USB BitJet Download Cable

User Guide

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About this Guide

Introduction

This document familiarizes you with the contents of the USB BitJet that allows to configure the Altera FPGA.

Table below shows the revision history of this document.

Version	Date	Description
1.0	August 2010	First Publication

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Typographic Conventions

The document uses the typographic conventions shown as below.

Visual Cue	Meaning
Bold Type with Initial Capital Letters	All Headings and Sub Headings Titles in a document are displayed in bold type with initial capital letters; Example: **Introduction, Hardware Setup, Software Setup**
Bold Type with Italic Letters	All Definitions, Figure and Table Headings are displayed in Italics. Examples: **Figure 1. USB BitJet Download Cable**
1. 2.	Numbered steps are used in a list of items, when the sequence of items is important. such as steps listed in procedure.
• ■	Bullets are used in a list of items when the sequence of items is not important.
	The hand points to information that requires special attention.
	The caution indicates required information that needs special consideration and understanding and should be read prior to starting or continuing with the procedure or process.
	The warning indicates information that should be read prior to starting or continuing the procedure or processes.
	The feet direct you to more information on a particular topic.

Contents

1. Introduction

The USB BitJet interfaces a USB port on a host computer to an Altera® FPGA mounted on a printed circuit board. The cable sends configuration data from the PC to a standard 10-pin header connected to the FPGA. You can use the USB BitJet to iteratively download configuration data to a system during prototyping or to program data into the system during production.

Device Support

The USB BitJet allows you to program and configure Altera devices. Specifically, you can do the followings:

- Download configuration data to FPGA devices:
  - Stratix® series FPGAs
  - Cyclone® series FPGAs
  - MAX® series CPLDs
  - Arria® series FPGAs
- In-system programming of the following devices:
  - Serial configuration devices including EPCS1, EPCS4, EPCS16, EPCS64 and EPCS128 devices.
- Perform Signal Tap® II logic analysis

USB BitJet supports target systems using, 3.3 V LVTTL/LVCMOS and single-ended I/O standards from 1.5 V to 3.3 V.

Power Requirements

The USB BitJet requires the following power sources:

- 5.0 V from the USB cable
- Between 1.5 V and 3.3 V from the target circuit board

Software Requirements

The USB BitJet is available for Windows XP (32-bit and 64-bit) with service pack 2, Windows Vista (32-bit and 64-bit) and Windows 7 (32-bit and 64-bit) systems.

Use the Quartus® II software version 7.2 or later to configure your device.

The USB BitJet download cable also supports the following:

- Quartus II Programmer (for programming and configuration)
- Quartus II SignalTap® II Logic Analyzer (for logic analysis)
- Quartus II Programmer (standalone version)
- Quartus II SignalTap II logic analyzer (standalone version)

Quartus II v8.1 Service pack 1 is required to be installed in Quartus II v8.1.

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2. USB BitJet Hardware and Software Setup

Hardware Setup

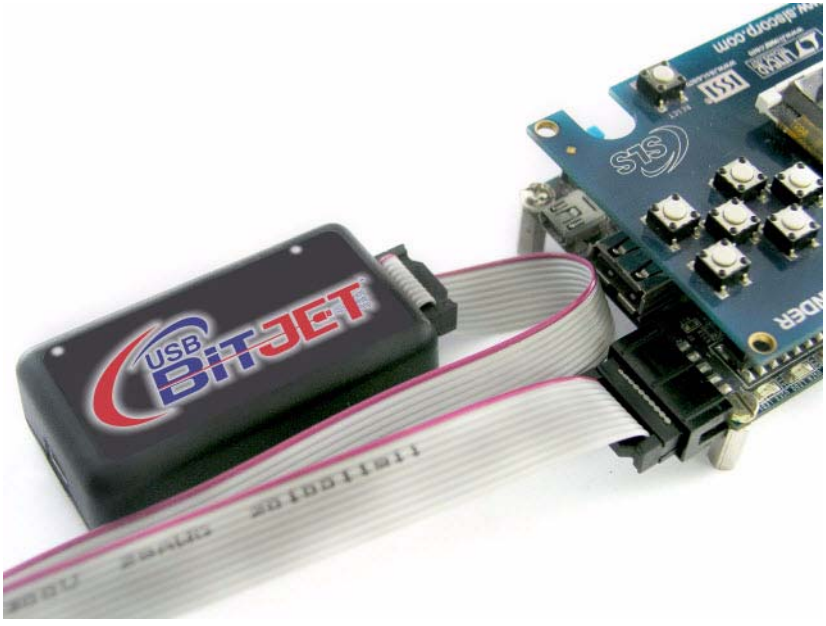
This section describes how to install and set up the USB BitJet for device configuration or programming.

For plug and header dimensions, pin names, and operating conditions, see Chapter 3. “USB BitJet Download Cable Specifications”.

Connect your USB BitJet Download Cable to the circuit board as instructed below.

1. Disconnect the power cable from the circuit board.
2. Connect USB cable to the USB port on your PC and to the USB BitJet port.
3. Connect the USB BitJet to the 10-pin header on the device board. Figure 2-1. shows the USB BitJet and the circuit board connector.

Figure 2-1. USB BitJet Download Cable



To avoid USB BitJet, first unplug the cable from the 10-pin header on the target board before unplugging the cable from the USB port on your PC. It is safest to remove power first from the target board before unplugging the USB BitJet.

4. Reconnect the power cable to apply power to the circuit board.

Software Setup

This section describes the following:

- Installing USB BitJet Driver on Windows XP systems
- Installing USB BitJet Driver on Windows Vista systems
- Installing USB BitJet Driver on Windows 7 systems
- Settings up USB BitJet hardware in Quartus II software

Before you begin the installation, verify that the USB BitJet drivers are located in <*USB BitJet Installation Path*>**Drivers** directory.

