Altera Programming Hardware

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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, *Note (1)*	BitBlaster™ Serial Download Cable	ByteBlaster™ Parallel Download Cable
Conventional device programming	✓		
In-system programming		✓	✓
In-circuit reconfiguration		✓	✓

Note:
(1) External programming hardware includes the Logic Programmer card and Master Programming Unit (MPU).

☞ Altera devices are also supported by a variety of third-party programmers. Refer to *Programming Hardware Manufacturers* in this data book for more information.

External Programming Hardware

Altera provides the following external programming hardware:

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

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 for configuring SRAM-based devices. PL-ASAP2 includes an LP6 Logic Programmer card, an MPU, MAX+PLUS® II Programmer software (which requires Microsoft Windows 3.*x*, Windows 95, or Windows NT), and complete documentation. The MAX+PLUS II Programmer supports device configuration for FLEX® 10K, FLEX 8000, and FLEX 6000 devices, and device programming for MAX® 9000, MAX 7000, MAX 5000, Classic™, and Configuration EPROM 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 through the 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 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. Table 2 on page 680 lists the adapters required for each Altera device and package option.

See the *QFP Carrier & Development Socket Data Sheet* in this data book for more information.

PLM-Prefix Adapters

The PLM-prefix adapters plug directly into the 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 EPROMs used to configure 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 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 MPU. This adapter allows PLE-prefix adapters to be used with the MPU. See Table 2.

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

Device	Package	Adapter	BitBlaster & ByteBlaster Support
FLEX 10K	All packages	*Note (2)*	✓
FLEX 8000	All packages	*Note (2)*	✓
FLEX 6000	All packages	*Note (2)*	✓
EPC1	DIP J-Lead	PLMJ1213 PLMJ1213	–
EPC1441	DIP J-lead TQFP	PLMJ1213 PLMJ1213 PLMT1064	–
EPC1213	DIP J-lead	PLMJ1213 PLMJ1213	–
EPC1064 EPC1064V	DIP J-lead TQFP	PLMJ1213 PLMJ1213 PLMT1064	–
EPM9320 EPM9320A	J-lead (84-pin) RQFP (208-pin) RQFP (240-pin)	PLMJ9320-84 PLMR9000-208 PLMR9000-208NC PLMR9000-280	✓
EPM9400 EPM9400A	J-lead (84-pin) RQFP (208-pin) RQFP (240-pin)	PLMJ9400-84 PLMR9000-208 PLMR9000-208NC PLMR9000-240 PLMR9000-240NC	✓
EPM9480 EPM9480A	RQFP (208-pin) RQFP (240-pin)	PLMR9000-208 PLMR9000-208NC PLMR9000-240 PLMR9000-240NC	✓
EPM9560 EPM9560A	RQFP (208-pin) RQFP (240-pin) PGA (280-pin) RQFP (304-pin) BGA (356-pin)	PLMR9000-208 PLMR9000-208NC PLMR9000-240 PLMR9000-240NC PLMG9000-280 PLMR9000-304 *Note (3)*	✓
EPM7032 EPM7032V EPM7032S EPM7032A	J-lead PQFP TQFP	PLMJ7000-44 PLMQ7000-44 PLMT7000-44	✓ *(4)*

Table 2. Programming Adapters & Hardware Support (Part 2 of 3) *Note (1)*			
Device	**Package**	**Adapter**	**BitBlaster & ByteBlaster Support**
EPM7064 EPM7064S EPM7064A	J-lead (44-pin) TQFP (44-pin) J-lead (68-pin) J-lead (84-pin) PQFP (100-pin) TQFP (100-pin)	PLMJ7000-44 PLMT7000-44 PLMJ7000-68 PLMJ7000-84 PLMQ7000-100 PLMQ7000-100NC PLMT7000-100NC	✓ *(4)*
EPM7096	J-lead (68-pin) J-lead (84-pin) PQFP (100-pin)	PLMJ7000-68 PLMJ7000-84 PLMQ7000-100	–
EPM7128E EPM7128S EPM7128A	J-lead (84-pin) PQFP (100-pin) PQFP (160-pin) TQFP (144-pin)	PLMJ7000-84 PLMQ7000-100 PLMQ7000-100NC PLMQ7128/7160-160 PLMQ7128/160-160NC *Note (3)*	✓ *(4)*
EPM7160E EPM7160S	J-lead (84-pin) TQFP (100-pin) PQFP (100-pin) PQFP (160-pin)	PLMJ7000-84 PLMT7000-100NC PLMQ7000-100 PLMQ7128/7160-160 PLMQ7128/160-160NC PLMT7000-100NC	✓ *(4)*
EPM7192E EPM7192S	PGA (160-pin) PQFP (160-pin)	PLMG7192-160 PLMQ7192/7256-160 PLMQ7192/256-160NC	✓ *(4)*
EPM7256E EPM7256S EPM7256A	PGA (192-pin) PQFP (160-pin) RQFP (208-pin) PQFP (208-pin) TQFP (144-pin)	PLMG7256-192 PLMQ7192/7256-160 PLMQ7192/256-160NC PLMR7256-208 PLMR7256-208NC *Note (3)*	✓ *(4)*
EPM7384A	TQFP (144-pin) PQFP (208-pin) BGA (256-pin)	*Note (3)*	✓
EPM7512A	TQFP (144-pin) PQFP (208-pin) BGA (256-pin)	*Note (3)*	✓
EPM71024A	PQFP (208-pin) BGA (256-pin)	*Note (3)*	✓

