1. Setting Up the USB-Blaster Download Cable

Introduction

The USB-Blaster™ download cable 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-Blaster cable to iteratively download configuration data to a system during prototyping or to program data into the system during production.

Supported Devices

You can use the USB-Blaster download cable to download configuration data to the following Altera devices:

- Stratix® series FPGAs
- Cyclone® series FPGAs
- MAX® series CPLDs
- Arria® GX series FPGAs
- APEX™ series FPGAs
- ACEX® 1K FPGAs
- Mercury™ FPGAs
- FLEX 10K® series FPGAs
- Excalibur™ FPGAs

You can perform in-system programming of the following devices:

- Altera configuration devices including EPC2 devices.
- Enhanced configuration devices including EPC4, EPC8, and EPC16 devices.
- Serial configuration devices including EPCS1, EPCS4, EPCS16, EPCS64, and EPCS128 devices.

In addition, you can perform SignalTap® II logic analysis.

The USB-Blaster download cable supports target systems using 5.0-V TTL, 3.3-V LVTTL/LVCMOS, and single-ended I/O standards from 1.5 V to 3.3 V.

Power Requirements

The USB-Blaster download cable requires the following power sources:

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

Software Requirements

The USB-Blaster download cable is only available for Windows 2000, Windows XP (32-bit and 64-bit), Windows Vista (32-bit and 64-bit), UNIX and all Linux plaforms such as Red Hat Enterprise 4, Red Hat Enterprise 5, CentOS 4/5, and SUSE Linux Enterprise 9.

For Quartus operating system support, refer Operating System Support.

Use the Quartus® II software version 4.0 or later to configure your device. The USB-Blaster 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)

Hardware Setup

This section describes how to install and set up the USB-Blaster download cable for device configuration or programming.

For plug and header dimensions, pin names, and operating conditions, see Chapter 2, USB-Blaster Specifications.

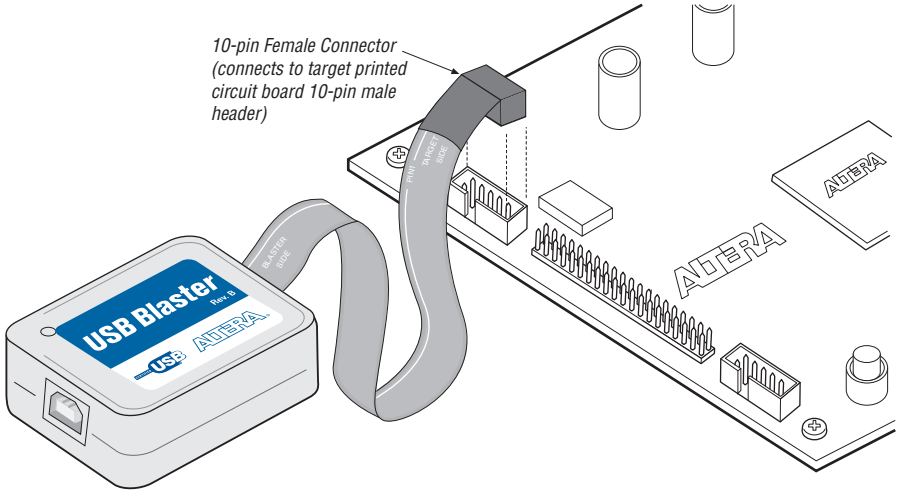
Connect your USB-Blaster download cable to the circuit board as instructed below.

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

WARNING

To avoid damaging the USB-Blaster cable, 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-Blaster cable. For more information, refer to *USB Blaster errata sheet*.

Figure 1–1. The USB-Blaster Download Cable



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

The **Found New Hardware** wizard may open and prompt you to install a new hardware driver. Close the wizard and install the hardware driver using the instructions provided in "Software Setup" on page 1–3.

Software Setup

This section describes the following:

- "Installing the USB-Blaster Driver on Windows 2000 and Windows XP Systems"
- "Installing the USB-Blaster Driver on Windows Vista Systems"
- "Installing the USB-Blaster Driver on Linux"
- "Setting Up the USB-Blaster Hardware in the Quartus II Software"

Installing the USB-Blaster Driver on Windows 2000 and Windows XP Systems

This section describes how to install the USB-Blaster driver on Windows 2000 and Windows XP systems.

Before you begin the installation, verify the USB-Blaster driver is located in your directory: \<*Quartus II system directory*>**drivers\usb-blaster**

☞ If the driver is not in your directory, download the USB-Blaster driver from the Altera web site: www.altera.com/support/software/drivers

To install the driver, follow the directions below:

1. Plug in the USB-Blaster download cable to the PC.
2. On the Found New Hardware Wizard window, click **No, not this time** and then click **Next** to continue.
3. Select **Install from a list of specific location (Advanced)** and click **Next** to continue.
4. Select **Don't search. I will choose the driver to install**. Click **Next**.
5. Select **Sound, video and game controllers**, and click **Next** to continue.
6. Select **Have Disk** and browse to the location of the driver on your system: \<*Quartus II system directory*>**drivers\usb-blaster**. Click **OK**.
7. Select **Altera USB-Blaster** and click **Next** to continue.
8. Click **Next** to install the driver.
9. Click **Continue Anyway** when the Hardware Installation warning appears.
10. Click **Finish** in the Completing the Add/Remove Hardware Wizard window. Reboot your system.