Installing USB BitJet Driver on Windows XP systems

This section describes how to install the USB BitJet driver on Windows XP 32/64-Bit systems.

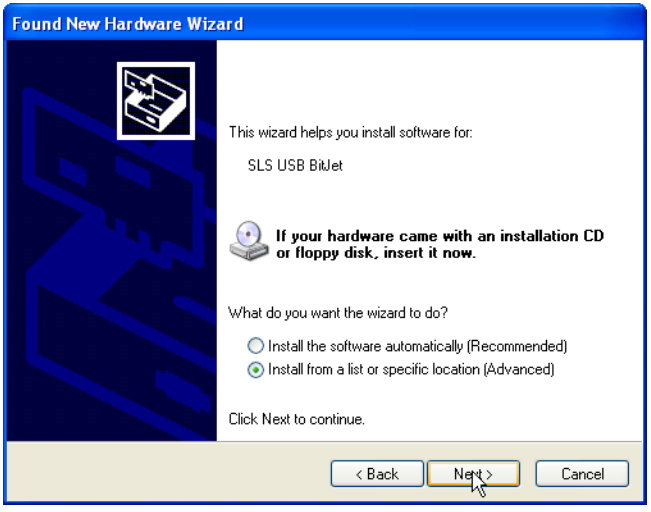
To install the driver, follow the directions below:

1. Plug in the USB BitJet download cable to the PC.
2. On the **Found New Hardware Wizard** window, click **Yes, this time only** and then click **Next** to continue. See Figure 2-2.

Figure 2-2. Found New Hardware Wizard Window (1)

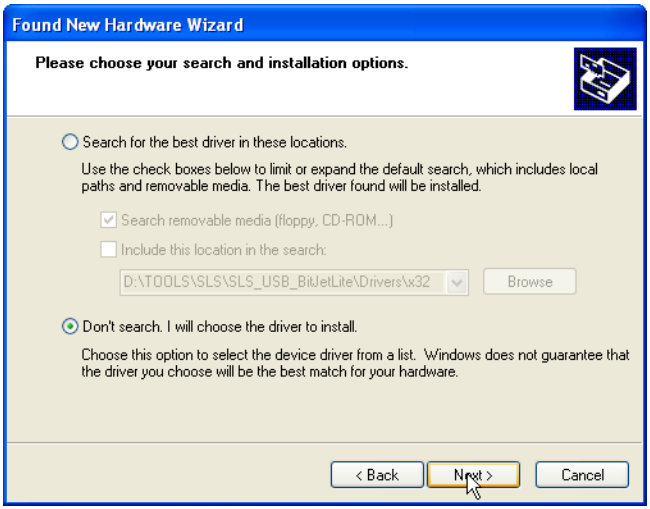
3. Select **Install from a list or specific location (Advanced)** and click **Next** to continue. See Figure 2-3.

Figure 2-3. Found New Hardware Wizard Window (2)



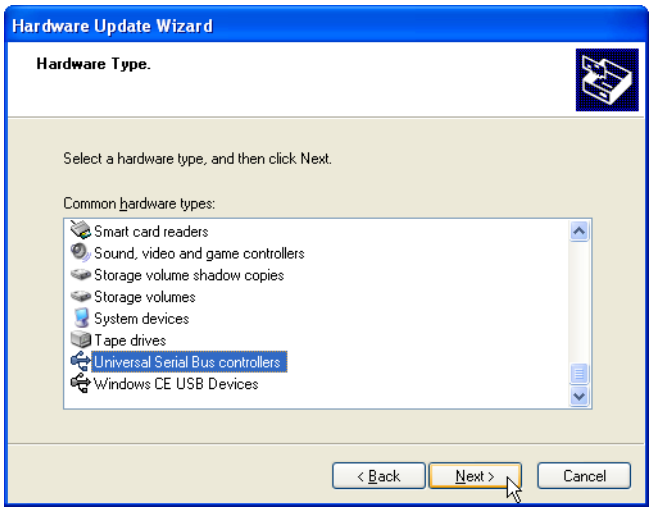
4. Select **Don't search. I will choose the driver to install.** Click **Next.** See Figure 2-4.

Figure 2-4. Choosing Installation Options Window



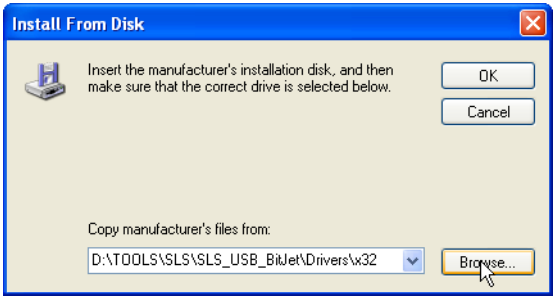
5. Select **Universal Serial Bus controllers** and click **Next** to continue. See Figure 2-5.

Figure 2-5. Hardware Type Window



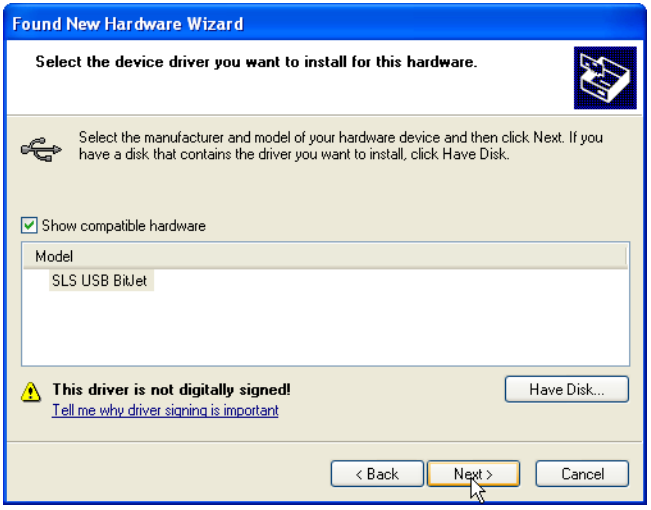
6. Click on **Have Disk** button and browse to the location <*USB BitJet Installation Path*>**Drivers\(x32|x64)** of the driver. Click **OK**. See Figure 2-6.

