



APEX DSP Development Kit

Getting Started

User Guide
November 2001



101 Innovation Drive
San Jose, CA 95134
(408) 544-7000
<http://www.altera.com>

A-UG-APEXDSPKIT-1.1
P25-06920-01

Copyright © 2001 Altera Corporation. Altera, The Programmable Solutions Company, the stylized Altera logo, specific device designations, and all other words and logos that are identified as trademarks and/or service marks are, unless noted otherwise, the trademarks and service marks of Altera Corporation in the U.S. and other countries. All other product or service names are the property of their respective holders. Altera products are protected under numerous U.S. and foreign patents and pending applications, maskwork rights, and copyrights. Altera warrants performance of its semiconductor products to current specifications in accordance with Altera's standard warranty, but reserves the right to make changes to any products and services at any time without notice. Altera assumes no responsibility or liability arising out of the application or use of any information, product, or service described herein except as expressly agreed to in writing by Altera Corporation. Altera customers are advised to obtain the latest version of device specifications before relying on any published information and before placing orders for products or services. All rights reserved.



This user guide provides comprehensive information about the Altera® APEX™ DSP development kit (starter and professional versions).

Table 1 shows the user guide revision history.



Refer to the APEX DSP development kit readme file on the *APEX DSP Development Kit CD-ROM* for late-breaking information that is not available in this user guide.

Table 1. User Guide Revision History

Date	Description
October 2001	Added DSP Builder information to the user guide.
August 2001	First version of user guide.

How to Find Information

- The Adobe Acrobat Find feature allows you to search the contents of a PDF file. Click on the binoculars icon in the top toolbar to open the Find dialog box.
- Bookmarks serve as an additional table of contents.
- Thumbnail icons, which provide miniature previews of each page, provide a link to the pages.
- Numerous links, shown in green text, allow you to jump to related information.

How to Contact Altera

For the most up-to-date information about Altera products, go to the Altera world-wide web site at <http://www.altera.com>.

For technical support on this product, send e-mail to dsp@altera.com. For additional information about Altera products, consult the sources shown in [Table 2](#).



Information Type	Access	USA & Canada	All Other Locations
Altera Literature Services	Electronic mail	lit_req@altera.com (1)	lit_req@altera.com (1)
Non-technical customer service	Telephone hotline	(800) SOS-EPLD	(408) 544-7000 (7:30 a.m. to 5:30 p.m. Pacific Time)
	Fax	(408) 544-7606	(408) 544-7606
Technical support	Telephone hotline	(800) 800-EPLD (6:00 a.m. to 6:00 p.m. Pacific Time)	(408) 544-7000 (1) (7:30 a.m. to 5:30 p.m. Pacific Time)
	Fax	(408) 544-6401	(408) 544-6401 (1)
	Electronic mail (DSP questions)	dsp@altera.com	dsp@altera.com
	FTP site	ftp.altera.com	ftp.altera.com
General product information	Telephone	(408) 544-7104	(408) 544-7104 (1)
	World-wide web site	http://www.altera.com	http://www.altera.com

Note:

(1) You can also contact your local Altera sales office or sales representative.

Typographic Conventions

The *APEX DSP Development Kit Getting Started User Guide* uses the typographic conventions shown in [Table 3](#).

Visual Cue	Meaning
Bold Type with Initial Capital Letters	Command names, dialog box titles, checkbox options, and dialog box options are shown in bold, initial capital letters. Example: Save As dialog box.
bold type	External timing parameters, directory names, project names, disk drive names, filenames, filename extensions, and software utility names are shown in bold type. Examples: f_{MAX} , \QuartusII directory, d: drive, chiptrip.gdf file.
Bold italic type	Book titles are shown in bold italic type with initial capital letters. Example: <i>1999 Device Data Book</i> .
Italic Type with Initial Capital Letters	Document titles are shown in italic type with initial capital letters. Example: <i>AN 75 (High-Speed Board Design)</i> .
Italic type	Internal timing parameters and variables are shown in italic type. Examples: <i>t_{PIA}</i> , <i>n + 1</i> . Variable names are enclosed in angle brackets (<>) and shown in italic type. Example: <i><file name></i> , <i><project name>.pof</i> file.
Initial Capital Letters	Keyboard keys and menu names are shown with initial capital letters. Examples: Delete key, the Options menu.
“Subheading Title”	References to sections within a document and titles of Quartus II Help topics are shown in quotation marks. Example: “Configuring a FLEX 10K or FLEX 8000 Device with the BitBlaster™ Download Cable.”
Courier type	Signal and port names are shown in lowercase Courier type. Examples: data1, tdi, input. Active-low signals are denoted by suffix n, e.g., resetn. Anything that must be typed exactly as it appears is shown in Courier type. For example: c:\quartusII\qdesigns\tutorial\chiptrip.gdf. Also, sections of an actual file, such as a Report File, references to parts of files (e.g., the AHDL keyword SUBDESIGN), as well as logic function names (e.g., TRI) are shown in Courier.
1., 2., 3., and a., b., c.,...	Numbered steps are used in a list of items when the sequence of the items is important, such as the steps listed in a procedure.
■	Bullets are used in a list of items when the sequence of the items is not important.
✓	The checkmark indicates a procedure that consists of one step only.
	The hand points to information that requires special attention.
↵	The angled arrow indicates you should press the Enter key.
	The feet direct you to more information on a particular topic.



