

# AZ-Delivery

## Welcome!

Thank you for purchasing our *AZ-Delivery MEGA2560 with ATmega2560*. On the following pages, we will introduce you to how to use and set-up this handy device.

**Have fun!**



## Areas of application

Education and teaching: Use in schools, universities and training institutions to teach the basics of electronics, programming and embedded systems. Research and development: Use in research and development projects to create prototypes and experiments in the fields of electronics and computer science. Prototype development: Use in the development and testing of new electronic circuits and devices. Hobby and Maker Projects: Used by electronics enthusiasts and hobbyists to develop and implement DIY projects.

## Required knowledge and skills

Basic understanding of electronics and electrical engineering. Knowledge of programming, especially in the C/C++ programming language. Ability to read schematics and design simple circuits. Experience working with electronic components and soldering.

## Operating conditions

The product may only be operated with the voltages specified in the data sheet to avoid damage. A stabilized DC power source is required for operation. When connecting to other electronic components and circuits, the maximum current and voltage limits must be observed to avoid overloads and damage.

## Environmental conditions

The product should be used in a clean, dry environment to avoid damage caused by moisture or dust. Protect the product from direct sunlight (UV)

## Intended Use

The product is designed for use in educational, research and development environments. It is used to develop, program and prototype electronic projects and applications. The Sensor product is not intended as a finished consumer product, but rather as a tool for technically savvy users, including engineers, developers, researchers and students.

## Improper foreseeable use

The product is not suitable for industrial use or safety-relevant applications. Use of the product in medical devices or for aviation and space travel purposes is not permitted

## disposal

Do not discard with household waste! Your product is according to the European one Directive on waste electrical and electronic equipment to be disposed of in an environmentally friendly manner. The valuable raw materials contained therein can be recycled become. The application of this directive contributes to environmental and health protection. Use the collection point set up by your municipality to return and Recycling of old electrical and electronic devices. WEEE Reg. No.: DE 62624346

## electrostatic discharge

Attention: Electrostatic discharges can damage the product. Note: Ground yourself before touching the product, such as by wearing an anti-static wrist strap or touching a grounded metal surface.

## safety instructions

Although our product complies with the requirements of the RoHS Directive (2011/65/EU) and does not contain any hazardous substances in quantities above the permitted limits, residues may still be present. Observe the following safety instructions to avoid chemical hazards: Caution: Soldering can produce fumes that can be harmful to health. Note: Use a solder fume extractor or work in a well-ventilated area. If necessary, wear a respirator mask. Caution: Some people may be sensitive to certain materials or chemicals contained in the product. Note: If skin irritation or allergic reactions occur, stop use and, if necessary, consult a doctor. Caution: Keep the product out of the reach of children and pets to avoid accidental contact and swallowing of small parts. Note: Store the product in a safe, closed container when not in use. Attention: Avoid contact of the product with food and drinks. Note: Do not store or use the product near food to prevent contamination. Although our product complies with the requirements of the RoHS Directive (2011/65/EU) and does not contain any hazardous substances in quantities above the permitted limits, residues may still be present. Observe the following safety instructions to avoid chemical hazards: Caution: Soldering can produce fumes that can be harmful to health. Note: Use a solder fume extractor or work in a well-ventilated area. If necessary, wear a respirator mask. Caution: Some people may be sensitive to certain materials or chemicals contained in the product. Note: If skin irritation or allergic reactions occur, stop use and, if necessary,

