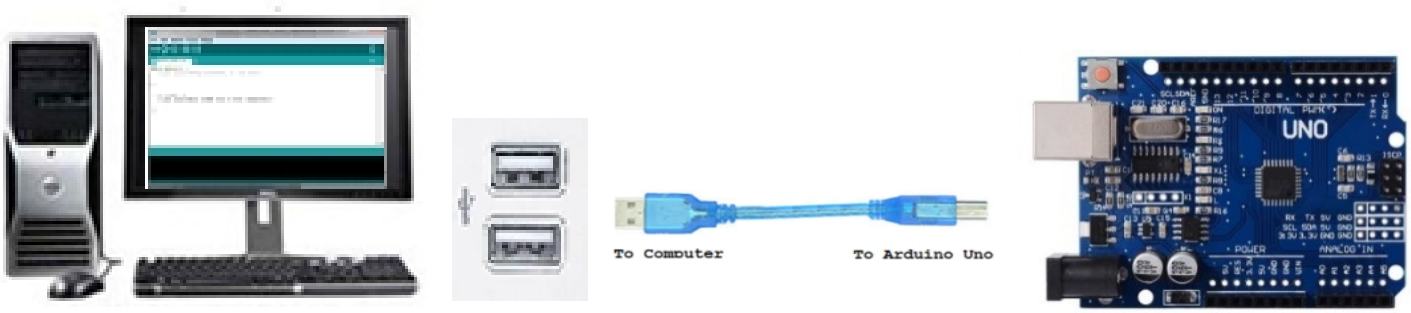
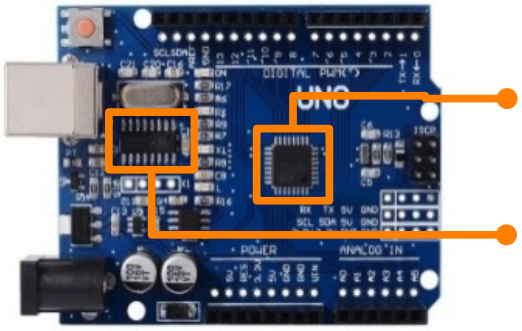


1x Computer with USB 2.0 Type A(Female), with Arduino IDE Software Installed
1x USB 2.0 Type A(Male) / B(Male) Data Cable
1x Arduino Uno Board with USB 2.0 Type B(Female)

From the list above, the most significant thing that we probably noticed will be the word "Arduino". **What is "Arduino" ?**

"Arduino" is basically a collection of tools, to help us to operate and work on something more important, the ATMEGA328 Micro-controller.



ATMEGA328 micro-controller chip (QFP Package) on the **Arduino Uno Development Board**

USB-TTL Chip (CH340)

Now that we know there is something called "ATMEGA328 micro-controller", **What is "ATMEGA328 Micro-controller" ?**

Most of us may not have realized, all the "Smart" electrical and electronic devices around us have one or more "micro-controllers" in them, that is what enabled them to perform various AI task

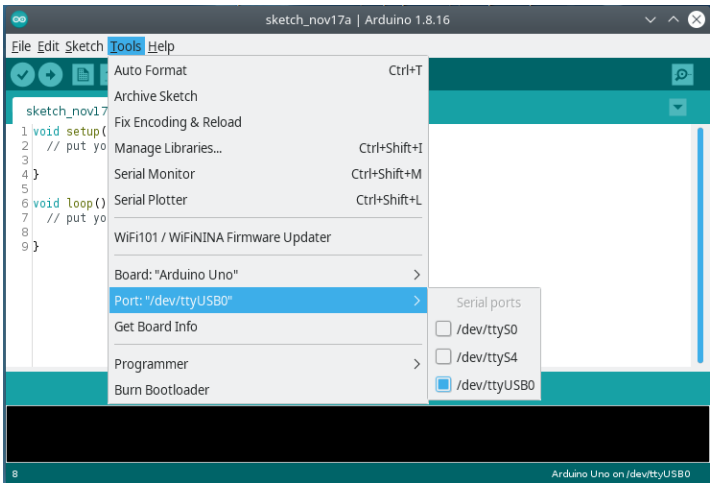
Micro-controller works similar to our regular Computer, we can give the micro-controller instructions (**Program**) so that it will perform various task for us according to what we code in our **Program**.

