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# AVR1922: Xplain Board Controller Firmware

## Features

- USB interface
  - Mass-storage to on-board DataFlash® memory
- Atmel® AVR® XMEGA™ reset control

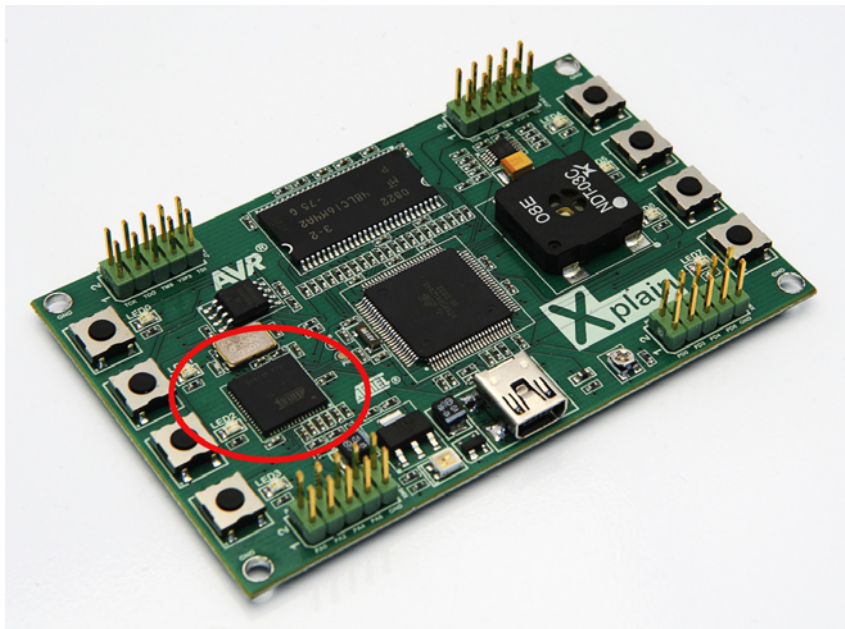
## 1 Introduction

The Xplain board controller, an AT90USB1287, is in charge of some of the low-level tasks on boards in the Xplain series. The board controller improves usability of the main microcontroller, and adds features the main controller lacks, like USB.

Some of the tasks the board controller can handle are moving data to and from the board over the USB interface, for example mass-storage or USB-to-serial.

Note that not all Xplain boards carry multiple microcontrollers; in these cases the main microcontroller will provide the board controller features when applicable.

**Figure 1-1.** Board controller on the Xplain board marked in a red circle



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Application Note

Rev. 8302A-AVR-04/10





## 2 Xplain Board Controller Hardware Features

This chapter will walk through the features available when having a separate board controller.

### 2.1 USB Interface

All Xplain boards features an USB connector. This connector has a dual purpose; power and USB interfaces. When the USB connector is wired to the board controller, it can be used for various tasks depending on the firmware.

#### 2.1.1 USB-to-serial Interface

The main microcontroller will have one UART wired to the board controller. This serial port can then be shared as a CDC/ACM USB class (USB-to-serial) on the USB interface. Having a USB-to-serial interface can be useful for debugging the main application running on the board, or for transferring data back and forth to an external host.

#### 2.1.2 USB Mass-storage Interface

When connected to a PC the Xplain board can share any external memories available for the board controller as mass-storage devices on the USB interface. This will present the on-board flash memory as a block device on the host side, and users are free to use them as they like. Typically storing data files, images, etc. there, for use with the main microcontroller.

### 2.2 AVR XMEGA Reset Line Control

The board controller has wired an I/O line to the AVR XMEGA reset line. This line can be used to control the reset state of the main microcontroller.

### 2.3 AVR XMEGA Program and Debug Interface

To program the main microcontroller, the board controller is wired to the program and debug interface (PDI) on the AVR XMEGA device. This interface can be used to program new firmware into the main microcontroller from the board controller.

## 3 Xplain Board Controller Firmware

### 3.1 Features

The board controller firmware currently supports the following features:

- DataFlash initialization read and write.
- AVR XMEGA reset control.
- USB mass-storage interface.
- USB mode switching.

The firmware will on power up hold the AVR XMEGA device in reset while it tries to probe the on-board DataFlash memory. When the firmware has identified the DataFlash device it will read the level of an I/O line to select USB mode.

A low level on the I/O line will make the AT90USB1287 chip enter mass-storage mode and share the DataFlash on the USB interface, thus keeping the AVR XMEGA device in reset.

If the I/O is high, the AT90USB1287 chip will release the AVR XMEGA device and enter a slave like presence, not interfering with the AVR XMEGA. The AVR XMEGA is now free to access the DataFlash on the board without interference.

