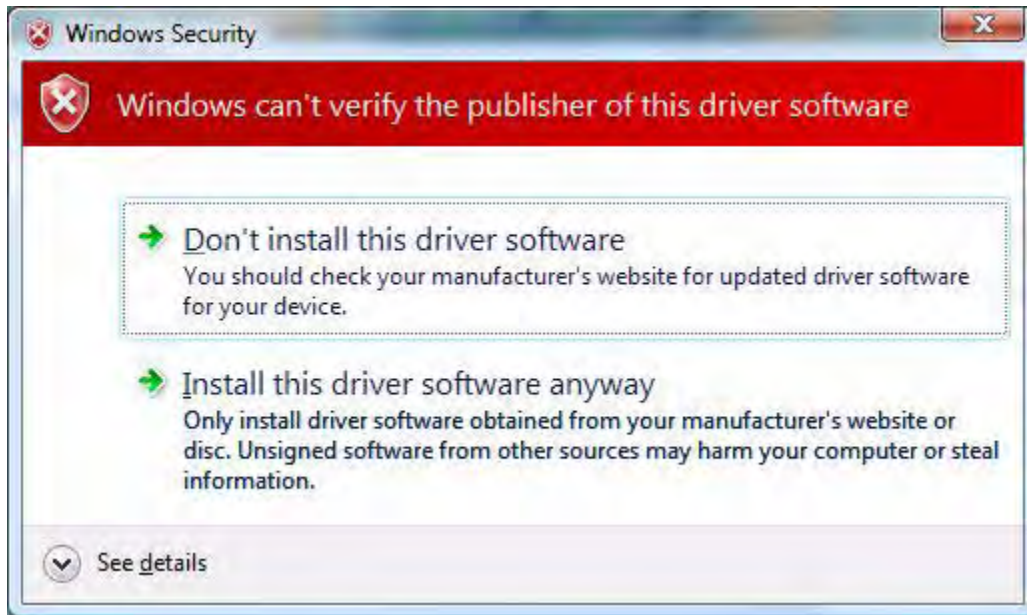
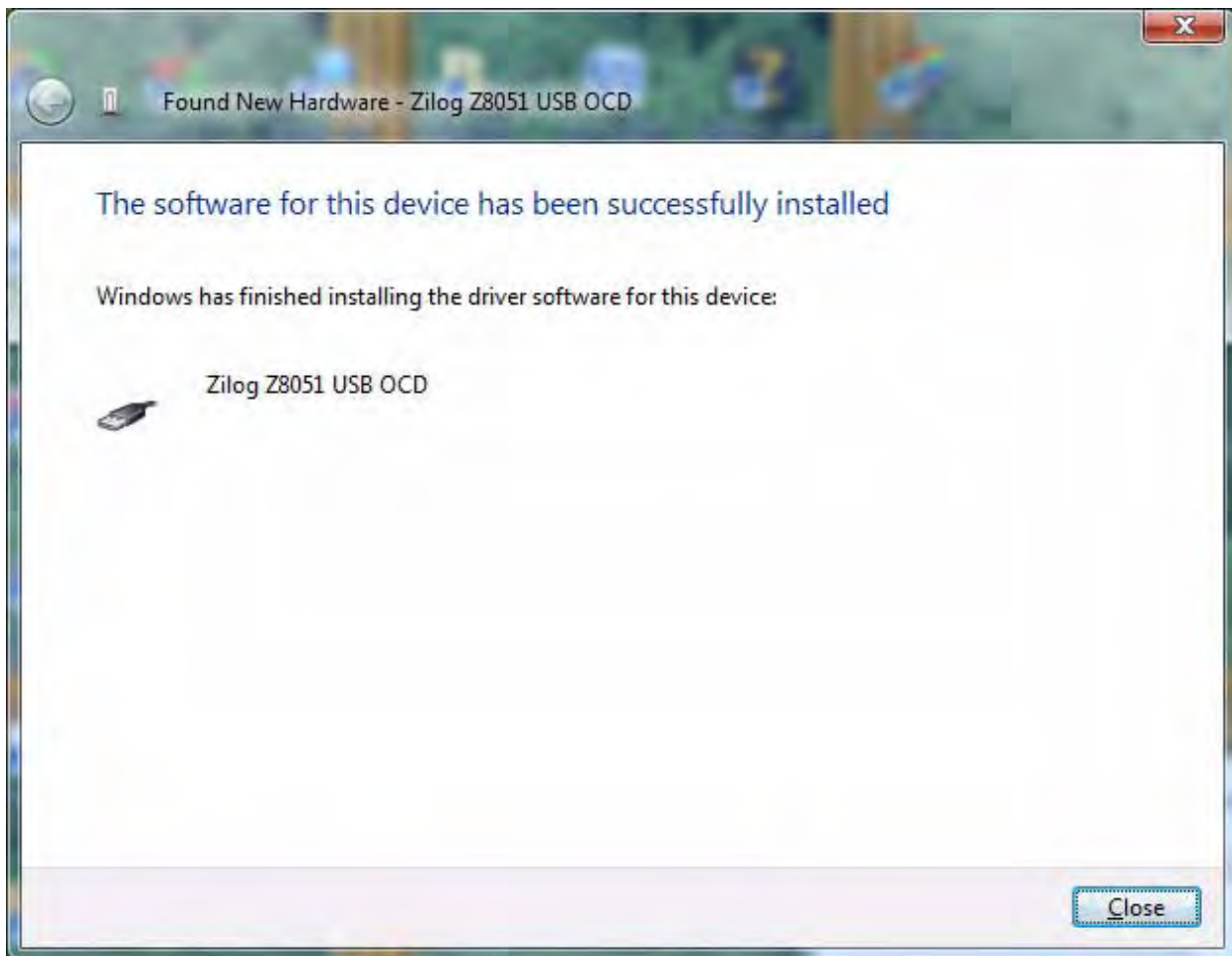


