# Using Arduino Boards in Atmel Studio



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#### Introduction

There are varieties of hardware tools to program Atmel microcontrollers. But if the chips have bootloaders, they can be programmed using serial ports without needing to use any hardware tools. Bootloader is small software which gets the program through the serial port and programs the IC chip.

The microcontrollers of Arduino boards have boot loaders. As a result you can connect them to the PC and use them as an AVR trainer board. The document teaches you to use Arduino Trainer boards in Atmel Studio.

You can also burn the boot loader on a new chip and make your own trainer board. But to program the boot loader onto the new chip you need a programmer.

### **Installing Atmel Studio and Making the First Project**

To install Atmel Studio and make the first project, read one of the following documents:

Assembly Programming in Atmel Studio 6.2 (Step by step tutorial)

<u>C Programming in Atmel Studio 6.2 (Step by step tutorial)</u>

#### **Downloading Avrdude**

1. To program Arduino boards you need *Avrdude*. Download Avrdude from the following website:

http://mirror.rackdc.com/savannah//avrdude/avrdude-5.11-Patch7610-win32.zip

2. Unzip the downloaded file, rename the directory to *avrdude*, and copy it into your *C* drive.

Note If you already have the Arduino IDE on your PC, the avrdude.exe file is located in C:\Program Files (x86)\Arduino\hardware\tools\avr\bin\avrdude.exe and avrdude.conf is in C:\Program Files (x86)\Arduino\hardware\tools\avr\etc\avrdude.conf

#### **Checking COM Port**

1. Right click on the *Computer* icon and choose *Manage*.



2. Click on *Device Manager* and then *Ports (COM & LPT)*. Check the *COM* port.



# **Opening the Atmel Studio and using avrdude**

- 3. Open the *Atmel Studio* IDE.
- 4. Go to the *Tools* menu and choose *External Tools...* .

AtmelStudio	
File Edit View VAssistX ASF Project Debug	Tools Window Help
- e   過 e &   🗟 🗟 🐨 🖽 🐨 😭	Command Prompt
현 📴 🐺 책 암 염 💁 🐝 🖬 📮 🕅 💷 🏻 4	<ul> <li>Device Programming</li> <li>Ctrl+Shift+P</li> <li>Add target</li> </ul>
	MemoryLogger
	Code Snippets Manager Ctrl+K, Ctrl+B
	Add-in Manager Extension Manager Atmel Gallery Profile
	External Tools
	Import and Export Settings Customize Options

- 5. In the *External Tools* dialog:
  - a. Press the Add button
  - b. Name it Arduino Programmer.
  - c. Type the following address next to the *Command*:

#### C:\avrdude\avrdude.exe

d. Avrdude needs the following arguments: *avrdude.conf* file, the COM port, the serial baud rate, the hex file to be programmed and the microcontroller part number. The following table gives the arguments for different Arduino board. They should be typed in the *Arguments* textbox:

Board	IC Chip	Arguments
Arduino Uno	Atmega328p	-C "C:\avrdude\avrdude.conf" -p atmega328p -c arduino -P COM9 -b 115200 -U flash:w:"\$(ProjectDir)Debug\\$(ItemFileName).hex":i
Arduino Pro Mini	Atmega328p	-C " C:\avrdude\avrdude.conf" -p atmega328p -c arduino -P COM9 -b 57600 -U flash:w:"\$(ProjectDir)Debug\\$(ItemFileName).hex":i
Arduino Mega2560	Atmega2560	-C " <mark>C:\avrdude\avrdude.conf</mark> " -p atmega2560 -c wiring -P COM9 -b 115200 -U flash:w:"\$(ProjectDir)Debug\\$(ItemFileName).hex":i
<b>Note:</b> Change the COM port and the location of avrdude.conf, according to your computer.		

- e. Tick "Use Output window".
- f. Press OK.