**Table 3-1.** Board Controller USB mode switching functionality overview

I/O line level	AVR XMEGA reset	USB mass-storage
Left floating / high level	Released after init	Disabled
Pulled low / low level	Held in reset after init	Enabled

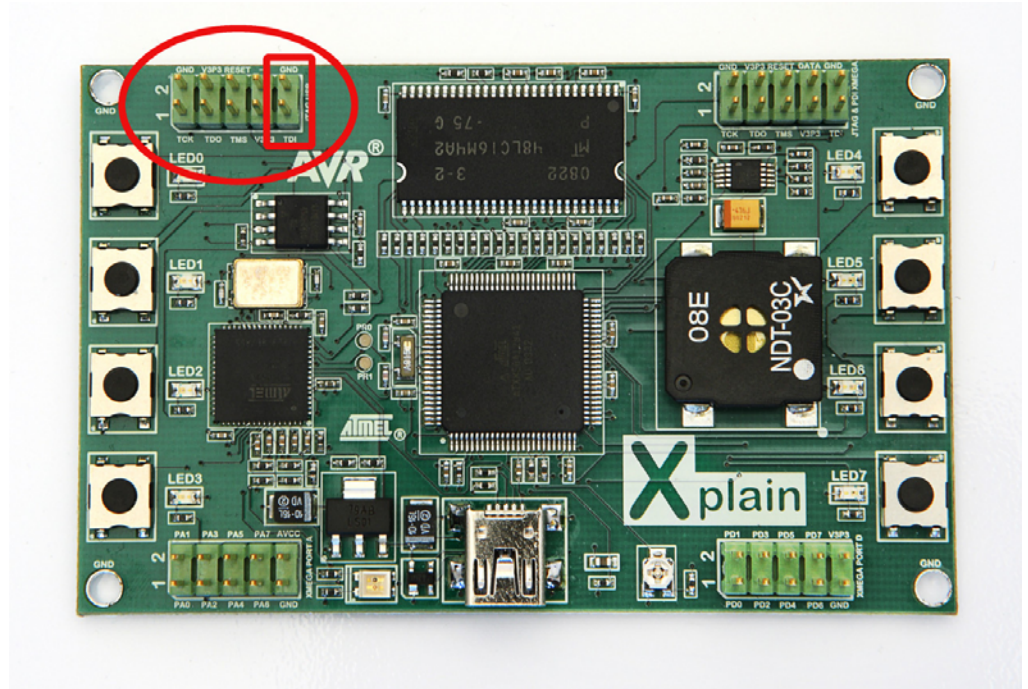
For specific mode switching behavior on the Xplain board, see chapter 3.1.1 USB Mode Switching on the Xplain Board on page 4.

For more information about the mass-storage interface see chapter 2.1.2 USB Mass-storage Interface on page 2.

### 3.1.1 USB Mode Switching on the Xplain Board

To select between the two different USB modes on the Xplain board, the user has to either pull the TDI pin on the JTAG USB header to ground or leave it floating. This is done by placing a jumper between TDI and GND pin, see the figure below.

**Figure 3-1.** USB mode switch pins located on the Xplain board



## 3.2 Compiling the Board Controller Firmware

The following step by step guide will compile the board controller firmware for the Xplain board.

1. Download and uncompress the compressed file archive from [www.atmel.com/products/AVR](http://www.atmel.com/products/AVR) -> *Application Notes* -> *AVR1922 Xplain Board Controller Firmware* containing the Xplain board controller source code.
2. Open up your favorite command line console and change into the directory extracted from the compressed file archive.
3. Enter the *apps/xplain-bc* directory.
4. Compile the application by telling the build system what kind of configuration you would like to use. This is done by setting the CONFIG symbol. For additional help, type *make help* on the command line. See the example below for how to compile for the Xplain board:

```
make CONFIG=xplain-bc
```

5. The application's output binaries will be in the top level *build/xplain-bc/xplain-bc/GNU* directory. The *xplain-bc.elf* and *xplain-bc.hex* files are probably most interesting. If the user does not use the GNU toolchain, the GCC part of the path must be changed appropriately. Also, the board name must be changed if another configuration has been used.
6. Use your favorite programming software and tool to program the ELF or HEX file into the AT90USB1287 chip on the Xplain board. See chapter 4.1 Reprogramming the Xplain AT90USB1287 and ATxmega128A1 Firmware for further details.

## 4 Suggested Reading

### 4.1 Reprogramming the Xplain AT90USB1287 and ATxmega128A1 Firmware

For details about how to program either device on the Xplain board see the application note *AVR1921: Reprogramming the Xplain AT90USB1287 and ATxmega128A1 Firmware*. This describes how to program the devices using either a programming tool, like AVRONE!, JTAGICE mkII or AVR Dragon, or programming software, like FLIP.

The application note is available from the website at [www.atmel.com/dyn/products/tools\\_card\\_v2.asp?tool\\_id=4506](http://www.atmel.com/dyn/products/tools_card_v2.asp?tool_id=4506).

### 4.2 Display Xplained Firmware – Getting Started

It is recommended to look into the *AVR1913: Display Xplained Firmware – Getting Started* application note, as this describes how the build system works and how to start using the software framework.

The application note is available from the website at [www.atmel.com/dyn/products/tools\\_card\\_v2.asp?tool\\_id=4506](http://www.atmel.com/dyn/products/tools_card_v2.asp?tool_id=4506).





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