Unlike the regular computers, the micro-controllers have Memory and processing units all built into a single chip. There is no need for harddisk or RAM outside the chip. Micro-controllers can work directly with raw electronic/electrical components dealing with electron flow directly. With this ability there will be endless limits of what we can do with micro-controllers.

There are types many micro-controllers out there, each with with their own unique specifications. The ATMEGA328 micro-controller is just one of them

Lets create a small Program to test out our Basic Setup (Computer + Arduino IDE Software + USB Cable + Arduino Uno + ATMEGA328 micro-controller)

STEP 1/6: Test connection between the Arduino IDE Software and the USB/TTL chip on the Arduino Uno board



Test 1: Connect Arduino Uno the Desktop Computer with USB Cable, from Arduino IDE Software Menu, select **"Tools | Port >"** a new "Port" will appear.

Test 2: Disconnect Arduino Uno the Desktop Computer from USB Cable, from Arduino IDE Software Menu, select **"Tools | Port >"** a "Port" will disappear.

The **"Port"** that **"appear"** and **"disappear"** is the Connection name between our Desktop Computer and the Arduino Uno USB-TTL chip. **Make sure it is "Selected" and your Arduino IDE is ready to be used with that Arduino Uno Board.**

If you cannot see the "Port" "appear" and "disappear" in Test 1: and Test 2:

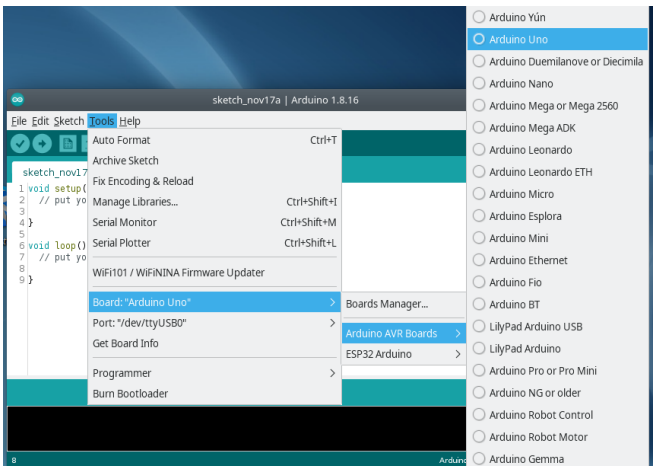
Most likely the driver(software) for the USB-TTL chip is not present on the Computer. We will need to install the USB-TTL driver. Most China made Arduino Uno clones uses the CH340 USB-TTL chip. We can download this USB-TTL driver from the following link

http://www.wch.cn/download/ch341ser_exe.html

If the Arduino Uno is using other USB-TTL chip, we have to find its driver and install it on the Computer.

STEP 2/6: Choose our Development Board. In our case, the Arduino Uno should be selected (normally Arduino Uno is already the default selection)