consult a doctor. Caution: Keep the product out of the reach of children and pets to avoid accidental contact and swallowing of small parts. Note: Store the product in a safe, closed container when not in use. Attention: Avoid contact of the product with food and drinks. Note: Do not store or use the product near food to prevent contamination. The product contains sensitive electronic components and sharp edges. Improper handling or assembly can result in injury or damage. Observe the following safety instructions to avoid mechanical hazards: Attention: The product's circuit board and connectors may have sharp edges. Use caution to avoid cuts. Note: Wear appropriate protective gloves when handling and assembling the product. Caution: Avoid excessive pressure or mechanical stress on the board and components. Note: Only mount the product on stable and flat surfaces. Use appropriate spacers and housings to minimize mechanical stress. Attention: Make sure the product is securely fastened to prevent accidental slipping or falling. Note: Use appropriate support or secure mounting in enclosures or on mounting plates. Caution: Make sure all cable connections are connected securely and correctly to avoid strain and accidental unplugging. Note: Route cables so that they are not under tension and do not pose a tripping hazard. The product operates with electrical voltages and currents that, if used improperly, can result in electric shocks, short circuits or other hazards. Observe the following safety instructions to avoid electrical hazards: Attention: Use the product only with the specified voltages. Note: The performance limits of the product can be found in the associated data sheet Caution: Avoid short circuits between the connectors and components of the product Note: Make sure that no conductive objects touch or bridge the circuit board. Use insulated tools and pay attention to the arrangement of connections. Caution: Do not perform any work on the product when it is connected to a power source. Note: Disconnect the product from power before making any circuit changes or connecting or removing components. Caution: Do not exceed the specified current ratings for the product's inputs and outputs. Note: The performance limits of the product can be found in the technical specifications or in the data sheet Attention: Make sure that the power sources used are stable and correctly sized. Note: Only use tested and suitable power supplies to avoid voltage fluctuations and overloads. Attention: Maintain sufficient distance from live parts to avoid accidental contact. Note: Ensure that the cabling is arranged safely and clearly according to the voltage used. Caution: Use insulating housings or protective covers to protect the product from direct contact. Note: Place the product in a non-conductive case to avoid accidental touching and short circuits. The product and the components on it may become warm during operation. Improper handling or overloading the product can result in burns, damage or fire. Observe the following safety instructions to avoid thermal hazards: Caution: Make sure the product is used within recommended operating temperatures. Note: The recommended operating temperature range is typically between -40°C and +85°C. Check the specific information in the product data sheet. Attention: Do not place the product near external heat sources such as radiators or direct sunlight. Note: Ensure that the product is operated in a cool and well-ventilated area. Attention: Make sure the product is well ventilated to avoid overheating. Note: Use fans or heat sinks when operating the product in a closed enclosure or in an environment with limited air circulation. Attention: Mount the product on heat-resistant surfaces and in heat-resistant housings. Note: Use enclosure materials that can withstand high temperatures to avoid damage or fire hazard. Caution: Implement temperature monitoring when using an enclosure and, if necessary, protection mechanisms that shut down the product if it overheats. Note: Note: Use temperature sensors and appropriate software to monitor the temperature of the product and shut down the system if necessary. Caution: Avoid overloads that can cause excessive heating of components. Note: To prevent overheating, do not exceed the specified current and voltage limits. Caution: Short circuits can generate significant heat and cause fires. Note: Make sure that all connections are correct and secure and that no conductive objects can accidentally cause short circuits.

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## Introduction

The Mega2560 microcontroller board is the successor to the comparative boards. It is a microcontroller board based on a ATmega2560 AVR microcontroller. It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC/DC adapter or battery to get started.

The Mega2560 with ATmega2560 adds SDA and SCL pins next to the AREF. In addition, there are two new pins placed near the RESET pin.

The AZ-Delivery Mega 2560 differs from other boards in that it does not use the FTDI USB-to-serial driver chip or Atmega16U2. Instead, it features a CH340 chip as a USB-to-serial converter. This chip allows communication between PC and Mega and for uploading the code to the ATmega2560 processor.

To enable communication between PC and Mega2560, a driver for the CH340 chip has to be installed.