Notes:



About this User Guide	iii
How to Contact Altera	iv
Typographic Conventions	v
About this Kit	9
Getting Started	11
Before You Begin	11
APEX DSP Development Kit (Professional Version) Contents	11
APEX DSP Development Kit (Starter Version) Contents	11
Inspect the Board	12
Software Requirements	12
Important Considerations	13
Quartus II Limited Edition System Requirements (Included with the Starter Version Only)	13
Software Installation	14
Installing the Quartus II Limited Edition Software (Included with the Starter Version Only)	14
Installing the MegaCore Functions & Reference Designs/Labs	14
Install the DSP Builder	15
Set Up Licensing	16
Install the Starter Kit License	16
Windows NT	17
Windows 2000	17
Windows 98	17
Install the Professional Kit License	18
Connect the Cables to the Board & PC	18
ByteBlasterMV Cable	19
RS-232 Cable	20
SMA Cable	20
Power Supply Cable	20
Run the Filtering Design	21
Using the Reference Designs/Labs	23
Documentation	24

Appendix—Installing the ByteBlaster Driver25
 Install the Altera ByteBlaster Driver for Windows NT25
 Installing the Altera ByteBlaster Driver for Windows 200026
 Set Up the ByteBlasterMV Download Cable in the Quartus II Software27

The Altera® APEX™ DSP development kit provides everything you need to develop complete system-on-a-programmable-chip (SOPC) solutions. This document describes how to install the software provided with the kit and how to connect the cables to the APEX DSP development board.

Figure 1 shows the kit contents.

Figure 1. APEX DSP Development Kit

The DSP Builder CD-ROM and the Quartus® II Limited Edition CD-ROM (only provided with the starter version of the kit) and additional power cables are not shown.



The APEX DSP development kit includes:

- **APEX DSP Development Board**—The APEX DSP development board is a prototyping platform that provides wireless system designers with a solution for signal processing design. The professional board in the kit has an APEX EP20K1500E device; the starter board in the starter version of the kit has an APEX EP20K200E device.

- *DSP Builder: Quartus II & MATLAB/Simulink Interface*—DSP system design in Altera devices requires both high-level algorithms and hardware description language (HDL) development tools. Altera's DSP Builder integrates these tools by combining the algorithm development, simulation, and verification capabilities of The MathWorks MATLAB and Simulink system-level design tools with HDL synthesis, simulation, and Altera development tools. The DSP Builder shortens DSP design cycles by helping you create the hardware representation of a DSP design in an algorithm-friendly development environment. DSP Builder allows system, algorithm, and hardware designers to share a common development platform.
- *Quartus II Limited Edition Development Software*—The Quartus II development software provides a comprehensive environment for SOPC design. The Quartus II software integrates into nearly any design environment, with interfaces to industry-standard EDA tools. You can obtain a license for the software from the Altera web site.



The APEX DSP development kit (starter version) includes the Quartus II Limited Edition software; the professional version of the kit requires that you purchase a full version of the software.

- *Evaluation MegaCore® IP Functions*—The kit contains evaluation versions of Altera DSP MegaCore functions. You can evaluate the functions using the OpenCore® feature, which lets you quickly and easily verify the functionality of an IP function, and evaluate its size and speed before making a purchase decision. Additionally, these functions have the OpenCore Plus hardware evaluation feature, which allows you to generate time-limited programming files for prototyping and board-level simulation. You can obtain a license to enable the OpenCore Plus feature from the Altera web site.



The OpenCore Plus hardware evaluation feature is an evaluation tool for prototyping only. You must purchase a license to use an Altera IP function in production designs.

- *Reference Designs/Labs*—Altera provides three labs and a reference design with the APEX DSP development kit to help you get started building applications. See [“Using the Reference Designs/Labs” on page 23](#) for more information on the labs provided.