from Arduino IDE Software Menu, select **"Tools | Board >**

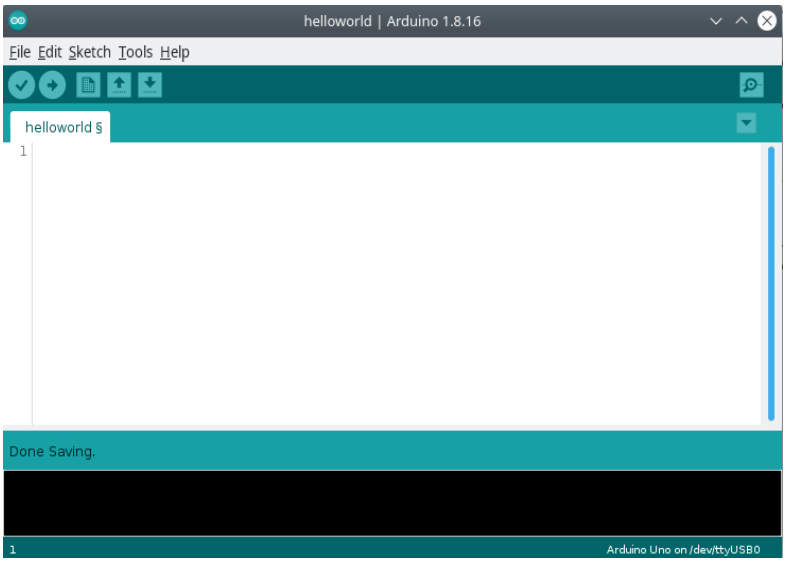


STEP 3/6: Create a new Program using the Arduino IDE Software

The Arduino IDE Software starts with its **Code Editor** screen with a default Program loaded.

To prevent potential mistakes of "over-writing" our existing Program, we do not immediately key-in our Program codes into the Arduino IDE Software Code Editor, we always start by making a new copy.

1.From the Arduino IDE Software menu, select **"File | Save As..."**
2.Key in a new Program name = **"quickstart"** and then Click **"Save"** button
3.Remove all existing codes from the Arduino IDE Software Code Editor so that we can have a clean start

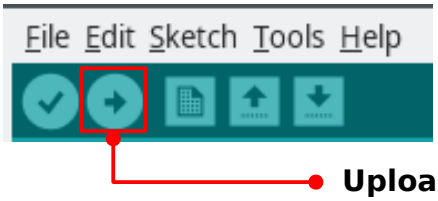


STEP 4/6: Key in the following Program Codes into the Arduino IDE Software

```
void setup() {
  pinMode(13, OUTPUT);
}
void loop() {
  digitalWrite(13, HIGH);
  delay(500);
  digitalWrite(13, LOW);
  delay(500);
}
```

STEP 5/6: Upload the Program into the ATMEGA328 micro-controller from our Arduino IDE Software

Click the **"Upload Icon"** or From Arduino IDE Software menu, select **"Sketch | Upload"**



STEP 6/6: Done Uploading

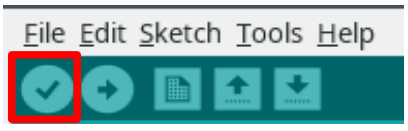
The Arduino IDE Software will show a status at the bottom of the screen "Done Uploading", means it has successfully sent our Program into the ATMEGA328 micro-controller. We are Done!!!

Watch the test LED on the Arduino Uno board, The test LED will be switched ON and OFF every 500 miliseconds.

This program will stay inside the micro-controller Program Memory permanently (until we replaced it with a new upload) otherwse, this Program will run automatically whenever we power-up or reset our Arduino Uno

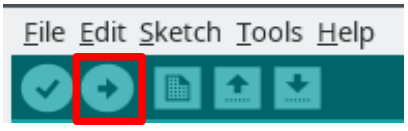
The difference between "Compile" and "Upload" in the Arduino IDE Software

Compile



"Compile" will check the C-Language Codes in the Program Code Editor for errors, if no errors are found, a "Machine Code" file will be generated otherwise errors will be shown at the bottom of the screen.

Upload



"Upload" will run the "Compile" option, if the "Machine Code" file is sucessfully generated by the "Compile" option, the "Upload" will continue to sent the "Machine Code" into the into the micro-controller Program Memory.

Arduino Uno QuickStart – Programming – Serial Monitor
https://github.com/teaksoon/lmaewapm

