Altera Programming Hardware

September 2005, ver. 5.3 Data Sheet

General Description

Altera offers a variety of hardware to program and configure Altera® devices. For conventional device programming, in-system programming, and in-circuit reconfiguration, designers can choose from the hardware options shown in Table 1. These options are described in more detail in subsequent sections.

Table 1. Available Hardware Options for Altera Device Programming & Configuration

	External Programming Hardware *(1)*	MasterBlaster Communications Cable	ByteBlasterMV Parallel Download Cable
Conventional device programming	✓		
In-system programming		✓	✓
In-circuit reconfiguration		✓	✓

Note:
(1) External programming hardware includes the USB- and RS-232-based Altera Programming Unit (APU) or the ISA bus-based Master Programming Unit (MPU).

External Programming Hardware

Altera provides the following external programming hardware:

- Altera Programming Unit
- Altera Stand-Alone Programmer
- Logic Programmer Card
- Master Programming Unit
- Programming adapters

Altera Programming Unit

The APU is a hardware module that is used together with an appropriate adapter to program Altera devices. The APU connects to a PC via the Universal Serial Bus (USB) port and receives power from a standard wall power adapter. Programming and functional test information is transmitted from the PC through the USB port connection to the APU. A programming status light on the APU lights up when the unit is active.

When used with the appropriate adapter, the APU automatically tests for continuity between the device leads and the programming socket before programming. It can also apply test vectors to functionally test and verify programmed Altera devices. Test vectors can be created in waveform or text format in the MAX+PLUS® II Waveform Editor or Text Editor and applied to the device; results can be viewed in waveform or text format. The APU will also be supported by the Quartus™ II development software in the second half of 2001.

Ordering Code: *PL-APU*

Altera Stand-Alone Programmer

The Altera Stand-Alone Programmer (PL-ASAP2), together with the appropriate programming adapters, provides the hardware and software needed for programming EPROM- and EEPROM-based devices and configuring SRAM-based devices. PL-ASAP2 includes an LP6 Logic Programmer Card and MPU, the MAX+PLUS II Programmer software (which requires Microsoft Windows 98, Windows NT, or Windows 2000), and complete documentation. The MAX+PLUS II Programmer software supports device programming for MAX® 9000, MAX 7000, MAX 3000A, Classic™, and configuration devices.

Ordering Code: *PL-ASAP2*

Logic Programmer Card

The LP6 Logic Programmer card generates programming waveforms and voltages for the MPU. The software-controlled card can be installed into any full-length computer expansion slot in an IBM PC or compatible computer. The LP6 card is available as part of PL-ASAP2 or individually.

Ordering Code: *PLP6*

Master Programming Unit

The MPU is a hardware module that is used together with an appropriate adapter to program Altera devices. The MPU connects to a Logic Programmer card via a 25-pin ribbon cable. The MPU receives power from the Logic Programmer card and does not require an external power supply. Programming and functional test information is transmitted from the Logic Programmer card via the 25-pin ribbon cable to the MPU. A programming status light on the MPU lights up when the unit is active.

When used with the appropriate adapter, the MPU automatically tests for continuity between the device leads and the programming socket before programming. It can also apply test vectors to functionally test and verify programmed Altera devices. Test vectors can be created in waveform or text format in the MAX+PLUS II Waveform Editor or Text Editor and applied to the device; results can be viewed in waveform or text format. The MPU is available as part of the PL-ASAP2 or individually.

Ordering Code: *PL-MPU*

Programming Adapters

Altera provides three types of programming adapters for Altera devices: PLM-prefix adapters, PLE-prefix adapters, and the PLAD3-12 compatibility adapter. Each adapter contains one of the following sockets: a zero-insertion-force (ZIF) dual in-line package (DIP), plastic or ceramic J-lead (PLCC/JLCC), pin-grid array (PGA), small-outline integrated circuit (SOIC), or quad flat pack (QFP). Most adapters for QFP devices with 100 or more pins support Altera's QFP carriers. Adapters with an "NC" suffix program QFP devices that are not in a QFP carrier.

For more information, see the *QFP Carrier & Development Socket Data Sheet*.

Table 2 lists the adapters required for each Altera device and package option. These adapters are supported by both the PL-APU and PL-ASAP2 programmers.