Before You Begin

Before using the kit or installing the software, be sure to check the contents of the kit and inspect the board to verify that you received all of the items. If any of these items are missing, contact Altera before you proceed. You should also verify that your PC meets the software and system requirements of the kit.

APEX DSP Development Kit (Professional Version) Contents

The professional kit contains the following items:

- APEX DSP development board with an EP20K1500E device
- ByteBlasterMV cable
- Power cable and adapters for North America, Europe, United Kingdom, and Japan
- SMA cable
- RS-232 cable
- *APEX DSP Development Kit CD-ROM*
- *DSP Builder: Quartus II & MATLAB/Simulink Interface CD-ROM*
- *The MathWorks Product & Documentation CDs*


APEX DSP Development Kit (Starter Version) Contents

The starter kit contains the following items:

- APEX DSP development board with an EP20K200E device
- ByteBlasterMV cable
- Power cable and adapters for North America, Europe, United Kingdom, and Japan
- SMA cable
- RS-232 cable
- *APEX DSP Development Kit CD-ROM*
- *DSP Builder: Quartus II & MATLAB/Simulink Interface CD-ROM*
- *The MathWorks Product & Documentation CDs*
- *Quartus II Limited Edition Development Software CD-ROM*

Inspect the Board

Place the board on an anti-static surface and inspect it to ensure that it has not been damaged during shipment. Verify that all components are on the board and appear intact. (For the APEX DSP development board starter version, the memory sockets at U14 and U23 and the 12-bit A/D sockets at U11 and U21 are unpopulated.)

 The board can be damaged without proper anti-static handling. Therefore, you should take anti-static precautions before handling the board.




Refer to the *APEX DSP Development Board (Professional Version) Data Sheet* or the *APEX DSP Development Board (Starter Version) Data Sheet*—which are available on the *APEX DSP Development Kit CD-ROM*—for information on the board components and their location.

Software Requirements

You should install the following software before you begin developing designs for the kit.

- Quartus II software version 1.1 or later (the limited edition provided with the starter kit, the web edition, or a purchased version). See [“Installing the Quartus II Limited Edition Software \(Included with the Starter Version Only\)”](#) on page 14.

 To develop designs for the professional kit only, you must have purchased the Quartus II version 1.1 software. Contact your local Altera sales representative if you do not have the software.

- Internet Explorer 4.01 with Service Pack 2 or later to use Quartus II Help. You need a web browser to register the Quartus II software and request license files.
- Altera recommends that you install the software on the *APEX DSP Development Kit CD-ROM*. See [“Installing the MegaCore Functions & Reference Designs/Labs”](#) on page 14.
- DSP Builder requires the following software:
 - MATLAB version 6.0 or later
 - Simulink version 4.0 or later
 - A VHDL synthesis tool that is fully compliant with the VHDL 93 specification
 - Quartus II version 1.1 or later

To use DSP Builder's automated Tcl script flows, you must use the following software in addition to the required software above (refer to the DSP builder user guide for a description of these flows):

- Synplify version 6.1 or later *or* LeonardoSpectrum version 2000.01b or later
- ModelSim version 5.5 or later



If you want to target Altera APEX II devices, you must use Synplify version 7.0 or LeonardoSpectrum version 2001.1d.

Important Considerations

- You need your network identification card (NIC) ID for licensing the Quartus II software and to enable the OpenCore Plus feature for the IP functions. Refer to the following URL for instructions on finding your NIC ID:

<http://www.altera.com/support/licensing/ip/lic-ipm-dsp.jsp>

- You need administrative privileges to install parts of the Quartus II software on Windows NT or Windows 2000.

Quartus II Limited Edition System Requirements (Included with the Starter Version Only)

To use the APEX DSP development kit with the Quartus II Limited Edition software (provided with the starter version), your system must meet the following minimum requirements.



Contact your local Altera sales representative for the purchased Quartus II version 1.1 system requirements.

- Pentium II PC running at 400 MHz or faster (faster systems give better performance)
- 512 MBytes of RAM
- 400 MBytes of free hard disk space plus 100 MBytes temporary space
- Microsoft Windows NT version 4.0 (Service Pack 3 or higher), Windows 98, or Windows 2000
- Microsoft Windows-compatible graphics card and SVGA monitor
- Microsoft Windows-compatible 2- or 3-button mouse
- One or more of the following ports:
 - Parallel port for use with the ByteBlasterMV parallel-port download cable
 - (Optional) Serial port for use with an RS-232 cable



Software Installation

Refer to the Quartus II Limited Edition readme file for additional installation, memory, and disk space information.

The APEX DSP development kit contains the Quartus II Limited Edition software (starter version only), the DSP Builder for use with the MATLAB and Simulink software, evaluation MegaCore functions that support the OpenCore Plus feature, and reference designs/labs.