Figure 2-6. Install From Disk Window



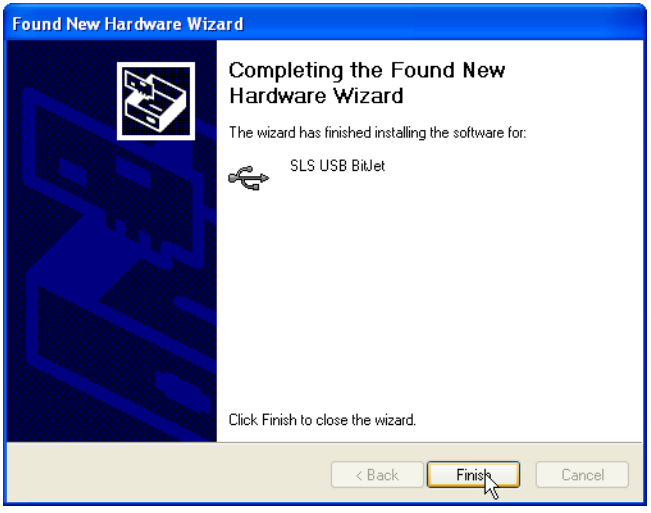
7. Select **SLS USB BitJet** and click **Next** to continue. See Figure 2-7.

Figure 2-7. Device Driver Selection Window



8. It will install the driver for the download cable. On successful driver installation you will see the windows as shown in Figure 2-8.

Figure 2-8. Finish Installation



9. Click **Finish** to exit the New hardware Installation Wizard.

Installing USB BitJet Driver on Windows Vista System

This section describes how to install the USB BitJet driver on Windows Vista systems.

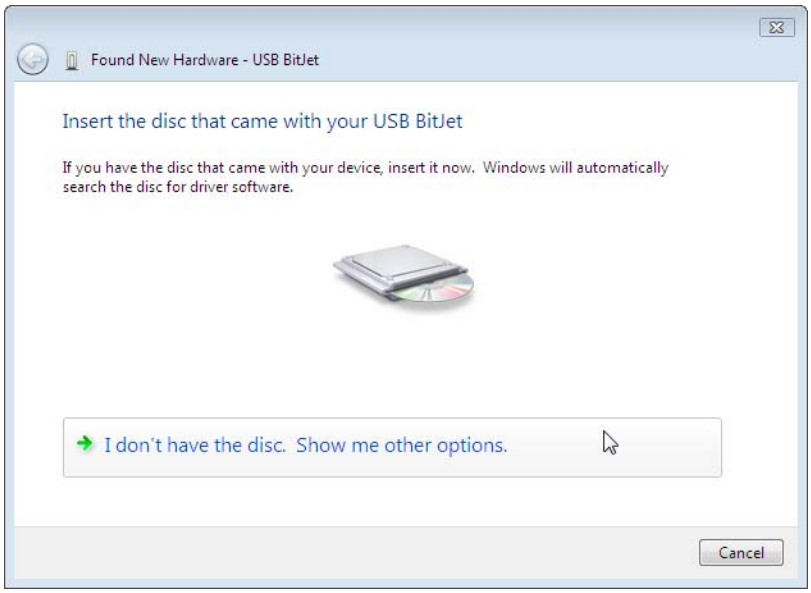
To install the driver, follow the directions below:

1. Plug in the USB BitJet download cable to the PC.
2. On the **Found New Hardware Wizard** window, click **Locate and install driver software** to continue. See Figure 2-9.

Figure 2-9. Choosing Installation option (1)

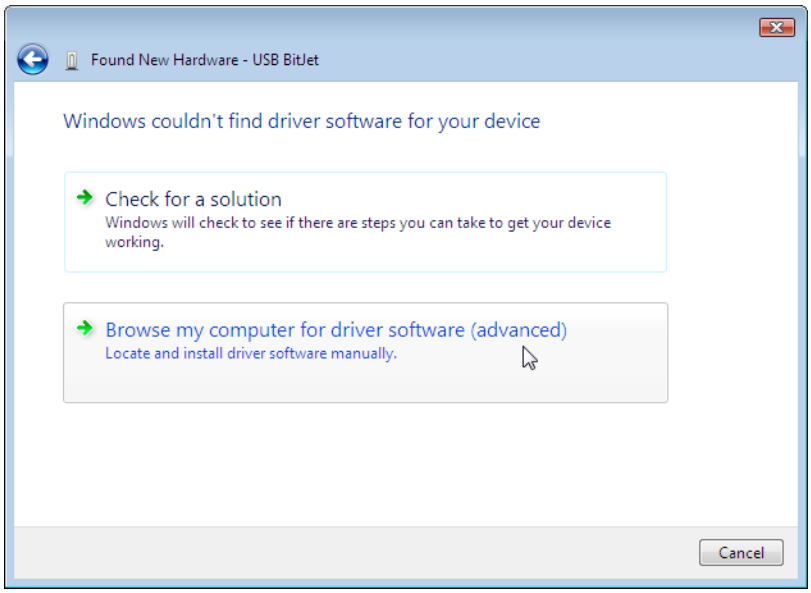
3. Click on **I don't have the disk. Show me other options** to continue**.** See Figure 2-10.