## **Difference Between Microcontroller with ATmega328P, ATmega16U2 and Mega 2560 Board**

The Microcontroller with ATmega328P and ATmega16U2 is a microcontroller board based on the ATmega328 which has 14 digital input/output pins. 6 of them (D3, D5, D6, D9, D10, and D11) can be used as PWM outputs and 6 analog inputs, one serial communication line (D0, D1). The Mega2560 Board provides much more pins than the microcontroller with ATmega328P and ATmega16U2 .

The Mega2560 Board is based on the ATmega2560. It has 54 digital input/output pins. 15 can be used as PWM outputs, 16 analog inputs, 4 UARTs. UARTs are hardware serial ports. On the ATmega328P, ATmega16U2 board there are one RX pin and one TX pin, in addition to Mega 2560 R3 Board that has 3 RX pins and 3 TX pins, 1 SDA pin and 1 SCL pins.

## Specifications

Microcontroller	ATmega2560
DC connector operating voltage	7-12V
Input voltage limit	6-15V
USB operating voltage	5V
Digital I/O pins	54 (14 pins support PWM)
Analog input pins	16
DC current draw per I/O pin	40mA
DC current draw for 3.3V pin	50mA
Flash memory	256KB (8KB used by bootloader)
SRAM	8KB
EEPROM	4KB
Clock speed	16MHz
Communication interfaces	SPI, I2C, UART
Dimensions	102x53x15mm (4.1x2x0.6in)







## **MEGA2560**

The Mega2560 is specially designed for projects that require complex circuitry and more memory space. Most of the electronic projects can be done by Mega like making 3D printers or controlling more than one motor, because of its ability to store more instructions in the code memory and a number of I/O digital and analog pins.

The Mega2560 can be powered in three ways, through USB cable to power the board and upload the code, through Vin pin on the board or through the power jack or battery.

The Vin pin and power jack can be used once the code is uploaded to this board and the project is finished.

The Mega 2560 comes with resettable polyfuse that prevents the USB port of your computer from overheating in the presence of high current flowing through the board. Most of the computers come with an ability to protect themselves from such devices, however, the addition of a fuse provides an extra layer of protection.

The Mega 2560 can be used for very complex projects in combination with other boards, shields or standalone.



### **Mega 2560 shield compatibility**

The Mega2560 is designed to be compatible with most shields designed for the ATmega328P and ATmega16U2 microcontroller. Digital pins 0 to 13 (and the adjacent AREF and GND pins), analog inputs 0 to 5, the power header, and ICSP header are all in equivalent locations. Further the main UART (serial port) is located on the same pins (0 and 1), as are external interrupts 0 and 1 (pins 2 and 3 respectively). SPI is available through the ICSP header on both Mega2560 and ATmega328 with ATmega16U2 board.



### **Pins description**

The 5V pin is used to provide regulated output voltage of 5VDC. It supplies the controller and other components on the board. It can be obtained from Vin of the board or USB cable or another regulated 5V voltage supply. Another voltage regulation is provided by 3.3V pin. Maximum current that can be drawn is 50mA.

The Vin is the input voltage supplied to the board which ranges from 7V to 15V. The voltage provided by the power jack can be accessed through this pin. However, the output voltage through this pin to the board will be automatically set up to 5V.

There are 5 ground pins available on the board which makes it useful when more ground pins are required for a project.

The Reset pin is used to reset the board. Setting this pin to LOW will reset the board.



## **I/O pins**

### **Serial communication pins**

Serial pins RXD and TXD are used to transmit and receive serial data. The Rx represents the transmission of data while Tx is used to receive data.

There are four UART interfaces (Universal Asynchronous Receiver Transmitter) where Serial 0 contains RX(0) and TX(1), Serial 1 contains TX(18) and RX(19), Serial 2 contains TX(16) and RX(17), and Serial 3 contains TX(14) and RX(15).

A *SoftwareSerial* library allows for serial communication on any of the Mega2560 digital pins.