Installing the Quartus II Limited Edition Software (Included with the Starter Version Only)

Follow these instructions to install the software:

1. Insert the *Quartus II Limited Edition Development Software CD-ROM* into your CD-ROM drive. The Setup program starts automatically and guides you through the installation process.



If the Setup program is not already running, you can start it manually. Choose **Run** (Windows Start menu), type the following command, and click **OK**:

```
<CD-ROM drive>:\install.exe ←
```

2. Click the **Install Quartus II Limited Edition Software** button.
3. After the software finishes installing, you must request and install a license to enable it. See [“Set Up Licensing” on page 16](#) for more information.

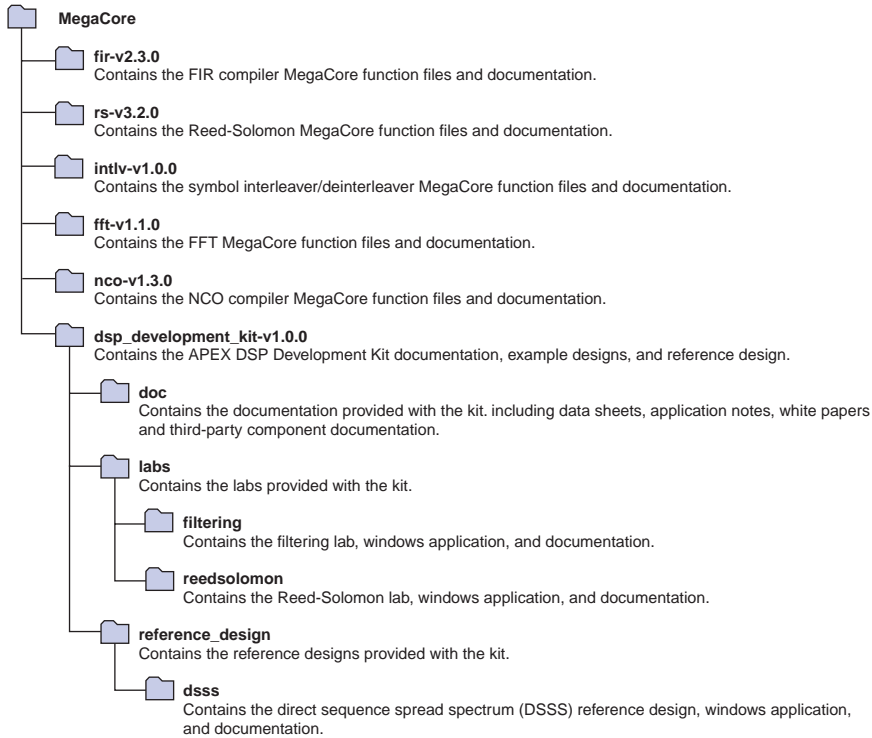
Installing the MegaCore Functions & Reference Designs/Labs

To install the MegaCore functions and reference designs:

- ✓ Insert the *APEX DSP Development Kit CD-ROM* into your CD-ROM drive. The installation program runs automatically.

The MegaCore functions with the OpenCore Plus feature and the reference designs/labs are installed. [Figure 1](#) shows the directory structure.

Figure 1. APEX DSP Development Kit Directory Structure



Install the DSP Builder

Follow these instructions to install the DSP Builder:

1. Insert the *DSP Builder: Quartus II & MATLAB/Simulink Interface CD-ROM* into your CD-ROM drive. The installation program runs automatically.



If the installation program does not run automatically, perform the following steps to run it manually.

- a. Choose **Run** (Windows Start menu).
 - b. Type `<CD-ROM drive>:\DSPBuilder.exe` in the **Open** box.
 - c. Click **OK**. The installation program opens.
2. Follow the instructions in the installation program.



Refer to the *DSP Builder Quartus II & MATLAB/Simulink Interface User Guide* for information on the DSP Builder directory structure.

The *DSP Builder Quartus II & MATLAB/Simulink Interface User Guide* also includes a tutorial that describes how to create a design in Simulink and then convert it to VHDL for synthesis, Quartus II compilation, and RTL simulation. See page 18 in the user guide.

Set Up Licensing

Before using the Quartus II Limited Edition software (starter kit only), DSP Builder, or the OpenCore Plus feature of the evaluation MegaCore functions, you must request a license file from the Altera web site at <http://www.altera.com/licensing> and install it on your PC. When you request a license file, Altera e-mails you a **license.dat** file that enables the software.