Figure 2-10. Choosing Installation Option (2)



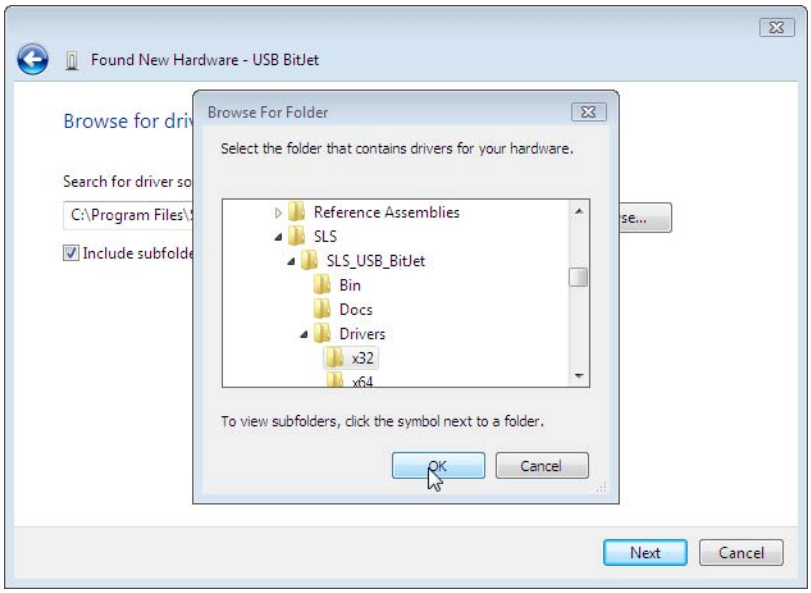
4. Click on **Browse my computer for driver software** to continue. See Figure 2-11.

Figure 2-11. Choosing Installation Option (3)



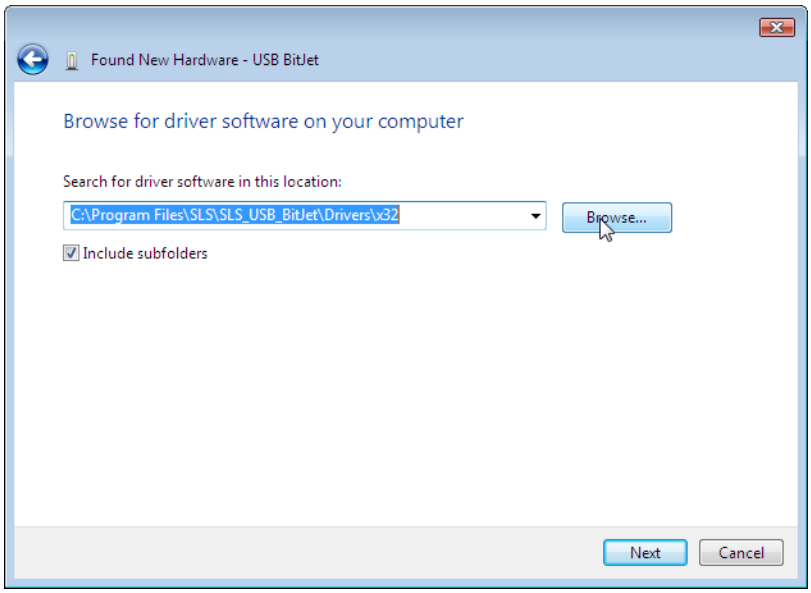
5. Select on **Browse** to the location <*USB BitJet Installation Path*> **\Drivers\(x32|x64)** of the driver. Click **OK.** See Figure 2-12.

Figure 2-12. Browsing Driver Installation Directory



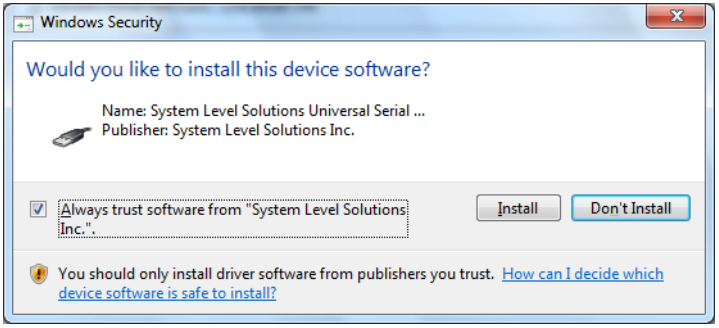
6. Click **Next** to install the driver. See Figure 2-13.

Figure 2-13. Driver Installation Directory Selection



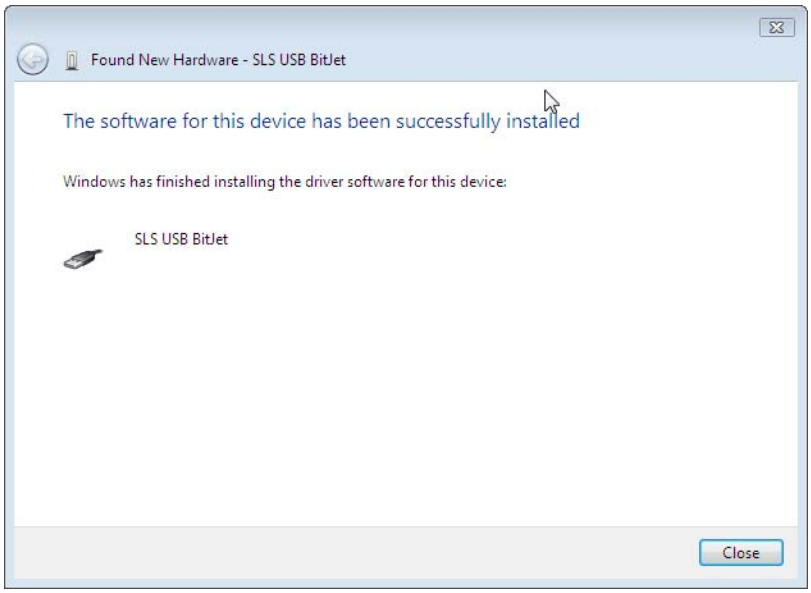
7. Windows security dialog box pop up. Check on "**Always trust software from "System Level Solutions, Inc**." and click **Install**. See Figure 2-14.