Figure 24. Can't Verify Publisher Dialog, Windows Vista

7. When the installation is complete, the screen shown in Figure 25 will appear. Click **Close** to exit the OCD driver installation.



**Figure 25. Successfully Installed Dialog, Windows Vista**

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► **Note:** On some installations, the Found New Hardware screen shown in Figure 25 may also display the text string, Zilog Z8051 USB OCD - No Firmware. This occurrence is normal and can be disregarded.

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## Appendix B. OCD Driver Installation on Windows 7 Systems

The driver programs for the Z8051 On-Chip Debugger are copied during the software and documentation installation. In the following procedure for PCs running Windows 7 32- and 64-bit operating systems, ensure that the target side of the OCD will remain unconnected while you install these drivers.

1. Connect the OCD hardware to the USB port of your PC by connecting the A (male) end of one of the two USB A (male)-to-Mini-B cables with the host PC's USB port. Connect the Mini-B end to the OCD device.
2. After the PC detects the new hardware, it will display the *Installing device driver software* dialog shown in Figure 26.

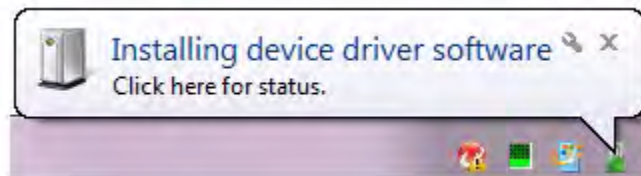


Figure 26. Install Device Driver Dialog, Windows 7

3. If you should encounter the scenarios shown in Figures 27 or 28, right-click your mouse on **ZILOG OCD I/F** (highlighted in Figure 27) or **Unknown device** (highlighted in Figure 28) and select **Update Drive Software...**
4. Follow [Steps 5 through 7](#) in [Appendix A](#) on page 25 to complete the driver installation.