Table 2. Programming Adapters & Hardware Support (Part 1 of 4) *Note (1)*

Device	Package	Adapter	MasterBlaster & ByteBlasterMV Support
APEX™ II	All packages	*(2)*	✓
APEX 20K	All packages	*(2)*	✓
Mercury™	All packages	*(2)*	✓
ARM-based Excalibur™	All packages	*(2)*	✓
MIPS-based Excalibur	All packages	*(2)*	✓
ACEX™ 1K	All packages	*(2)*	✓
FLEX® 10K	All packages	*(2)*	✓
FLEX 8000	All packages	*(2)*	✓
FLEX 6000	All packages	*(2)*	✓
EPC16	Ultra FineLine BGA™ (88-pin)	*(3)*	✓

Table 2. Programming Adapters & Hardware Support (Part 2 of 4) *Note (1)*

Device	Package	Adapter	MasterBlaster & ByteBlasterMV Support
EPC2	J-lead (20-pin) TQFP (32-pin)	PLMJ1213 PLMT1064	✓ ✓
EPC1	DIP (8-pin) J-lead (20-pin)	PLMJ1213 PLMJ1213	– –
EPC1441	DIP (8-pin) J-lead (20-pin) TQFP (32-pin)	PLMJ1213 PLMJ1213 PLMT1064	– – –
EPC1213	DIP (8-pin) J-lead (20-pin)	PLMJ1213 PLMJ1213	– –
EPC1064 EPC1064V	DIP (8-pin) J-lead (20-pin) TQFP (32-pin)	PLMJ1213 PLMJ1213 PLMT1064	– – –
EPM9320 EPM9320A	J-lead (84-pin) RQFP (208-pin) RQFP (240-pin)	PLMJ9320-84 PLMR9000-208NC PLMR9000-208 PLMR9000-240NC PLMR9000-240	✓ ✓ ✓ ✓ ✓
EPM9400 EPM9400A	J-lead (84-pin) RQFP (208-pin) RQFP (240-pin)	PLMJ9400-84 PLMR9000-208NC PLMR9000-208 PLMR9000-240NC PLMR9000-240	✓ ✓ ✓ ✓ ✓
EPM9480 EPM9480A	RQFP (208-pin) RQFP (240-pin)	PLMR9000-208NC PLMR9000-208 PLMR9000-240NC PLMR9000-240	✓ ✓ ✓ ✓
EPM9560 EPM9560A	RQFP (208-pin) RQFP (208-pin) PGA (280-pin) RQFP (304-pin) BGA (256-pin)	PLMR9000-208NC PLMR9000-208 PLMR9000-240NC PLMR9000-240 PLMG9000-280 PLMR9000-304 *(3)*	✓ ✓ ✓ ✓ ✓ ✓ ✓

Table 2. Programming Adapters & Hardware Support (Part 3 of 4) *Note (1)*

Device	Package	Adapter	MasterBlaster & ByteBlasterMV Support
EPM7032	J-lead (44-pin)	PLMJ7000-44	✓
EPM7032V	PQFP (44-pin)	PLMQ7000-44	✓
EPM7032S	TQFP (44-pin)	PLMT7000-44	✓
EPM7032AE			✓
EPM7032B			✓
EPM7064	J-lead (44-pin)	PLMJ7000-44	✓
EPM7064S	TQFP (44-pin)	PLMT7000-44	✓
EPM7064AE	J-lead (68-pin)	PLMJ7000-68	✓
EPM7064B	J-lead (84-pin)	PLMJ7000-84	✓
	Ultra FineLine BGA (49-pin)	*(3)*	✓
	PQFP (100-pin)	PLMQ7000-100NC	✓
		PLMQ7000-100	✓
	TQFP (100-pin)	PLMT7000-100NC	✓
	FineLine BGA (100-pin)	*(3)*	✓
EPM7096	J-lead (68-pin)	PLMJ7000-68	–
	J-lead (84-pin)	PLMJ7000-84	–
	PQFP (100-pin)	PLMQ7000-100	–
EPM7128E	J-lead (84-pin)	PLMJ7000-84	✓
EPM7128S	PQFP (100-pin)	PLMQ7000-100NC	✓
EPM7128A		PLMQ7000-100	✓
EPM7128AE	PQFP (160-pin)	PLMQ7128/7160-160NC	✓
EPM7128B		PLMQ7128/7160-160	✓
	TQFP (144-pin)	*(3)*	✓
	Ultra FineLine BGA (49-pin)	*(3)*	✓
	FineLine BGA (100-pin)	PLMF7000-100	✓
	Ultra FineLine BGA (169-pin)	*(3)*	✓
	FineLine BGA (256-pin)	PLMF7000-256	✓
EPM7160E	J-lead (84-pin)	PLMJ7000-84	✓
EPM7160S	TQFP (100-pin)	PLMT7000-100NC	✓
	PQFP (100-pin)	PLMQ7000-100	✓
	PQFP (160-pin)	PLMQ7128/7160-160NC	✓
		PLMQ7128/7160-160	✓
EPM7192E	PGA (160-pin)	PLMG7192-160	✓
EPM7192S	PQFP (160-pin)	PLMQ7192/7256-160NC	✓
		PLMQ7192/7256-160	✓