Figure 2-14. Windows Security Dialog Box



8. Click on **Close** to exit Hardware Installation Wizard. See Figure 2-15.

Figure 2-15. Finish Installation



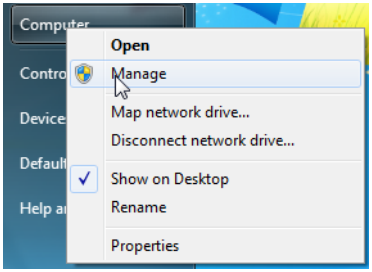
Installing USB BitJet Driver on Windows 7 Systems

This section describes how to install the USB BitJet driver on Windows 7 systems.

To install the driver, follow the directions below:

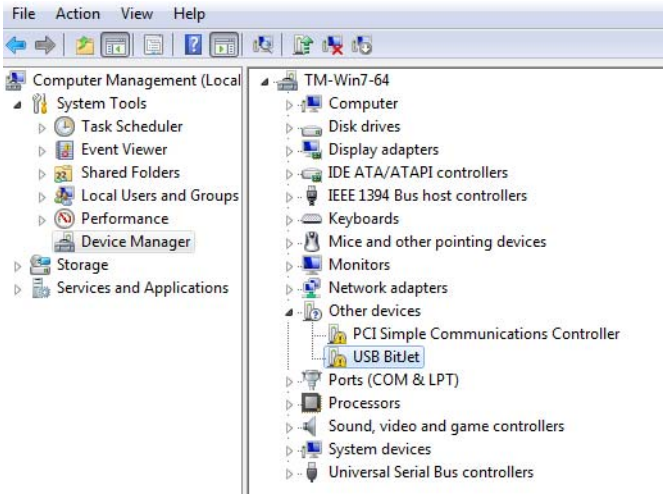
1. Plug in the USB BitJet download cable to the PC.
2. Right click on **My Computer**. Select **Manage** option. See Figure 2-16.

Figure 2-16. Device Manager selection



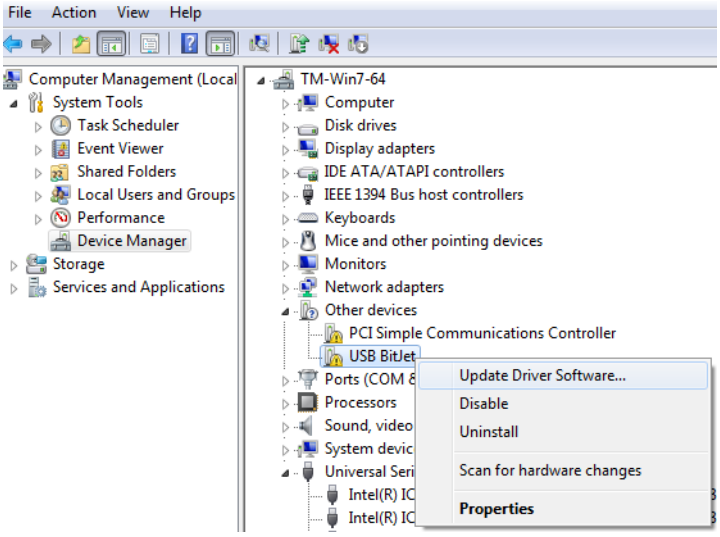
3. Select **Device Manager**. It will list all drivers of all devices. See Figure 2-17.

Figure 2-17. Device Manager Window



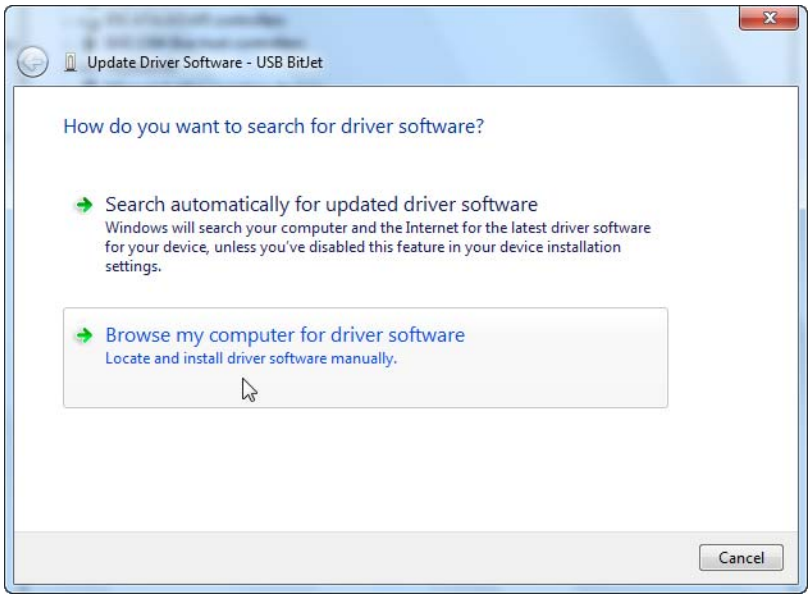
4. Expand **Other devices** option. Right click on **USB BitJet** and click on **Update Driver Software...**option. See Figure 2-18.