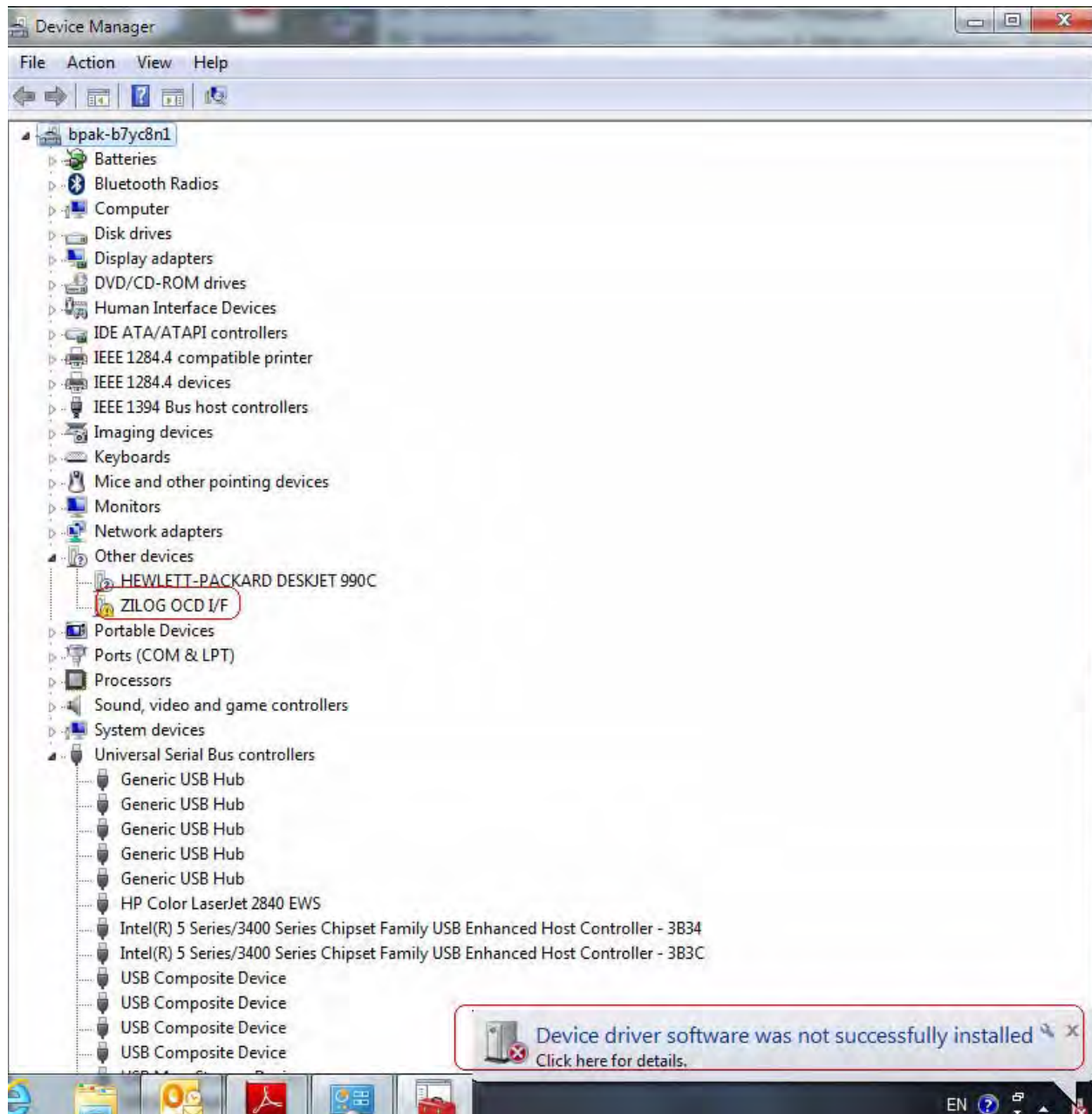


Figure 27. Unsuccessful Installation, Scenario 1



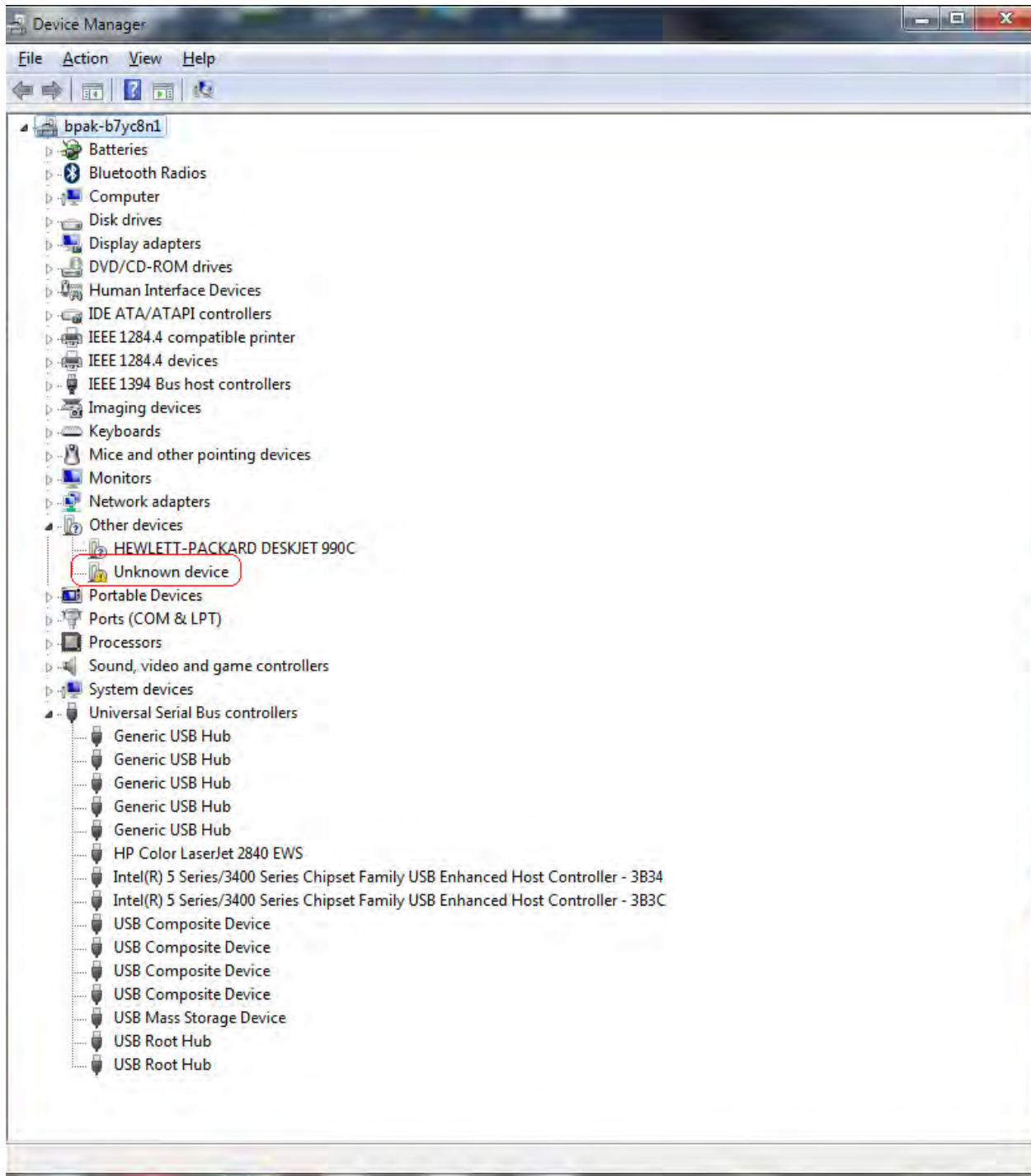


Figure 28. Unsuccessful Installation, Scenario 2

5. If *Zilog Z8051 USB OCD* appears in the Device Manager (as highlighted in Figure 29), the OCD driver software has been successfully installed.