Table 2. Programming Adapters & Hardware Support (Part 4 of 4) *Note (1)*

Device	Package	Adapter	MasterBlaster & ByteBlasterMV Support
EPM7256E	TQFP (100-pin)	PLMT7000-100NC	✓
EPM7256S	TQFP (144-pin)	PLMT7000-144NC	✓
EPM7256AE	PGA (192-pin)	PLMG7000-192	✓
EPM7256B	PQFP (160-pin)	PLMQ7192/7256-160NC	✓
		PLMQ7192/7256-160	✓
	RQFP (208-pin)	PLMR7256-208	✓
	PQFP (208-pin)	PLMR7256-208NC	✓
	Ultra FineLine BGA (169-pin)	*(3)*	✓
	FineLine BGA (256-pin)	PLMF7000-256	✓
			✓
EPM7512AE	TQFP (144-pin)	*(3)*	✓
EPM7512B	PQFP (208-pin)	*(3)*	✓
	BGA (256-pin)	*(3)*	✓
	FineLine BGA (256-pin)	*(3)*	✓
	Ultra FineLine BGA (169-pin)	*(3)*	✓
EPM3032A	J-lead (44-pin)	PLMJ3000A-44	✓
	TQFP (44-pin)	PLMT3000A-44	✓
EPM3064A	J-lead (44-pin)	PLMJ3000A-44	✓
	TQFP (44-pin)	PLMT3000A-44	✓
	TQFP (100-pin)	PLMT3000A-100NC	✓
EPM3128A	TQFP (100-pin)	PLMT3000A-100NC	✓
	TQFP (144-pin)	PLMT3000A-144NC	✓
EPM3256A	TQFP (100-pin)	PLMT3000A-100NC	✓
	PQFP (208-pin)	PLMQ3000A-208NC	✓
EP600	DIP (24-pin)	PLED610	–
EP610	J-lead (28-pin)	PLEJ610	–
	SOIC (24-pin)	PLES610	–
EP900	DIP (40-pin)	PLED910	–
EP910	J-lead (44-pin)	PLEJ910	–
EP1810	J-lead (68-pin)	PLMJ1810	–
	PGA (68-pin)	PLEG1810	–

Notes:

(1) Adapters with an NC suffix program QFP devices that are not in QFP carriers.

(2) Configuration of Excalibur, Mercury, APEX II, APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, or FLEX 6000 devices is supported by configuration devices (EPC1064, EPC1064V, EPC1213, EPC1, EPC1441, EPC2, and EPC16), and the MasterBlaster™ or ByteBlasterMV™ download cable.

(3) A MasterBlaster or ByteBlasterMV download cable is used to program this device via in-system programming. For the latest adapter support for this package, go to the Altera web site (**http://www.altera.com**) or contact a local Altera sales office.

PLM-Prefix Adapters

The PLM-prefix adapters plug directly into the APU or MPU. Each adapter provides programming support for a specific device package. Additionally, PLM-prefix adapters (except the PLMJ1213 and PLMT1064) support functional testing of programmed Altera devices. The PLMJ1213 and PLMT1064 adapters can program the configuration devices used to configure Excalibur, Mercury, APEX II, APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, and FLEX 6000 devices.

PLE-Prefix Adapters

The PLE-prefix adapters plug into the PLAD3-12 compatibility adapter, which in turn plugs into the APU or MPU. Each PLE-prefix adapter provides programming support for a specific Classic device.

PLAD3-12 Compatibility Adapter

The PLAD3-12 compatibility adapter plugs directly into the APU or MPU. This compatibility adapter allows PLE-prefix adapters to be used with the APU. See Table 2 on page 3.