Figure 2-18. Update Driver Software Selection



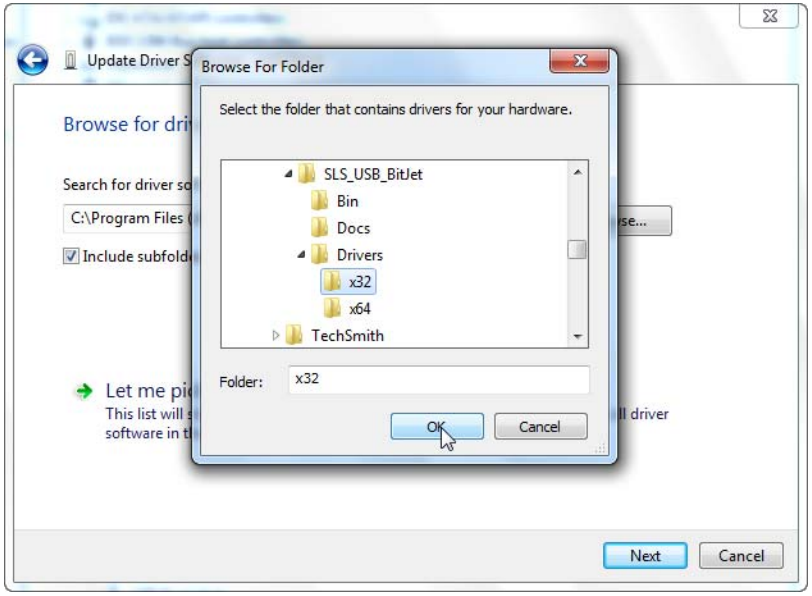
5. On the Update Driver Software wizard, select **Browse my computer for driver software.** See Figure 2-19.

Figure 2-19. Update Driver Software Wizard



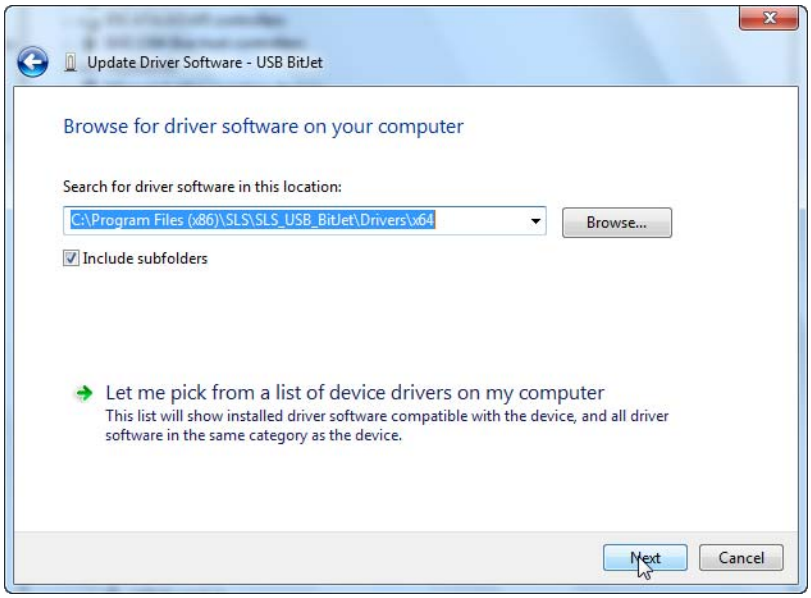
6. Click on **Browse** and browse to the location <*USB BitJet Installation Path*>**Drivers\(x32|x64)** of the driver. Click **OK**. See Figure 2-20.

Figure 2-20. Browsing Driver Installation Directory



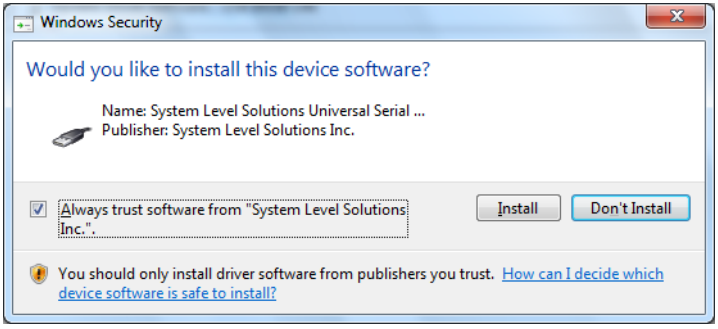
7. Click **Next** to install the driver. See Figure 2-21.

Figure 2-21. Driver Installation Directory Selection



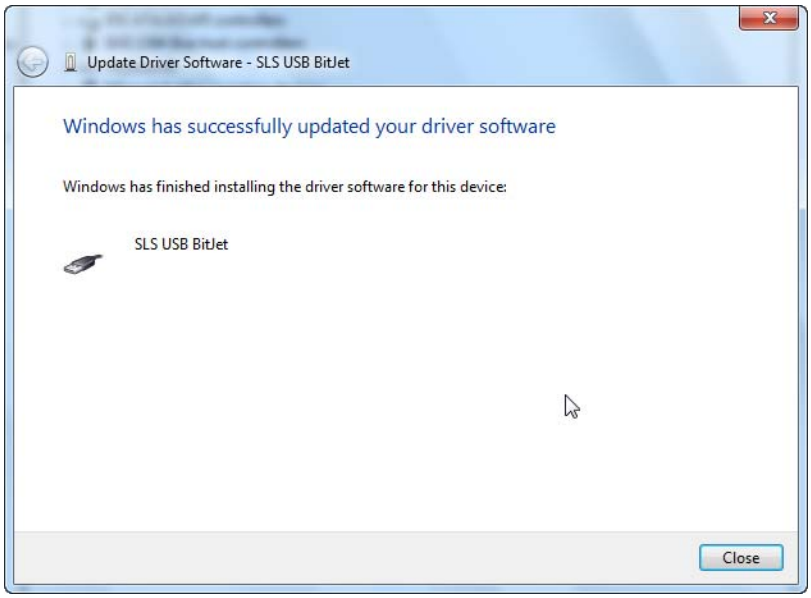
8. Windows security dialog box pop up. Check on "**Always trust software from "System Level Solutions, Inc**." and click **Install**. See Figure 2-22.