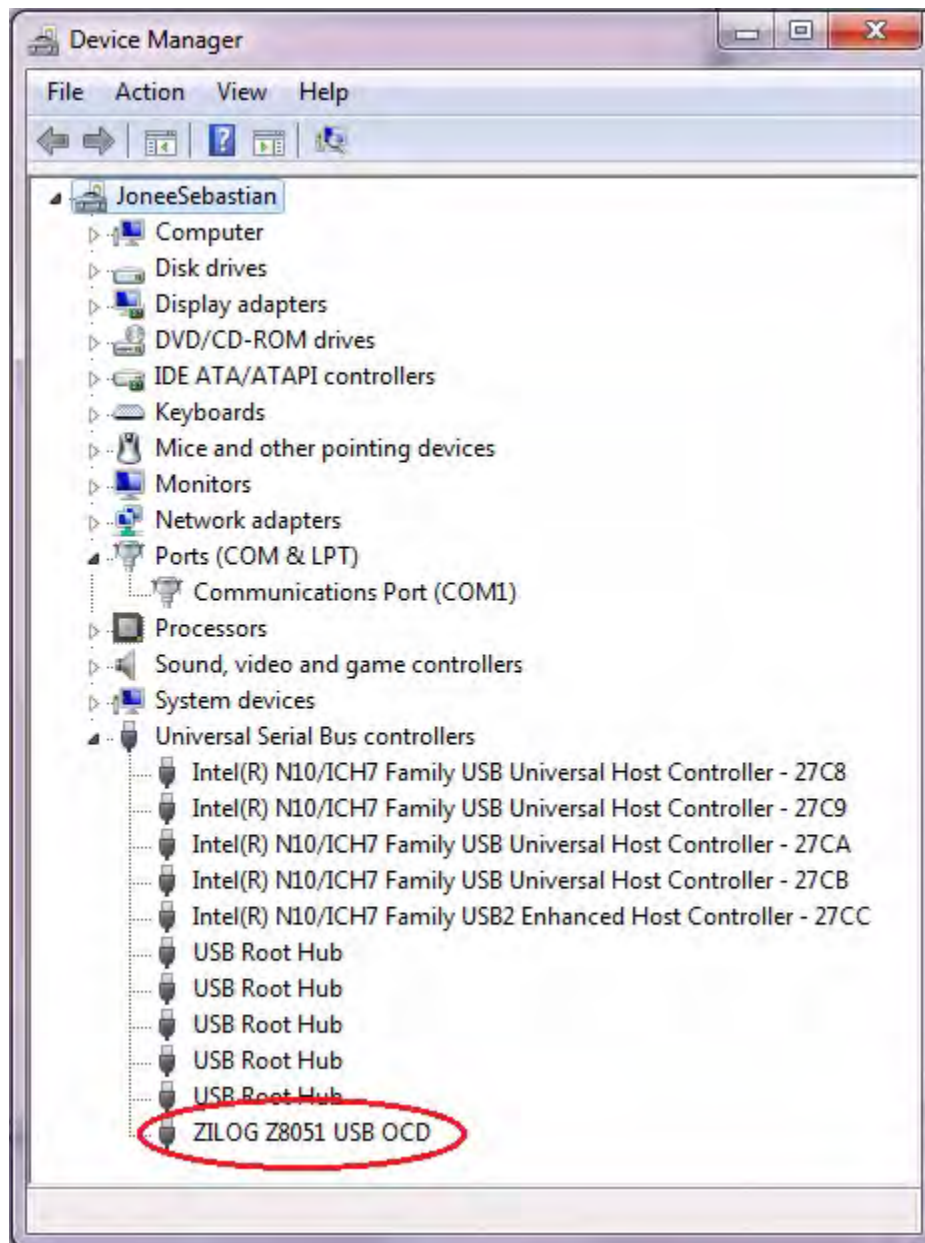


Figure 29. Device Manager Dialog, Windows 7



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