External Tools	? 💌
Menu contents: Arduino Programmer	Add 1 Delete
	Move Up Move Down
Title:	Arduino Programmer 2
Command:	C:\avrdude\avrdude.exe
Arguments: 4	-C "C:\avrdude\avrdude.conf" -p atmega328p -c
Initial directory:	
Vse Output window	5 Prompt for arguments
Treat output as Unicod	le 🗸 Close on exit
	6 OK Cancel Apply

6. Go to the *Tools* menu again. *Arduino Programmer* should be added to the *Tools* menu.

Too	s Window Help	
>	Command Prompt	
<b>%</b>	Device Programming	Ctrl+Shift+P
2	Add target	
	MemoryLogger	
B	Code Snippets Manager	Ctrl+K, Ctrl+B
	Add-in Manager	
	Extension Manager	
	Atmel Gallery Profile	
	Arduino Programmer	
	External Tools	
	Import and Export Settings	
	Customize	
	Options	

# **Making a Project**

7. Go to the *File* menu. Click on *New* and then *Project*.



8. Choose GCC C Executable Project and name the project as toggleProject. Then press OK.

New Project				8	×
Recent Templates		Sort by: Default		Search Installed Templates	2
Installed Template	s	GCC C ASF Board Project	C/C++	Type: C/C++ Creates an AVR 8-bit or AVR/ARM 32-	-
Assembler Atmel Studio Solution		GCC C Executable Project	2 C/C++	bit C project	
		GCC C Static Library Project	C/C++		Ш
		GCC C++ Executable Project	C/C++		
		GCC C++ Static Library Project	C/C++	int main(un)	
Name	toggleProject	3		j Printf("u.	Ŧ
Location:	E:\AVRprojects\		•	Browse.	
Solution:	Create new solu	ition	•		
Solution name:	toggleProject			Create directory for solution	
				5 OK Cance	:

Device Family:	megaAVR, 8-bit 🔻					Search for device	۶
Name	App./Boot Memory (Kbytes)	Data Memory (bytes)	EEPROM (b		Device Info:		
ATmega325P	32	2048	1024	*	Device Name	ATmega328	
ATmega325PA	32	2048	1024		Speed	0	
ATmega328	32	2048	1024		Vec	19/55	
ATmega328P	32	2048	1024		vcc:	1.0/ J.J	
ATmega329	32	2048	1024		Family:	megaAVR	
Tmega3290	32	2048	1024		Datashee	<u>ets</u>	
Tmega3290A	32	2048	1024				
Tmega3290P	32	2048	1024		Supported To	ols	
Tmega3290PA	32	2048	1024		Atmel-ICE		
ATmega329A	32	2048	1024		AVR Drag	on	
ATmega329P	32	2048	1024		• • • • • • • • • •	-1-11	
ATmega329PA	32	2048	1024	=	AVRISP I	<u>1KII</u>	
Tmega32A	32	2048	1024	_	AVR ONE	<u>!</u>	
ATmega32C1	32	2048	1024			3	
ATmega32HVB	32	2048	1024			- 	
ATmega32HVBrevB	32	2048	1024		JIAGICE	<u>mkii</u>	
ATmega32M1	32	2048	1024		Simulator		
ATmega32U2	32	1024	1024		STK500		
1 2014		2562	1001	*			
			-		STK600		

9. Choose ATmega328 from the list and press OK.

10. Type the following program.

```
/*
 * toggleProgram.c
 *
 * This program toggles ports B, C, and D.
 *
 * Created: 4/3/2015 4:43:51 PM
* Author: Naimi
*/
#include <avr/io.h>
#define F_CPU 1600000UL
#include "util/delay.h"
int main(void)
{
        DDRB = 0xFF;
        DDRC = 0xFF;
        while(1) //loop forever
        {
                PORTB ^= 0xFF; //toggle port B
PORTC ^= 0xFF; //toggle port C
                _delay_ms(1000); //wait 1 second
        }
}
```

# **Programming the Arduino Board**

- 11. Connect your Arduino board to the PC.
- 12. Go to the *Tools* menu, and click on *Arduino Programmer*. The following texts appear in the *Output* window and the L LED starts blinking on the board.





# The IC pins

The following picture shows the Arduino UNO board together with the Atmega328 pins.



PC5(ADC5/SCL)

PC4(ADC4/SDA)

AREF

GND PB5(SCK)

PB4(MISO)

PB3(MOSI)

PB2(OC1B)

PB1(OC1A)

PB0

PD7 PD6

PD5

PD4 PD3(INT1)

PD2(INT0)

PD1(TXD)

PD0(RXD)

4

1

0

Labal	Dort
	PCO(ADCO)
A1	PC1(ADC1)
A2	PC2(ADC2)
A3	PC3(ADC3)
A4	PC4(ADC4)
A5	PC5(ADC5)

#### **References**

http://www.atmel.com/

http://www.nongnu.org/avrdude/

http://www.jayconsystems.com/tutorial/atmerpt1/