To obtain a license, perform the following steps:

1. Point your web browser to the Altera web site at <http://www.altera.com/licensing>.
2. Click the APEX™ DSP Development Kit Licensing - Starter Version or APEX™ DSP Development Kit Licensing - Professional Version link, depending on which version of the kit you have.
3. Follow the on-line instructions to request your license. A license file is e-mailed to you.
4. To install your license, continue to “Install the Starter Kit License” or “Install the Professional Kit License”, depending on which kit you have.

Install the Starter Kit License

Before installing your license, close the following software if it is running on your PC:

- Quartus II
- MAX+PLUS II
- MATLAB and Simulink
- LeonardoSpectrum
- Synplify
- ModelSim

To install your license, perform the steps for your platform.

Windows NT

1. Choose **Settings > Control Panel** (Windows Start menu).
2. Double-click the System icon in the **Control Panel** window.
3. In the **System Properties** dialog box, click the **Environment** tab.
4. Click the **System Variable** list to highlight it, and then in the **Variable** box, type `LM_LICENSE_FILE`.
5. In the **Value** box, type `<path to license file>\license.dat`.
6. Click **OK**.

Windows 2000

1. Choose **Settings > Control Panel** (Windows Start menu).
2. Double-click the System icon in the **Control Panel** window.
3. In the **System Properties** dialog box, click the **Advanced** tab.
4. Click the **Environment Variables** button.
5. Click the **System Variable** list to highlight it, and then click **New**.
6. In the **Variable Name** box, type `LM_LICENSE_FILE`.
7. In the **Variable Value** box, type `<path to license file>\license.dat`.
8. Click **OK**.

Windows 98


1. With a text editor, open your PC's **autoexec.bat** file.
2. Type the following environment variable on its own line in the **autoexec.bat** file:

```
set LM_LICENSE_FILE=<path to license file>\license.dat
```

3. Save the **autoexec.bat** file.
4. Restart the PC.

Install the Professional Kit License


To install your license, perform the following steps.

 Before installing your license, you must already have installed a full version of the Quartus II software and set up licensing for it.

1. Close the following software if it is running on your PC:
 - Quartus II
 - MAX+PLUS II
 - MATLAB and Simulink
 - LeonardoSpectrum
 - Synplify
 - ModelSim
2. Open your DSP Builder/OpenCore Plus license file in a text editor. The file should contain two `FEATURE` line, spanning 2 lines, one for DSP Builder and one to enable the OpenCore Plus feature.
3. Open your Quartus II `license.dat` file in a text editor.
4. Copy the `FEATURE` lines from the DSP Builder/OpenCore Plus license file and paste them into the Quartus II license file.

 Do not delete any `FEATURE` lines from the Quartus II license file.


5. Save the Quartus II license file.

 When using editors such as Microsoft Word or Notepad, ensure that the file does not have extra extensions appended to it after you save (e.g., `license.dat.txt` or `license.dat.doc`). Verify the filename in a DOS box or at a command prompt.

Connect the Cables to the Board & PC

The instructions in this section explain how to set up the following hardware:

- ByteBlasterMV cable
- RS-232 cable
- Power supply cable
- SMA cable

 Before connecting the cables, shut down and power off your PC. Turn on your PC when you are finished connecting the cables (ByteBlasterMV and/or RS-232) to it.

ByteBlasterMV Cable

The board supplies power to the ByteBlasterMV download cable. Connect the ByteBlasterMV cable to one of two headers on the board, depending on which device you want to configure/program.

- ✓ Connect the ByteBlasterMV cable's 10-pin female plug to the APEX device JTAG header on the board (J8) and connect the other end to your PC to configure the APEX device directly using an SRAM Object File (.sof). See [Figure 2](#).



The labs provided in this kit include SOFs for configuring the APEX device directly.

or

- ✓ Connect the ByteBlasterMV cable's 10-pin female plug to the EPC16 JTAG header on the board (JP7) and connect the other end to your PC to program the EPC16 device using a Programmer Object File (.pof). The EPC16 device configures the APEX device when power to the board is turned off and then on again.

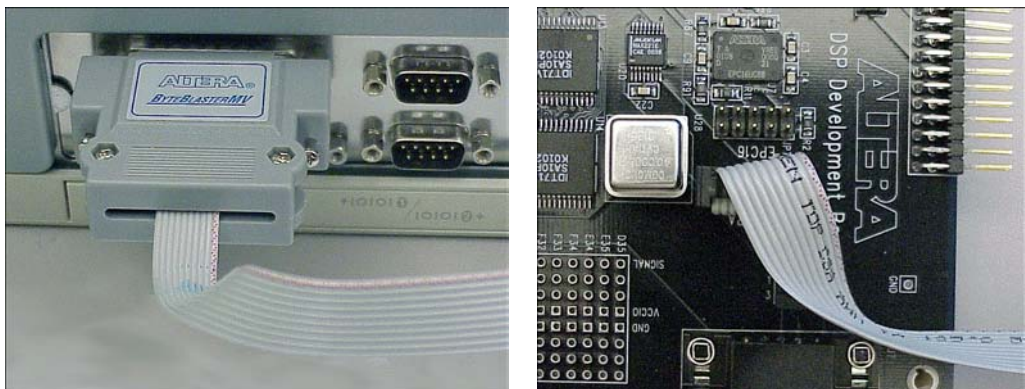


Align the ByteBlasterMV connector so that the red stripe is oriented towards the Altera logo on the board.