Installing the USB-Blaster Driver on Windows Vista Systems

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

Before you begin the installation, verify that the USB-Blaster driver is located in your directory: \<*Quartus II system directory*>**drivers\usb-blaster**

☞ If the driver is not in your directory, download the USB-Blaster driver from the Altera web site: www.altera.com/support/software/drivers

To install the driver, follow the directions below:

1. Plug in the USB-Blaster download cable to the PC.
2. On the Found New Hardware Wizard window, click **Locate and install driver software** to continue.
3. On the Found New Hardware - USB-Blaster window, click **I don't have the disk**. **Show me other options** to continue.
4. Click **Browse my computer for driver software** to continue.

5. Click **Browse…** and browse to the location of the driver on your system: \<*Quartus II system directory*>**\drivers\usb-blaster.** Click **OK**.
6. Click **Next** to install the driver.
7. Click **Install this driver software anyway** when the Hardware Installation warning appears.
8. Click **Close** when the driver installation is completed. Reboot your system.

Installing the USB-Blaster Driver on Linux

This section describes how to install the USB-Blaster driver on Linux.

The Quartus II software uses the built-in USB drivers (usbfs) on RedHat Linux to access the USB-Blaster download cable. By default, *root* is the only user allowed to use usbfs. You must change the permission on the ports before you can use the USB-Blaster download cable to program devices with the Quartus II software.

You must have system administration (root) privileges to configure the USB-Blaster download cable drivers.

For Red Hat Enterprise 4 and earlier versions

1. Add the following lines to the **/etc/hotplug/usb.usermap** file.

```
#
# Altera USB-Blaster
#
usbblaster 0x03 0x09fb 0x6001 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0
usbblaster 0x03 0x09fb 0x6002 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0
usbblaster 0x03 0x09fb 0x6003 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0
```

2. Create a file named **/etc/hotplug/usb/usbblaster** and add the following lines to it.

```
#!/bin/sh
# USB-Blaster hotplug script
# Allow any user to access the cable
chmod 666 $DEVICE
```

3. Make the file executable.
4. Complete your installation by setting up the programming hardware in the Quartus II software as described in the following section.

Refer to www.altera.com/support/software/drivers for more information on USB-Blaster driver installation.

For Red Hat Enterprise 5

1. Create a file named **/etc/udev/rules.d/51-usbblaster.rules** and add the following lines to it. Take note that after `#USB-Blaster`, all code must be in one line.

```
# USB-Blaster

BUS=="usb", SYSFS{idVendor}=="09fb", SYSFS{idProduct}=="6001",
MODE="0666", PROGRAM="/bin/sh -c 'K=%k; K=$${K#usbdev}; printf
/proc/bus/usb/%%03i/%%03i $${K%%%%.*} $${K#*.}'", RUN+="/bin/chmod 0666
%c"
```

2. Complete your installation by setting up the programming hardware in the Quartus II software as described in the "Setting Up the USB-Blaster Hardware in the Quartus II Software".

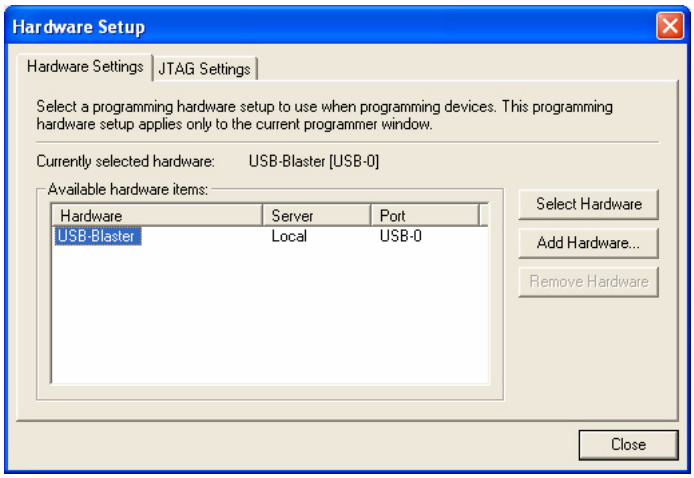
For more information about USB-Blaster driver installation, refer to www.altera.com/support/software/drivers.

Setting Up the USB-Blaster Hardware in the Quartus II Software

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

1. Start the Quartus II software.
2. Choose **Programmer** (Tools menu).
3. Click **Hardware Setup**. The **Hardware Settings** tab of the **Hardware Setup** dialog box is displayed (Figure 1–2).

Figure 1–2. Hardware Setup Dialog Box



4. From the drop-down menu, select **USB-Blaster [USB-0]** (Figure 1–2).
5. Click **Close** to close the **Hardware Setup** dialog box.
6. In the **Mode** list, select the desired mode (Programmer window). Table 1–1 describes each mode.

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

Table 1–1. Programming Modes

Mode	Mode Description
Joint Test Action Group (JTAG)	Programs or configures all Altera devices supported by Quartus II software, excluding FLEX 6000 and EPCS serial configuration devices.
In-Socket Programming	Not supported by the USB-Blaster.
Passive Serial Programming	Configures all Altera devices supported by Quartus II software excluding MAX 3000, MAX 7000, MAX II, EPC enhanced configuration devices, and EPCS serial configuration devices.
Active Serial Programming	Programs a single EPCS1, EPCS4, EPCS16, EPCS64, or EPCS128 serial configuration device.

For details about programming devices and creating secondary programming files, see the *Programming & Configuration* chapter of the *Introduction to Quartus II Handbook*.

For details about the Quartus II Programmer, refer to the *Quartus II Programmer* chapter in volume 3 of the *Quartus II Handbook*.

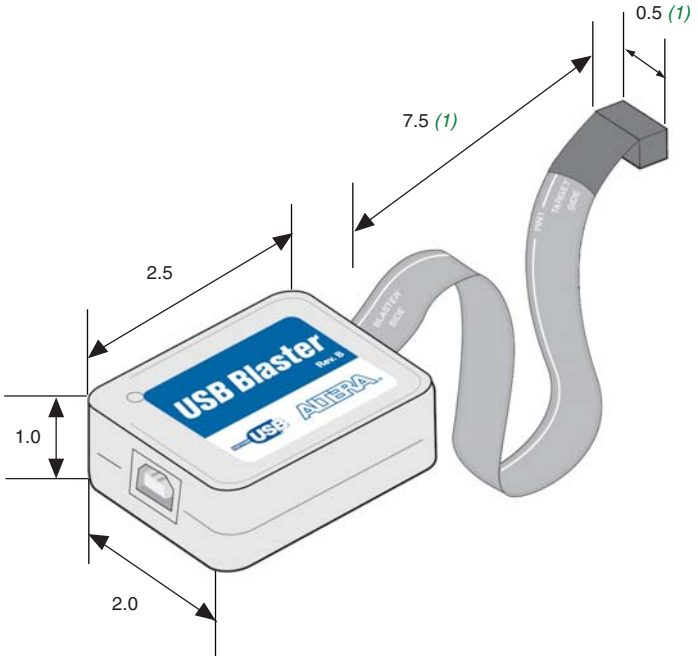
For more information, refer to the Programming module of the Quartus II software online tutorial and the following topics in the Quartus II Help:

- Changing the Hardware Setup
- Programmer Introduction
- Overview: Working with Chain Description Files
- Overview: Converting Programming Files

USB-Blaster Plug Connection

The 10-pin female plug connects to a 10-pin male header on the circuit board containing the target device. Figure 2–2 shows the dimensions of the USB-Blaster, and Figure 2–3 shows the dimension of the female plug.

Figure 2–2. USB-Blaster Dimension

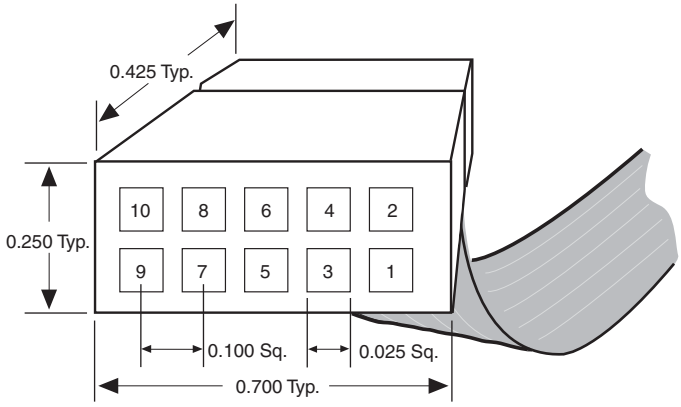


Dimensions are shown in inches.

Note to Figure 2–2:

(1) For Rev. B and Rev. C.

Figure 2–3. USB-Blaster 10-Pin Female Plug Dimensions



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

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

Table 2–2. USB-Blaster Female Plug Signal Names & Programming Modes

Pin	AS Mode		PS Mode		JTAG Mode	
	Signal Name	Description	Signal Name	Description	Signal Name	Description
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 control
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-Blaster cable for the I/O drivers.

Circuit Board Header Connection

The circuit board's 10-pin male header, which connects to the USB-Blaster 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 2–4 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 2–4. 10-Pin Male Header Dimensions