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

Device	Package	Adapter	BitBlaster & ByteBlaster Support
EPM5032	DIP J-lead	PLMD5032A PLMJ5032A	–
EPM5064	J-lead	PLMJ5064A	–
EPM5128 EPM5128A	J-lead PGA	PLMJ5128A PLMG5128A	–
EPM5130	J-lead PGA PQFP	PLMJ5130A PLMG5130A PLMQ5130A	–
EPM5192	J-lead PGA	PLMJ5192A PLMG5192A	–
EP600 EP610	DIP J-lead SOIC	PLED610 PLEJ610 PLES610	–
EP900 EP910	DIP J-lead	PLED910 PLEJ910	–
EP1810	J-lead PGA	PLMJ1810 PLEG1810	–

Notes:

(1) Adapters with an NC suffix program QFP devices that are not in QFP carriers.
(2) Configuration of FLEX 10K, FLEX 8000, or FLEX 6000 devices is supported by Configuration EPROMs (EPC1064, EPC1064V, EPC1213, EPC1441, and EPC1), and the BitBlaster or ByteBlaster download cable.
(3) A BitBlaster or ByteBlaster download cable is used to program this device via in-system programming.
(4) The BitBlaster and ByteBlaster download cables support in-system programming of MAX 7000S and MAX 7000A devices.

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

BitBlaster Serial Download Cable

The BitBlaster serial download cable is a hardware interface to a standard PC or UNIX workstation RS-232 port (known as a “COM port” on a PC and a “ttya port” or “ttyb port” on a UNIX workstation) that provides configuration data to FLEX 10K, FLEX 8000, and FLEX 6000 devices and programming data to MAX 9000, MAX 7000S, and MAX 7000A devices.

The 25-pin female port on the BitBlaster download cable connects to an RS-232 port with a standard serial cable. The 10-pin female plug on the BitBlaster download cable connects to a device on a circuit board via a 10-pin male header. The BitBlaster cable contains status lights that indicate the state of the device configuration or programming. Refer to the *BitBlaster Serial Download Cable Data Sheet* in this data book for more information.

Ordering Code: *PL-BITBLASTER*

To configure / program 3.3-V devices (e.g., FLEX 10KA and MAX 7000A devices), using a BitBlaster download cable, connect the cable's VCC pin to a 5.0-V power supply and the device to a 3.3-V power supply. FLEX 10KA and MAX 7000A devices have 5.0-V tolerant inputs, so the download cable's 5.0-V output will not harm these 3.3-V devices. The pull-up resistors should be connected to the 5.0-V power supply.

ByteBlaster Parallel Download Cable

The ByteBlaster parallel download cable is a hardware interface to a standard parallel port (also known as an LPT port). This cable channels configuration data to FLEX 10K, FLEX 8000, and FLEX 6000 devices as well as programming data to MAX 9000, MAX 7000S, and MAX 7000A devices.

The ByteBlaster 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 ByteBlaster to the circuit board. The ByteBlaster 10-pin plug is identical to the BitBlaster 10-pin plug. Refer to the *ByteBlaster Parallel Port Download Cable Data Sheet* in this data book for more information.

Ordering Code: *PL-BYTEBLASTER*

To configure / program 3.3-V devices (e.g., FLEX 10KA and MAX 7000A devices), using a ByteBlaster download cable, connect the cable's VCC pin to a 5.0-V power supply and the device to a 3.3-V power supply. FLEX 10KA and MAX 7000A devices have 5.0-V tolerant inputs, so the download cable's 5.0-V output will not harm these 3.3-V devices. The pull-up resistors should be connected to the 5.0-V power supply.

Programming Techniques

Table 3 summarizes programming/configuration techniques.

Table 3. Programming/Configuration Techniques by Device Family

Device Family	Programming/Configuration Techniques
FLEX 10K, *Note (1)*	Download configuration data via the BitBlaster or ByteBlaster download cables, or an embedded microprocessor using the JTAG ports.
FLEX 10K, FLEX 8000, or FLEX 6000	In passive serial (PS) mode, download configuration data via the BitBlaster or ByteBlaster download cables.
	Configure devices via an on-board microcontroller.
FLEX 10K and FLEX 6000	Configure devices via an EPC1 or EPC1441 Configuration EPROM.
FLEX 8000	Configure devices via an EPC1, EPC1441, EPC1213, EPC1064, or EPC1064V Configuration EPROM.
MAX 9000, MAX 7000S, and MAX 7000A, *Note (1)*	Program devices in-system via the BitBlaster or ByteBlaster and the JTAG ports.
	Program devices via the MPU and the LP6 card and the appropriate adapters.
	Program devices via third-party programming hardware.
	Program devices in-system via in-circuit test (ICT) equipment or an on-board microcontroller.
MAX 7000 MAX 5000 Classic	Program using the MPU and the LP6 card and the appropriate adapters.
	Program using third-party programming hardware.

Note:

(1) To configure or program 3.3-V devices (e.g., FLEX 10KA and MAX 7000A devices) using a BitBlaster or ByteBlaster download cable, connect the cable's VCC pin to a 5.0-V power supply and the device to a 3.3-V power supply. FLEX 10KA and MAX 7000A devices have 5.0-V tolerant inputs, so the download cable's 5.0-V output will not harm these 3.0-V devices. The pull-up resistors should be connected to the 5.0-V power supply.