Refer to the *APEX DSP Development Board (Professional Version) Data Sheet* or the *APEX DSP Development Board (Starter Version) Data Sheet* for more information on how to configure the APEX device on the board. Refer to *AN 116 (Configuring APEX 20K, FLEX 10K & FLEX 6000 Devices)* for more information on configuring Altera devices.

Figure 2. Connect the ByteBlasterMV Cable to the Board



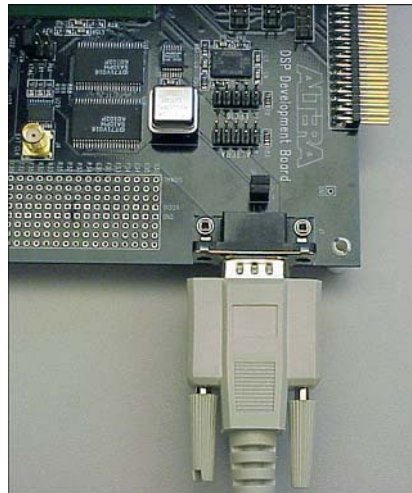
RS-232 Cable

Attach the serial cable to one of the serial ports on your PC and to the RS-232 male connector at J7 on the board. See [Figure 3](#).



For the APEX DSP board to communicate with the PC via the RS-232 cable, RS-232 interface logic must be implemented in the Altera device on the board.

Figure 3. Connect the RS-232 Cable



SMA Cable

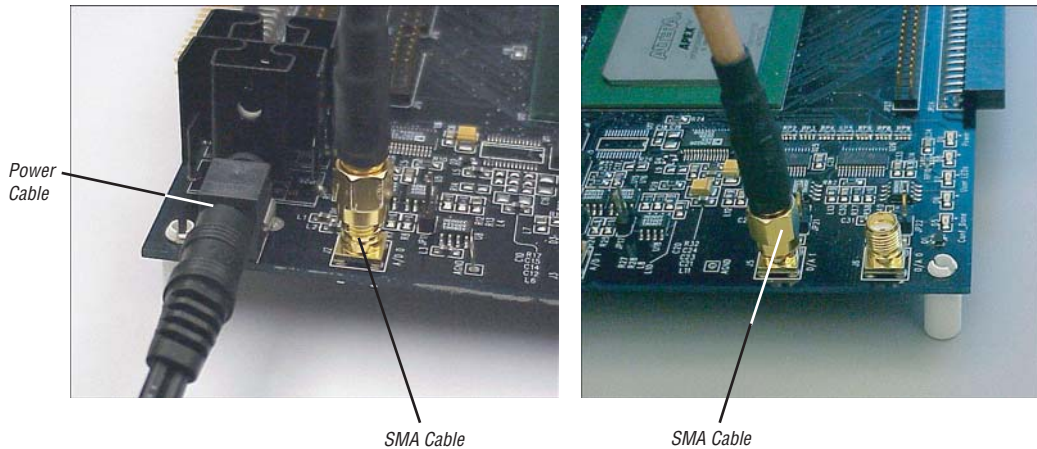
Connect both ends of the SMA cable to the APEX DSP development board. This cable connects the digital-to-analog (D/A 0 and D/A 1) and analog-to-digital (A/D 0 and A/D 1) connectors on the board.

Power Supply Cable

Connect the power cable to the board as shown in [Figure 4 on page 21](#) and plug the other end into a power outlet.

After the board powers-up, the EPC16 configuration device, which ships pre-programmed with a filtering design, automatically configures the APEX 20KE device. The CONF_DONE LED turns on signifying that the APEX device is configured.