Ordering Codes: *PLExxxx, PLMxxxx, PLAD3-12*

MasterBlaster Download Cable

The MasterBlaster download cable is a hardware interface to either a standard PC or UNIX workstation RS-232 port (known as a "COM port" on a PC and a "ttya port" on a UNIX workstation) or a USB port. It provides configuration data to Excalibur, Mercury, APEX II, APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, and FLEX 6000 devices and programming data to MAX 9000, MAX 7000S, MAX 3000A, MAX 7000B, and MAX 7000A devices.

The 25-pin female port on the MasterBlaster download cable connects to an RS-232 port with a standard serial cable, or the MasterBlaster can connect to a USB port. The 10-pin female plug on the MasterBlaster download cable connects to a device on a circuit board via a 10-pin male header. The MasterBlaster cable contains status lights that indicate the state of the device configuration or programming. The MasterBlaster supports the SignalTap® feature, which allows designers to view internal device logic nodes with a virtual logic analyzer.

Ordering Code: *PL-MASTERBLASTER*

For more information, refer to the *MasterBlaster Serial Download Cable Data Sheet*.

ByteBlasterMV Parallel Download Cable

The ByteBlasterMV parallel download cable is a hardware interface to a standard parallel port (also known as an LPT port). This cable channels configuration data to Excalibur, Mercury, APEX II, APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, and FLEX 6000 devices and programming data to MAX 9000, MAX 7000S, MAX 7000B, MAX 7000A, and MAX 3000A devices.

The ByteBlasterMV download cable has a 25-pin male header that connects to the PC parallel port, and a 10-pin female plug that connects to the circuit board. Data is downloaded from the PC's parallel port through the ByteBlasterMV cable to the circuit board.

To configure/program low-voltage devices (e.g., APEX 20K and MAX 7000B devices) using a ByteBlasterMV download cable, connect the cable's VCC pin to a 3.3-V power supply and the device to the appropriate power supply. Altera 1.8-V and 2.5-V devices have 3.3-V tolerant inputs, so the download cable's 3.3-V output will not harm these devices. The pull-up resistors should be connected to the 3.3-V power supply.

Ordering Code: *PL-BYTEBLASTERMV*

For more information, see the *ByteBlasterMV Parallel Download Cable Data Sheet*.

Programming Techniques

Table 3 summarizes Altera device programming/configuration techniques.

Table 3. Programming/Configuration Techniques by Device Family (Part 1 of 2)

Device Family	Programming/Configuration Techniques
Excalibur Mercury APEX II APEX 20K ACEX 1K FLEX 10K	Download configuration data via the MasterBlaster or ByteBlasterMV download cable, or an embedded microprocessor using the JTAG ports
Excalibur Mercury APEX II APEX 20K ACEX 1K FLEX 10K FLEX 8000 FLEX 6000	In passive serial (PS) mode, download configuration data via the MasterBlaster or ByteBlasterMV download cable
	Configure devices via an on-board microcontroller

Table 3. Programming/Configuration Techniques by Device Family (Part 2 of 2)

Device Family	Programming/Configuration Techniques
Excalibur Mercury APEX II APEX 20K ACEX 1K FLEX 10K FLEX 6000	Configure via an EPC2, EPC1, or EPC1441 configuration device
FLEX 8000	Configure via an EPC1, EPC1441, EPC1213, EPC1064, or EPC1064V configuration device
MAX 9000 MAX 7000A MAX 7000B MAX 7000S MAX 3000A	Program devices in-system via the MasterBlaster or ByteBlasterMV download cable and the JTAG ports
	Program via the MPU and the appropriate adapters
	Program via third-party programming hardware
	Program in-system via in-circuit test (ICT) equipment or an on-board microcontroller
MAX 7000 Classic	Program using the MPU and the appropriate adapters
	Program using third-party programming hardware

Revision History

The information contained in the *Altera Programming Hardware Data Sheet* version 5.1 supersedes information published in previous versions.

The following changes were made to the *Altera Programming Hardware Data Sheet* version 5.1:

- Added APEX II content
- Text addition to Note (3) on page 6

Notes:

Notes:

101 Innovation Drive
San Jose, CA 95134
(408) 544-7000
http://www.altera.com
Applications Hotline:
(800) 800-EPLD
Customer Marketing:
(408) 544-7104
Literature Services:
lit_req@altera.com