Figure 2-22. Windows Security Dialog Box



9. Click on **Close** to exit Update Driver Software Wizard. See Figure 2-23.

Figure 2-23. Finish Installation

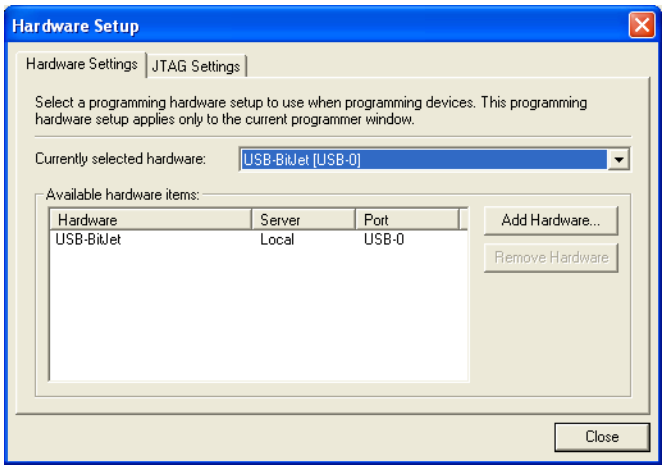


Setting up USB BitJet hardware in the Quartus II software

Use the following steps to set up the USB BitJet hardware in the Quartus II software:

1. Start the Quartus II software.
2. Choose **Tools>Programmer**.
3. Click **Hardware Setup**. The Hardware Setup dialog box is displayed. See Figure 2-24.

Figure 2-24. Hardware Setup



4. From the drop-down menu, select **USB-BitJet [USB-0].** See Figure 2-24.
5. Click **Close** to exit Hardware Setup dialog box.
6. In the Mode list, select the desired mode to program in Programmer Window. Table 2-1 describes each programming mode.

The USB BitJet supports the Joint Test Action Group (JTAG), Passive Serial Programming and Active Serial modes.

Table 2-1. Programming Modes

Mode	Mode Description
Joint Test Action Group (JTAG)	Programs or configures all Altera devicessupported by Quartus II software, excluding FLEX 6000.
In-Socket Programming	Not supported by USBs-BitJet
Passive Serial Programming	Configures all Altera devices supported by Quartus II software excluding MAX 3000 and MAX 7000 devices.
Active Serial Programming	Programs a single EPCS1, EPCS4, EPCS16 and EPCS64 serial configuration device.

For more information about programming devices and creating secondary programming files, refer to *Programming & Configuration* chapter of the Introduction to Quartus II Manual.

3. USB BitJet Download Cable Specifications

USB BitJet Connections

The USB BitJet cable has a USB universal plug that connects to the PC USB port, and a 10-pin female plug that connects to the circuit board. Data is downloaded from the USB port on the PC through the USB BitJet cable to the circuit board via the connections discussed in this section.

Voltage Requirements

The USB BitJet VCC (TRGT) pin must be connected to a specific voltage for the device being programmed. It supports maximum VCC (TRGT) of 3.3 V. Connect pull-up resistors to the same power supply as the USB BitJet $V_{CC(TRGT)}$. See Table 3-1.

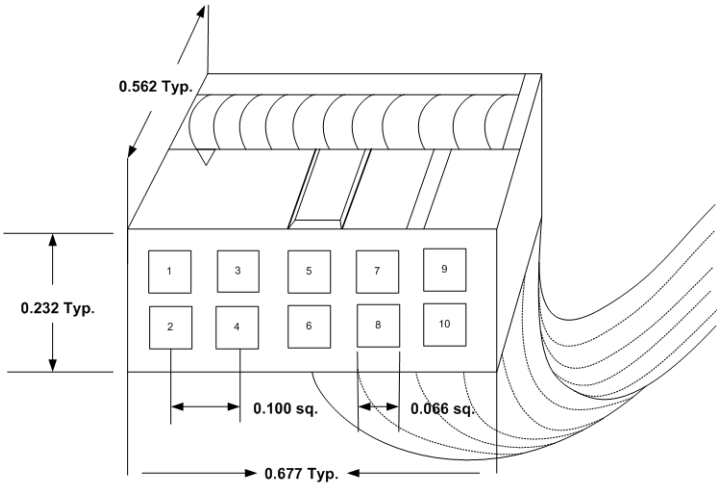
Table 3-1. Typical USB BitJet $V_{CC(TRGT)}$ Pin Voltage Requirements

Device Family	USB BitJet V_{CC} Voltage Required
MAX® II devices	As specified by V_{CCIO} of Bank 1
MAX 7000AE and MAX 3000A devices	3.3 V
MAX 7000B devices	2.5 V
Cyclone and Cyclone II devices	As specified by V_{CCIO}
Cyclone III devices	As specified by V_{CCA} or V_{CCIO}
Cyclone® IV devices	V_{CCA}
Stratix devices	As specified by V_{CCSEL}
Stratix II, Stratix III, Stratix® IV, Arria™ II GX and Arria GX devices	V_{CCPD}
EPC2 devices	3.3 V
EPC4, EPC8 and EPC16 devices	3.3 V
EPCS1, EPCS4, EPCS16, EPCS64 and EPCS128 devices	3.3 V

USB BitJet Plug Connection

The 10-pin female plug connects to a 10-pin male header on the circuit board containing the target device. Figure 3-1. shows the dimension of the female plug.

Figure 3-1. USB BitJet 10 Pin Female Plug Dimension



Dimensions are shown in inches. Spacing between pin centers is 0.1 inches.

Table 3-2. identifies the 10-pin female plug pin names and the corresponding programming mode.