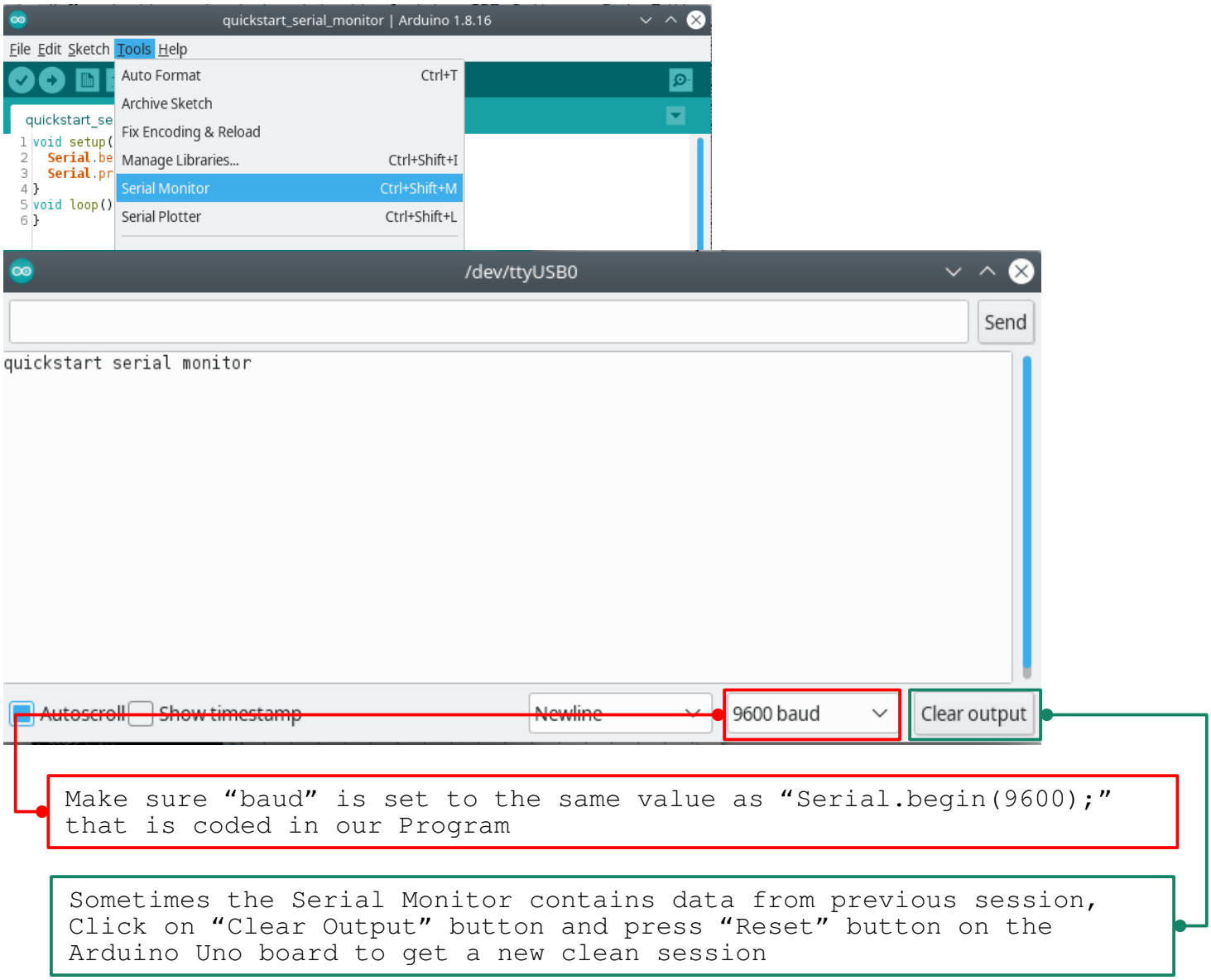
We are able to send our Program into the ATMEGA328P micro-controller with our Arduino IDE Software "Upload" facility. The Arduino IDE Software can also receive information from our Program running inside the Atmega328 micro-controller via the Arduino IDE Software, "Serial Monitor" facility.

Use the Arduino IDE Software
1.Save Program as "quickstart serial monitor"
2.Key in the codes below into the Arduino IDE Software Code Editor and Upload

```
void setup() {
  Serial.begin(9600);
  Serial.println("quickstart serial monitor");
}
void loop() {
}
```

This time we will not see blinking LED but we will see something on the "Serial Monitor" screen

From Arduino IDE Software menu, select **"Tools | Serial Monitor"**



When our ATMEGA328 micro-controller run the Serial.println("quickstart serial monitor") instruction code, the "quickstart serial monitor" text will be sent from our ATMEGA328 micro-controller to our Computer via the USB interface, and is picked-up and displayed by our Arduino IDE Software's Serial Monitor facility.