Figure 4. Connect the SMA Cable



Run the Filtering Design

The board comes pre-programmed with a filtering design. After connecting the cables to the board, you can run the filtering design. Additionally, Altera provides a Windows application for the filtering design that lets you view the unfiltered and filtered signals without an oscilloscope. To run the Windows application, perform the following steps:

1. Press push-button SW1 or SW2 to make the user LED 2 (D8) blink, verifying that the filtering design is loaded into the board.
2. Connect the SMA cable to D/A 1 and A/D 1. See [Figure 4 on page 21](#).
3. Choose **Run** (Windows Start menu).
4. Click **Browse**.
5. Browse to the `c:\MegaCore\dsp_development_kit-v1.0.0\labs\filtering\application` directory. (If you did not install the software in the default location, adjust the path accordingly.)
6. Select the file **Filter_App.exe**.
7. Click **Open**.
8. Click **OK**. The **Filter_app** window opens.

9. If you connected the RS-232 cable to a port other than COM 1, choose the port in the Serial Port menu.
10. Choose **Load Nios** (Processor menu).
11. Select the file **disp.srec**.
12. Click **Open**. The program is loaded into the Nios embedded processor on the board.



If you receive the message **Nios not loaded**, push **SW0** on the board, press the push-button switch **SW0** and then click **OK** in the message box. If the Nios program does not load after pressing **SW0** and clicking **OK**, refer to the kit readme file for troubleshooting information.

13. If you are using the professional board, choose **1500E** (Board menu). If you are using the starter board, the **200E** option, which enables the starter board, is turned on by default.



If you are using the starter board and **200E** is selected in the Board menu, do not select it again. If you do so, the application selects the **1500E** instead.

14. Enter 1000000 (6 zeros) in the **frequency 1** box and click **Apply** to set the NCO 1 frequency.
15. Enter 10000000 (7 zeros) in the **frequency 2** box and click **Apply** to set the NCO 2 frequency. Leave all other settings as is.
16. Click **Get Data**. The NCO frequencies 1 and 2 are added together.
17. Turn on the **On/Off** option under **Filter**.
18. Click **Get Data**.
19. The display in the **Signal** tab, which is selected by default, shows the filtered data in time. Click the **Spectrum Analysis** tab to view the frequency domain.



Refer to the following documents for more information:

- Refer to the *Filtering Lab White Paper*, which is located in the `c:\MegaCore\dsp_development_kit-v1.0.0\labs\filtering\doc` directory, for more information on the filtering design and lab.
- Refer to the *APEX DSP Development Board (Professional Version) Data Sheet* or the *APEX DSP Development Board (Starter Version) Data Sheet*—which are available in the `c:\MegaCore\dsp_development_kit-v1.0.0\doc` directory—for instructions on how to program the board with your own design.

Using the Reference Designs/Labs

Altera provides three labs and one reference design with the APEX DSP development kit to help you get started building applications. Refer to the white papers for each design, which are located in each design's `doc` directory, for background information and lab exercises.

- *Filtering Design*—This design uses two numerically controlled oscillator (NCO) functions to generate two sine waves. The design filters out one of the sine waves. This design uses a compiled Windows application to communicate with the APEX DSP development board. The filtering design is loaded into the APEX DSP development board when you receive the kit.
- *Reed-Solomon Design*—This design consists of a Windows application in which you specify a picture to transmit over a channel using the Reed-Solomon MegaCore function. You can use the application to alter the type and intensity of errors inserted into the data as it passes through the channel. The DSP development board implements the hardware portion of the design, which includes the encoder, decoder, and channel. The demonstration runs at 33 MHz.
- *Direct Sequence Spread Spectrum (DSSS) Design*—The DSSS digital modem reference design modulates direct sequence spread data onto an IF carrier. The modulated data is input to a channel model and passed to a digital receiver, which demodulates and recovers the data from the received IF signal. The reference design also implements a UART and an interface between it and the DSSS modem to allow communication between the APEX DSP development board and your PC.

Documentation

The *APEX DSP Development Kit CD-ROM* contains the following documentation:

- *APEX DSP Development Board (Starter Version) Data Sheet* and *APEX DSP Development Board (Professional Version) Data Sheet*—These data sheets describe the specifications of the starter and professional board, respectively. They also describe how to load design data into the APEX device on the board.
- *AN 176: OpenCore Plus Hardware Evaluation*—This application note describes the OpenCore Plus hardware evaluation feature and how to use it with Altera MegaCore functions.
- *OpenCore Plus Hardware Evaluation with the APEX DSP Development Kit White Paper*—This white paper describes the operation of the evaluation MegaCore functions provided in the kit when performing OpenCore Plus hardware evaluation.
- *Filtering Lab White Paper, DSSS Modem Lab White Paper, and Reed-Solomon Lab White Paper*—These white papers describe how to perform the labs provided with the kit. The white papers are located in the **doc** directory in each lab directory.
- *Data sheets and application notes for Altera products*—The kit contains specification and how-to documentation for the APEX and EPC16 devices on the board and the ByteBlasterMV cable.
- *Documentation for board components*—The kit contains documentation for the components used on the APEX DSP boards. Refer to the component manufacturer's web site for the most up-to-date versions of this documentation.