Table 3-2. USB BitJet Female Plug Signal Names & Programming Modes

Pin	AS Mode		PS Mode		JTAG Mode	
1	DCLK	Clock signal	DCLK	Clock signal	TCK	Clock signal
2	GND	Signal ground	GND	Signal ground	GND	Signal ground
3	CONF_DONE	Configuration done	CONF_DONE	Configuration done	TDO	Data from device
4	VCC (TRGT)	Target power supply	VCC (TRGT)	Target power supply	VCC (TRGT)	Target power supply
5	nCONFIG	Configuration control	nCONFIG	Configuration control	TMS	JTAG state machine

Table 3-2. USB BitJet Female Plug Signal Names & Programming Modes

Pin	AS Mode		PS Mode		JTAG Mode	
6	nCE	Cyclone chip enable	—	No connect	—	No connect
7	DATAOUT	Active serial data out	nSTATUS	Configuration status	—	No connect
8	nCS	Serial configuration device chip select	—	No connect	—	No connect
9	ASDI	Active serial data in	DATA0	Data to device	TDI	Data to device
10	GND	Signal ground	GND	Signal ground	GND	Signal ground

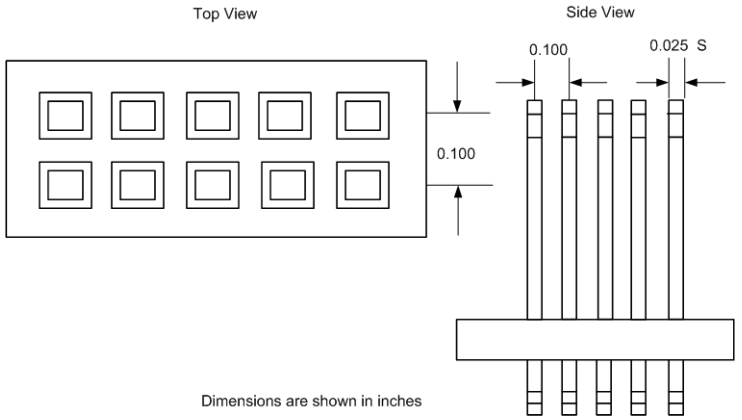
The circuit board must supply $V_{CC(TRGT)}$ and ground to the USB BitJet cable for the I/O drivers.

Circuit Board Header Connection

The circuit board's 10-pin male header, which connects to the USB BitJet cable's 10-pin female plug, has two rows of five pins. These pins are connected to the device's programming or configuration pins. Figure 3-2. shows the dimensions of a typical 10-pin male header.

Although a 10-pin surface mount header can be used for the JTAG, AS or PS download cable, Altera recommends using a through-hole connector because of the repeated insertion and removal force needed.

Figure 3-2. 10 Pin Male Header Dimensions



Operating Conditions

Table 3-3. and Table 3-4. summarize the maximum ratings, recommended operating conditions and DC operating conditions for the USB BitJet cable.

Table 3-3. USB BitJet Cable Absolute Maximum Ratings

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC(TRGT)}$	Target supply voltage	With respect to ground	–0.3	4.6	V
$V_{CC(USB)}$	USB supply voltage	With respect to ground	–0.3	6.0	V
I_I	Input current	TDO or dataout	–10.0	10.0	mA
I_O	Output current	TCK, TMS, TDI, nCS, nCE	–50.0	50.0	mA

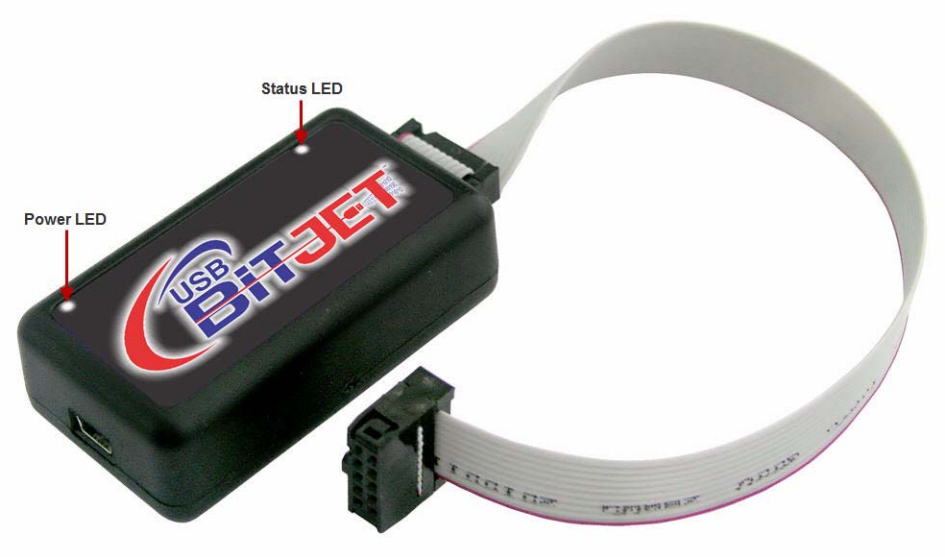
Table 3-4. USB BitJet Cable Recommended Operating Conditions

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC(TRGT)}$	Target supply voltage, 3.3 V operation	__	3.0	3.6	V
	Target supply voltage, 2.5 V operation	__	2.375	2.625	V
	Target supply voltage, 1.8 V operation	__	1.72	1.89	V
	Target supply voltage, 1.5 V operation	__	1.43	1.57	V

LED Indication

The USB BitJet is having LED for the power and process status indication. The LED on the USB connector side is used for power indication and LED on 10x2 connector side is used for process status indication.
Figure 3-3. shows the Power LED and Status LED on the USB BitJet.

Figure 3-3. USB BitJet LED Indication



While programming the device the Status LED will continuously blink and as the process gets completed, it becomes OFF. The power LED will remain ON until the USB cable is connected to the hardware.