## External interrupt pins

Six pins are used for creating external interrupts 2 (interrupt 0), 3 (interrupt 1), 18 (interrupt 5), 19 (interrupt 4), 20 (interrupt 3), and 21 (interrupt 2) These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the *attachInterrupt()* function for details.

## AREF pin

The AREF stands for Analog Reference Voltage which is a reference voltage for analog inputs. The function used for AREF in Arduino IDE is *analogReference()*.

## Analog pins

There are 16 analog pins incorporated on the board labeled as A0 to A15. It is important to note that all these analog pins can be used as digital I/O pins. Each analog pin comes with 10bit resolution. These pins can measure from 0 to 5V. However, the upper value can be changed using AREF and *analogReference()* function from the Arduino IDE.

## I2C pins

Two pins 20 and 21 support I2C communication where 20 represents SDA (Serial Data Line) mainly used for holding the data and 21 represents SCL (Serial Clock Line) mainly used for providing data synchronization between the devices.

## SPI pins

The SPI stands for Serial Peripheral Interface used for the transmission of data between the controller and other peripheral components. Four pins 50(MISO), 51(MOSI), 52(SCK), 53(SS) are used for SPI communication.

The SPI is also available through the ICSP header.



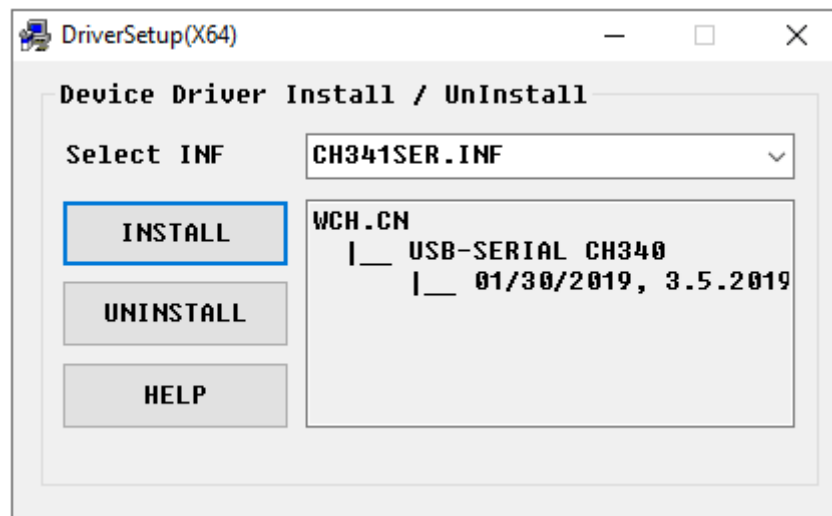
## On-board LED

This board comes with a built-in LED connected to digital pin 13. HIGH value at this pin will turn the LED on and LOW value will turn it off. Simple *Blink* and *Fade* examples from the Arduino IDE can be used for testing the Mega2560 for the first time.