You can use the ByteBlasterMV download cable to configure the APEX 20K device or to program the EPC16 configuration device on the APEX DSP development board. You can connect the ByteBlasterMV download cable directly to your PC's parallel port, or through an Altera Software Guard that is connected to the parallel port.

To install the ByteBlasterMV download cable, you must perform the following steps, each of which are described in more detail in this section:

1. Install the Altera ByteBlaster driver (for PCs running Windows NT version 4.0 or Windows 2000 only; you do not need to install the driver if you have a PC running Windows 98).
2. Set up the ByteBlasterMV download cable in the Quartus II software.

The Altera ByteBlaster driver is required for PCs running Windows NT 4.0 that use the ByteBlasterMV download cable. You must install the Altera ByteBlaster driver separately from the Quartus II software.



You do not need to install the ByteBlasterMV download cable before installing the Altera ByteBlaster driver.

Installing the Altera ByteBlaster driver requires that you have system administration (Administrator) privileges.

To install the Altera ByteBlaster driver for Windows NT, follow these steps:

1. Choose **Settings > Control Panel** (Windows Start menu).
2. In the Control Panel window, double-click the **Multimedia** icon.
3. In the **Multimedia Properties** dialog box, click the **Devices** tab, and click **Add**.
4. In the **List of Drivers** list, select **Unlisted or Updated Driver** and click **OK**.

Install the Altera ByteBlaster Driver for Windows NT

5. In the **Install Driver** dialog box, type `<disk drive>:\quartus\drivers` or select the name with **Browse** to specify the Quartus II software **drivers** directory.
6. Click **OK**.
7. In the **Add Unlisted or Updated Driver** dialog box, select **Altera ByteBlaster**.
8. To restart your computer, click **Restart Now**.

Installing the Altera ByteBlaster Driver for Windows 2000

The Altera ByteBlaster driver is required for PCs running Windows 2000 that use the ByteBlasterMV download cable. You must install the Altera ByteBlaster driver separately from the Quartus II software.



You do not need to connect the ByteBlasterMV download cable to the board before installing the Altera ByteBlaster driver.

Installing the Altera ByteBlaster driver requires that you have system administration (Administrator) privileges.

To install the ByteBlaster driver for Windows 2000, follow these steps:

1. Choose **Settings > Control Panel** (Windows Start menu).
2. In the **Control Panel** window, double-click the **Add/Remove Hardware** icon and click **Next**.
3. In the **Choose a Hardware Task** dialog box, select **Add/Troubleshoot a device** and click **Next**.
4. In the **Choose a Hardware Device** dialog box, select **Add a new device** and click **Next**.
5. In the **Find New Hardware** dialog box, select **No, I want to select the hardware from a list** and click **Next**.
6. In the **Hardware Type** dialog box, select **Sound, video and game controllers** and click **Next**.
7. In the **Select a Device Driver** dialog box, select **Standard System Devices** in the left-hand column and then select **Media Control Devices** in the right-hand column.
8. Click **Have disk**.

9. Use **Browse (...)** to specify the full directory path to the **win2000.inf** file (for example, **\quartus\drivers\win2000**) and click **OK**.
10. In the **Digital Signature Not Found** dialog box, click **Yes**.
11. In the **Select a Device Driver** dialog box, select **ByteBlasterMV** and click **Next**.
12. In the **Start Hardware Installation** dialog box, click **Next**.
13. In the **Digital Signature Not Found** dialog box, click **Yes**.
14. In the **Completing the Add/Remove Hardware Wizard** dialog box, click **Finish**.
15. To restart your computer, click **Restart Now**.

Set Up the ByteBlasterMV Download Cable in the Quartus II Software

To set up the ByteBlasterMV parallel port download cable in the Quartus II software for device configuration or programming, follow these steps:

1. Open the Quartus II Programmer:
 - ✓ Choose **Open Programmer** (Processing menu).
 - or*
 - ✓ Choose **New** (File menu). Click the **Other Files** tab, select **Chain Description File**, and click **OK**.
2. In the Programmer window, under **Programming Hardware**, click **Setup**. The **Programming Hardware Setup** dialog box displays.
3. Click **Add**. The **Add Hardware** dialog box displays.
4. In the **Hardware Type** list, select **ByteBlasterMV**.
5. In the **Port** list, select the appropriate port.
6. Click **OK**.



For more information about the ByteBlasterMV parallel port download cable, refer to the *ByteBlasterMV Parallel Port Download Cable Data Sheet*.



Notes: