Dust Networks

Eterna™ Serial Programmer Guide

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About This Guide

This document describes the use of the Eterna Serial Programmer and the Eterna Serial Programming application.

Audience

This document is intended for system developers, hardware designers, and software developers.

Related Documents

The following related documents are available:

040-0102 Eterna Integration Guide

040-0109 Eterna Board Specific Parameter Configuration Guide

Conventions and Terminology

This guide uses the following text conventions:

- `Computer type` indicates information that you enter, such as a URL.
- **Bold type** indicates buttons, fields, and menu commands.
- *Italic type* is used to introduce a new term.
- **Note:** Notes provide more detailed information about concepts.
- **Caution:** Cautions advise about actions that might result in loss of data.
- **Warning:** Warnings advise about actions that might cause physical harm to the hardware or your person.

Revision History

Revision	Date	Description
040-0110 rev 1	2/9/2012	Initial Release
040-0110 rev 2	7/18/2012	Added examples, and clarification

1 Getting Started

Installation

ESP software is distributed as a .zip archive and doesn't require installation. To install, unarchive all files files into a directory (e.g. c:\esp). ESP software calls FTDI, http://www.ftdichip.com/, drivers that are required for operation. The FTDI drivers can be found at http://www.ftdichip.com/Drivers/D2XX.htm and are reffered to by FTDI as "D2XX Drivers". ESP software has been tested against D2XX Drivers revision 2.08.14.

The utility should be executed from the directory where you placed the files.

Setup

The Eterna Serial Porgramming solution is comprised of the Windows ESP.exe application, which in turn use the drivers supported by Future Technology Devices International (FTDI) to inteface to the Eterna Serial Programmer via USB. Pairing of USB hardware to drivers is most easilily accomplished in most systems by connecting the hardware and following the windows driver installation instructions.

FTDI hardware solutions are very common and as such there is a reasonable chance that the required drivers have already been installed in a system. It should also be noted as the drivers are generic to many solutions, for some of the ESP commands manual notation of the Eterna Serial Programmer's target COM ports is required.

Note that the pairing of the FTDI hardware is done to a specific USB port on a system. Changing of the USB port used to pair the Eterna Serial Programmer to the FTDI driver will result in having to reinstall the driver and additional manual notation of the Eterna Serial Programmer's target COM ports.

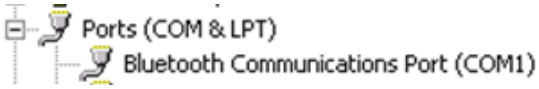
To pair the Eterna Serial Programmer to the FTDI driver on a system:

1) When the installation and mapping of the USB ports is complete, open the Device Eterna Serial Programmer to find out the COM port numbers that have been assigned to the virtual serial ports. The third COM port number listed will be the COM port used by the ESP application for communications with the Eterna Serial Programmer.

    a. From the Start menu select **Settings -> Control Panel - System**.

    b. Click the **Hardware** tab and then click on **Device Manager**.

    c. Open **Ports (COM & LPT)** and note the COM ports – later you will want to indetify the new COM ports that are added after the device drivers have been installed.



2) Connect the USB cable between the Eterna Serial Programmer and the system.

    If four new COM ports appear in the device manager, go to step 7.

    If the Found New Hardware Wizard appears, go to step 2.

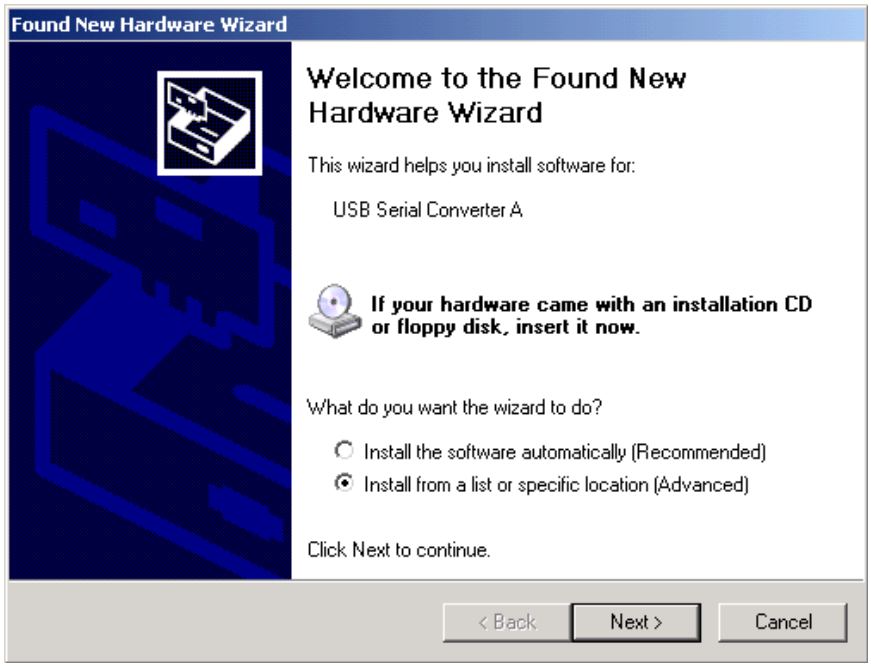
If the Found New Hardware Wizard does not appear, do the following:

a. Ensure that the port is functional, and that the device is connected correctly. If the Wizard still does not appear, open the Windows Device Eterna Serial Programmer to see how Windows has recognized the device.

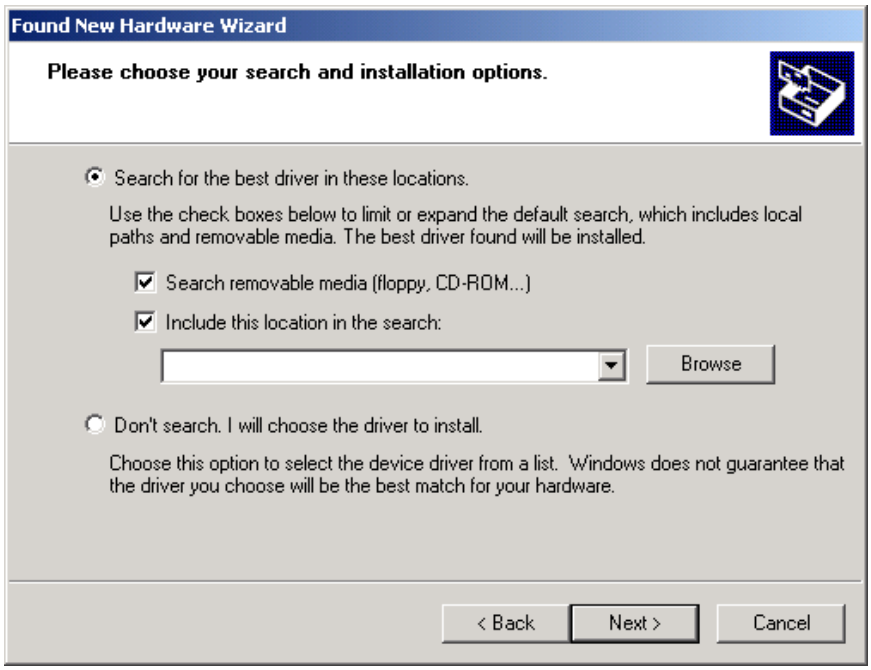
b. If a new "Question Mark Icon" appears , right-click the device and select Update Driver. This displays the Found New Hardware Wizard.

c. Go to step 2.

3) In the Wizard, click the option to "Install from a list or specific location," and click Next.



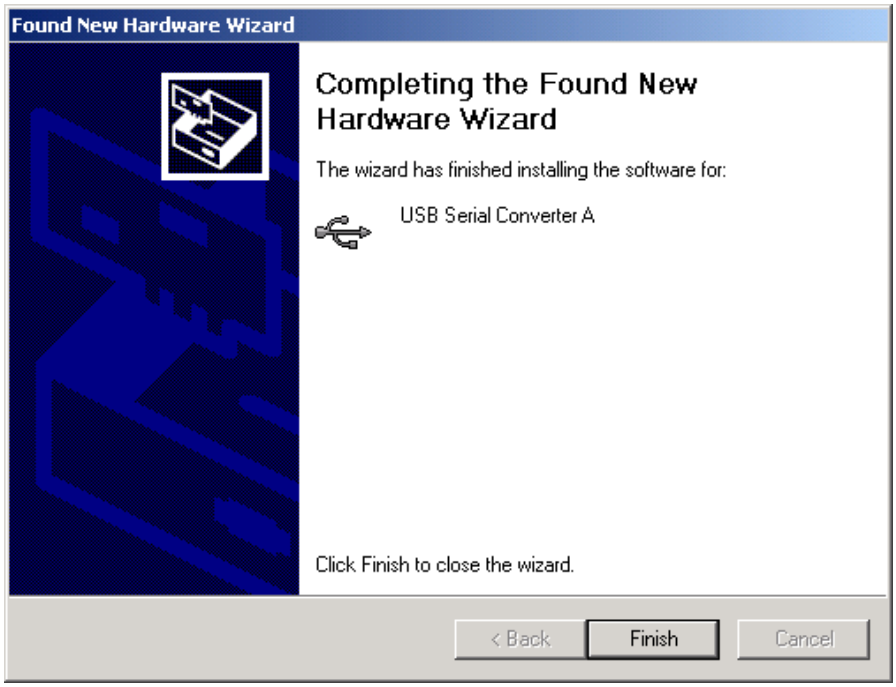
4) Select the box to "Include this location in the search." Then, use the Browse button to navigate to the directory where ESP and the associated drivers have been stored , and click Next.



5) After the Wizard installs the software, click **Finish**.

6) When the Found New Hardware Wizard reappears, repeat steps 2 through 5 to continue the installation. Repeat these steps each time the Wizard appears.

   Because of the way Windows works, you may be prompted to go through the Wizard up to eight times to complete the installation and mapping of the USB port. The Eterna Serial Programmer will install a total of four virtual serial ports, along with the USB drivers to control them.

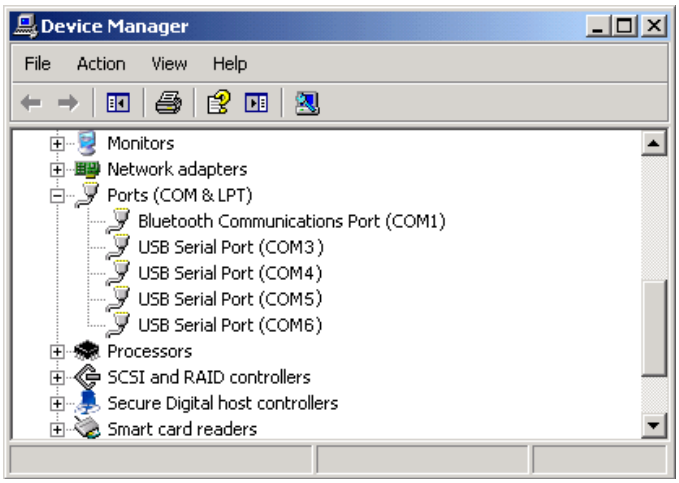


7) When the installation and mapping of the USB ports is complete, open the Device Eterna Serial Programmer to find out the COM port numbers that have been assigned to

the virtual serial ports. The third COM port number listed will be the COM port used by the ESP application for communications with the Eterna Serial Programmer.

a. Make a note of the third COM port indentifier.

   For example, if the new ports are COM3, COM4, COM5, and COM6, the PORT parameter used in some ESP commands will be “5”, corresponding to serial port COM5.



8) Configure the following Advanced Settings for each of the four new COM ports:

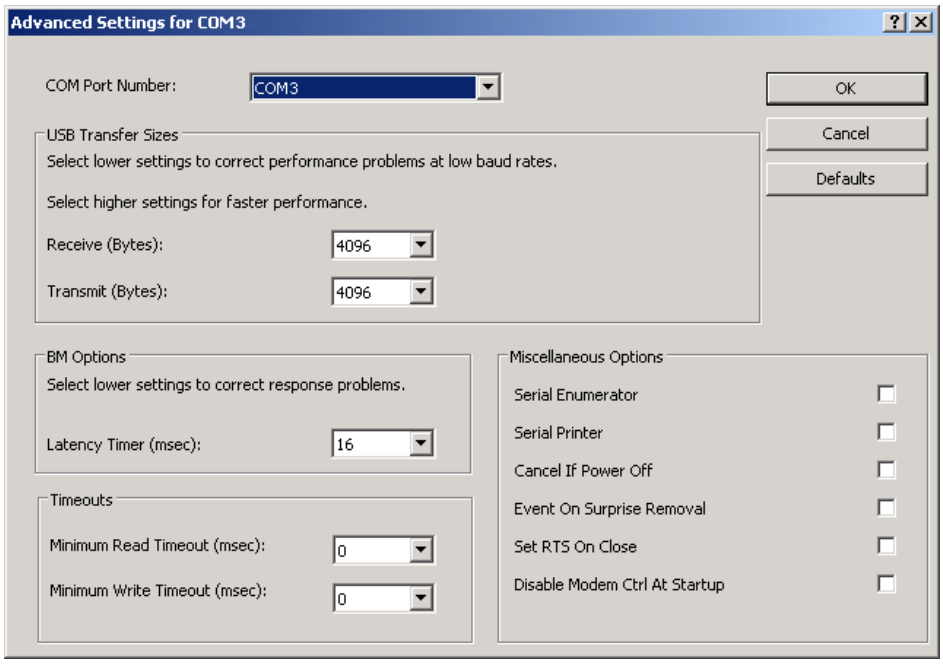
   a. **Right-click** on a COM port and click **Properties**.

   b. Click the **Port Settings** tab, and then click **Advanced**.

   c. Deselect the **Serial Enumerator** option, and click **OK**.

   d. Click **OK** to return to the Device Manager.

   e. Repeat this step for each of the four new COM ports. When you are finished, close the Device Manager.



Invoke

Commands are issued via a windows Command Prompt – see the Usage section for a list of commands.

2 Usage

Loading a Fuse Table / BSP binary file

Hardware configuration of IO and setting of Board Specific Parameters is accomlished with the FuseTable application, see *040-0109 Eterna Board Specific Parameter Configuration Guide*. The FuseTable application will generate a 2 KB binary file as its output. To load this file the use the program with verify with an offset of 0.

Loading a software image

Eterna Network stack software can be downloaded from www.linear.com. To load the software image use the program with verify with an offset of 800.

Basic Commands

Help

For a complete list of all the ESP options, enter:

```
C:\...\ESP\ESP
```

Erase

To erase the entire 512 KB of flash, enter:

```
C:\...\ESP\ESP -E
```

To erase a select number of pages of flash, enter:

```
C:\...\ESP\ESP –e OFFSET PAGES
```

Where OFFSET is in hexidecimal with no leading 0x and must be in multiples of 800 hexidecmial (2 KB). For example, to erase the 3rd and 4th pages enter:

```
C:\...\ESP\ESP –e 1800 2
```

Read (unlocked device)

To read the entire 512 KB of flash and store the image in a file, enter:

```
C:\...\ESP\ESP –r FILENAME
```

To read the entire a subet of flash and store the image in a file, enter:

```
C:\...\ESP\ESP –R FILENAME OFFSET BYTES
```

Where OFFSET and BYTES are in hexidecimal with no leading 0x and bytes.

For example, to read the 3rd and 4th pages enter:

```
C:\...\ESP\ESP –R third_and_fourth_pages.bin 1800 1000
```

Read (locked device)

Via the Hardware Lock Key, see *040-0109 Eterna Board Specific Parameter Configuration Guide* for details, a device can be locked to prevent access to all internal memory including the flash. To read a locked device enter:

```
C:\...\ESP\ESP –r FILENAME –u KKKKKKKK PORT
```

Where KKKKKKK is the Hardware Lock Key, in hexidecimal, with no leading 0x. Where PORT is the COM port number identified in step 7 of the Setup section of this document. This will store the entire 512 KB in FILENAME. This will not modify the locked state of the device.

Where OFFSET is in hexidecimal with no leading 0x and must be in multiples of 800 hexidecmial (2 KB). The device will only program the number of bytes from the starting OFFSET to OFFSET + size(FILENAME).

For example, to read a device locked with a key of 0x1F2E3D4C using com port COM5 enter:

```
C:\...\ESP\ESP –r whole_image.bin –u 1F2E3D4C 5
```

Program with Verify

The program command will not erase the target memory range prior to programming. When programming a part that already contains an image, the target memory must be erased prior to programming.

To program an image enter:

```
C:\...\ESP\ESP –P FILENAME OFFSET
```

Where OFFSET is in hexidecimal with no leading 0x and must be in multiples of 800 hexidecmial (2 KB). The device will only program the number of bytes from the starting OFFSET to OFFSET + size(FILENAME). If the verify passes ESP will report on a new line:

```
Verify: PASS
```

If the verify fails ESP will report on a new line:

```
Verify: FAIL
```

Followed by a line indicating which address failed, the expected value and the value read from the failing location.

For example, to program a fuse table image onto a part:

```
C:\...\ESP\ESP –P fusetable.bin 0
```

Verify

To verify an image enter:

```
C:\...\ESP\ESP –V FILENAME OFFSET
```

Where OFFSET is in hexidecimal with no leading 0x and must be in multiples of 800 hexidecmial (2 KB). The device will only verify the number of bytes from the starting OFFSET to OFFSET + size(FILENAME). If verify fails it will report the first difference. If the verify passes ESP will report:

```
Verify: PASS
```

If the verify fails ESP will report on a new line:

```
Verify: FAIL
```

Followed by a line indicating which address failed, the expected value and the value read from the failing location.

Unlock (persistent)

Via the Hardware Lock Key, see *040-0109 Eterna Board Specific Parameter Configuration Guide* for details, a device can be locked to prevent access to all internal memory including the flash. **This command will alter part of the first page in flash, blanking the lock key in the process.** To unlock a locked device enter:

```
C:\...\ESP\ESP –u KKKKKKKK PORT
```

Where KKKKKKK is the Hardware Lock Key and PORT is the COM port number identified in step 7 of the Setup section of this document.

Manufacturing Support

Multiple ESPs can be enabled to run in parallel on a single PC. To accomplish this the ESP software must be provided with the specific location ID and serial port for the. The serial port can be indentified via the PC's "Device Manager" as described in the Setup section of this document. To determine the location ID see below.

Location ID

To determine the Location ID for a specific programmer enter the following prior to connecting the ESP:

```
C:\...\ESP\ESP –L
```

A list similar to the following will be presented:

```
locID[0] = 0x2121, devString = Eterna Serial Programmer A
locID[1] = 0x2122, devString = Eterna Serial Programmer B
```

Use the B port's location ID with the –i option with any of the commands to direct the command to a specific ESP. For example to program with verify to the ESP device identified above one, enter:

```
C:\...\ESP\ESP –i 2122 –P FILENAME OFFSET
```

Creating an image for manufacture

Eterna's flash image is a combination of

1) a software image with it's own non-volatile image that can be modifed when setting parameters such as join key and network ID.
2) A binary configuration file for IO and Board Specefic Parameters

To create a single image for manufacturing:

1) Erase the contents of Eterna's flash
2) Load the configuration file for IO and Board Specific Parameters
3) Load the software image
4) Configure any parameters via Eterna's API to the values needed for manufacture
5) Read Eterna's flash conents to a 512 KB file

The binary image created from reading the flash contents now represents a single image that can be loaded using the program with verify command with an offset of zero.

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