## Driver installation

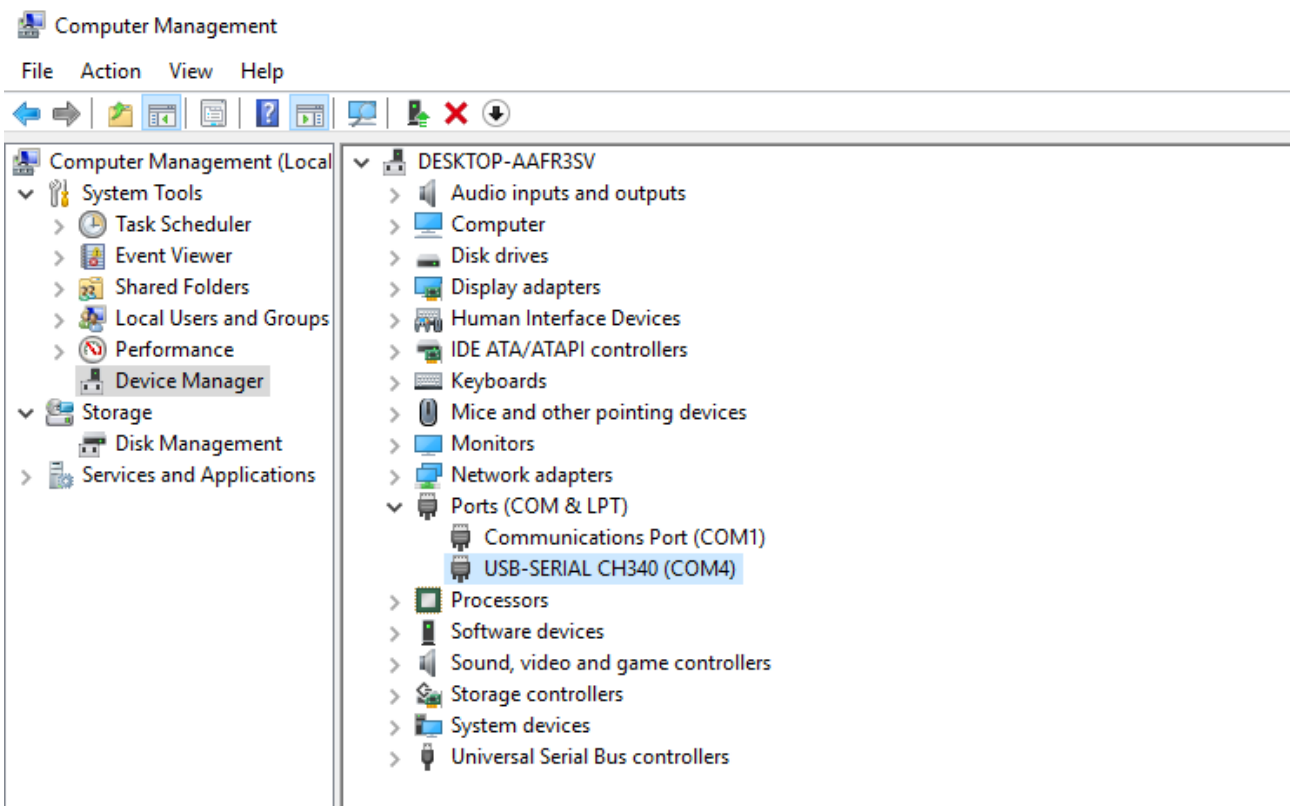
To use the Mega 2560 R3 with the Arduino IDE in Windows, the USB driver has to be installed. Driver can be downloaded from the following [link](#).

Extract the downloaded file and open the folder where the file has been extracted. Execute the installation file called *CH341SER.EXE*.



When installation is finished, open device manager in Windows and check if driver is present. The Mega2560 has to be connected by USB cable to the PC. If driver is properly installed, it will be shown as on the following image:






## How to set-up Arduino IDE

If the Arduino IDE is not installed, follow the [link](#) and download the installation file for the operating system of choice. The Arduino IDE version used for this eBook is **1.8.13**.

### Download the Arduino IDE




#### ARDUINO 1.8.13

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software.

This software can be used with any Arduino board. Refer to the [Getting Started](#) page for Installation instructions.

**Windows** Installer, for Windows 7 and up  
**Windows** ZIP file for non admin install

**Windows app** Requires Win 8.1 or 10 

**Mac OS X** 10.10 or newer

**Linux** 32 bits  
**Linux** 64 bits  
**Linux** ARM 32 bits  
**Linux** ARM 64 bits

[Release Notes](#)  
[Source Code](#)  
[Checksums \(sha512\)](#)

For *Windows* users, double click on the downloaded .exe file and follow the instructions in the installation window.



For *Linux* users, download a file with the extension *.tar.xz*, which has to be extracted. When it is extracted, go to the extracted directory and open the terminal in that directory. Two *.sh* scripts have to be executed, the first called *arduino-linux-setup.sh* and the second called *install.sh*.

To run the first script in the terminal, open the terminal in the extracted directory and run the following command:

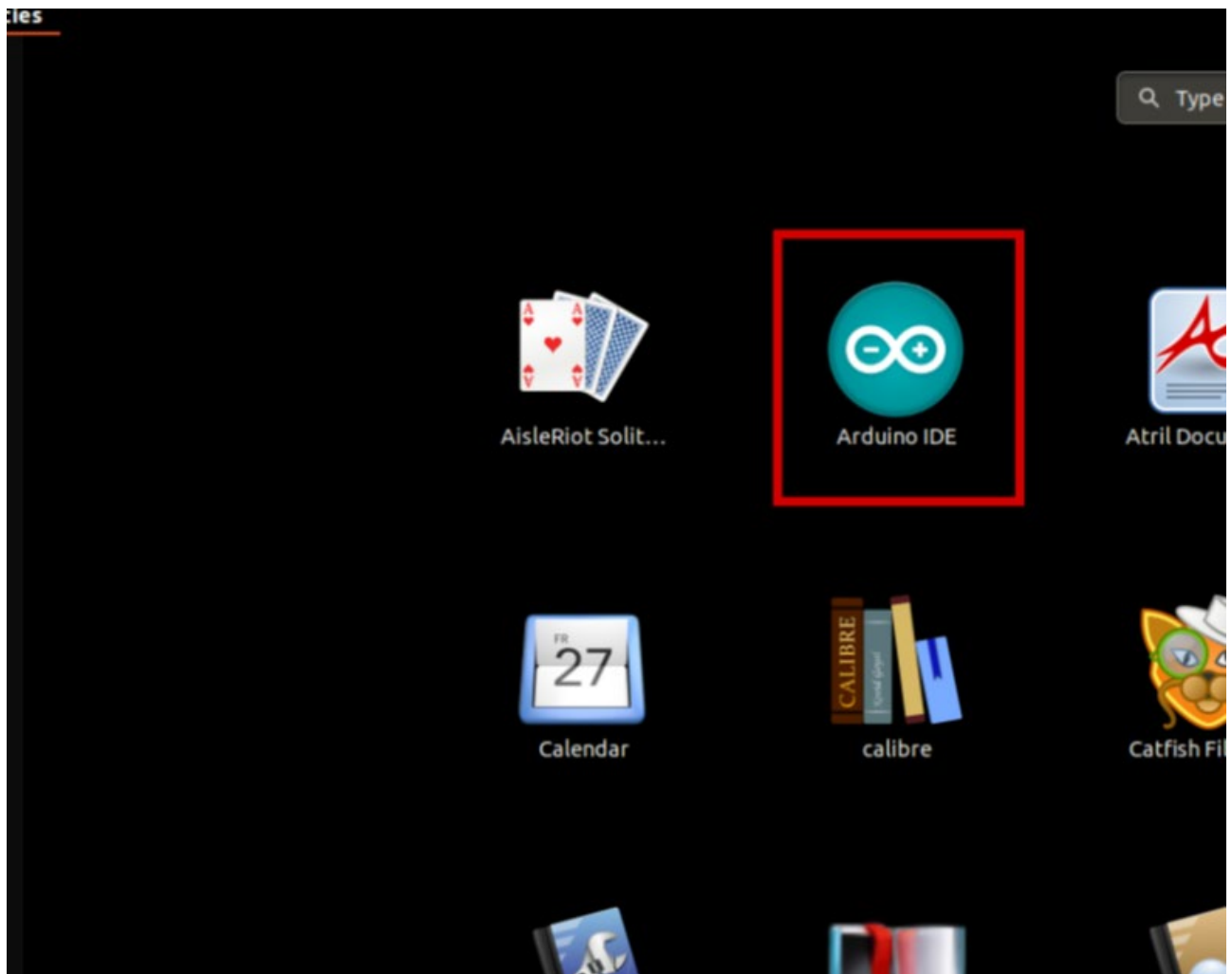
**sh arduino-linux-setup.sh user\_name**

**user\_name** - is the name of a superuser in the Linux operating system. A password for the superuser has to be entered when the command is started. Wait for a few minutes for the script to complete everything.

The second script, called *install.sh*, has to be used after the installation of the first script. Run the following command in the terminal (extracted directory):

**sh install.sh**

After the installation of these scripts, go to the *All Apps*, where the *Arduino IDE* is installed.



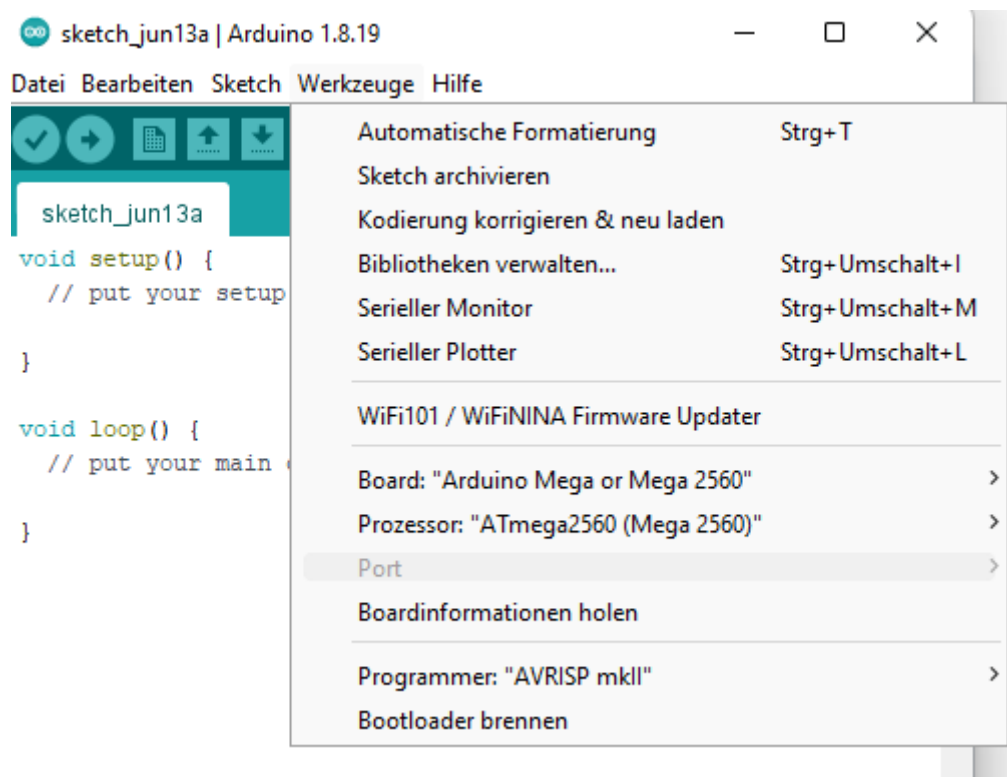
# Az-Delivery

Almost all operating systems come with a text editor preinstalled (for example, *Windows* comes with *Notepad*, *Linux Ubuntu* comes with *Gedit*, *Linux Raspbian* comes with *Leafpad*, etc.). All of these text editors are perfectly fine for the purpose of the eBook.

Next thing is to check, if your PC can detect this board. Open freshly installed Arduino IDE, and go to:

*Tools > Board > {your board name here}*

*{your board name here}* should be the *MEGA2560* as it can be seen on the following image:

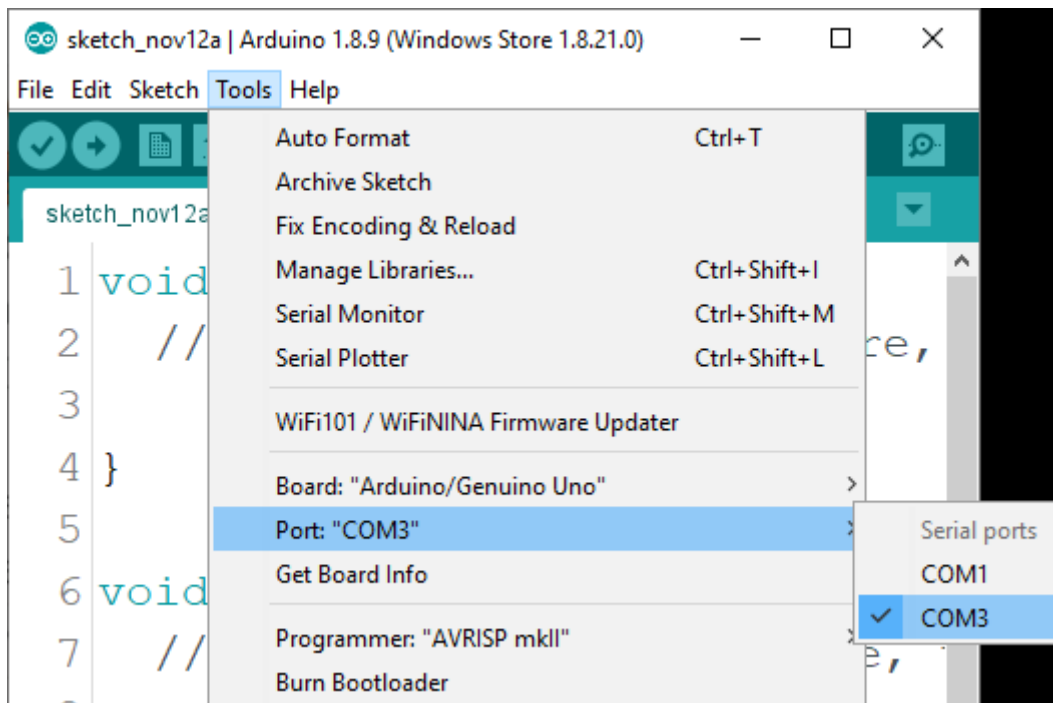


The port to which the board is connected has to be selected. Go to: *Tools > Port > {port name goes here}*

and when the microcontroller board is connected to the USB port, the port name can be seen in the drop-down menu on the previous image.

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## Port configuration



For *Linux* users, for example port name is */dev/ttyUSBx*, where *x* represents integer number between 0 and 9.

## Sketch examples

### Blinking LED

```
void setup() {  
  // initialize digital pin LED_BUILTIN as an output.  
  pinMode(LED_BUILTIN, OUTPUT);  
}  
  
void loop() {  
  digitalWrite(LED_BUILTIN, HIGH);  
  delay(1000);  
  digitalWrite(LED_BUILTIN, LOW);  
  delay(1000);  
}
```

## PWM - Pulse Width Modulation

```
int led = 13; // Built-in LED is connected to pin 13
int brightness = 0;
int fadeAmount = 5;

void setup() {
  pinMode(led, OUTPUT);
}

void loop() {
  analogWrite(led, brightness);
  brightness = brightness + fadeAmount;
  if (brightness <= 0 || brightness >= 255) {
    fadeAmount = -fadeAmount;
  }
  delay(30);
}
```





Now it is the time to learn and make your own projects. You can do that with the help of many example scripts and other tutorials, which can be found on the Internet.

**If you are looking for the high quality microelectronics and accessories, AZ-Delivery Vertriebs GmbH is the right company to get them from. You will be provided with numerous application examples, full installation guides, eBooks, libraries and assistance from our technical experts.**

<https://az-delivery.de>

Have Fun!

Impressum

<https://az-delivery.de/pages/about-us>