

ESP-12E (ESP8266) WITH ARDUINO UNO: GETTING CONNECTED

Technology (/technology/) > Arduino (/technology/arduino/) by Tstef (/member/Tstef/)

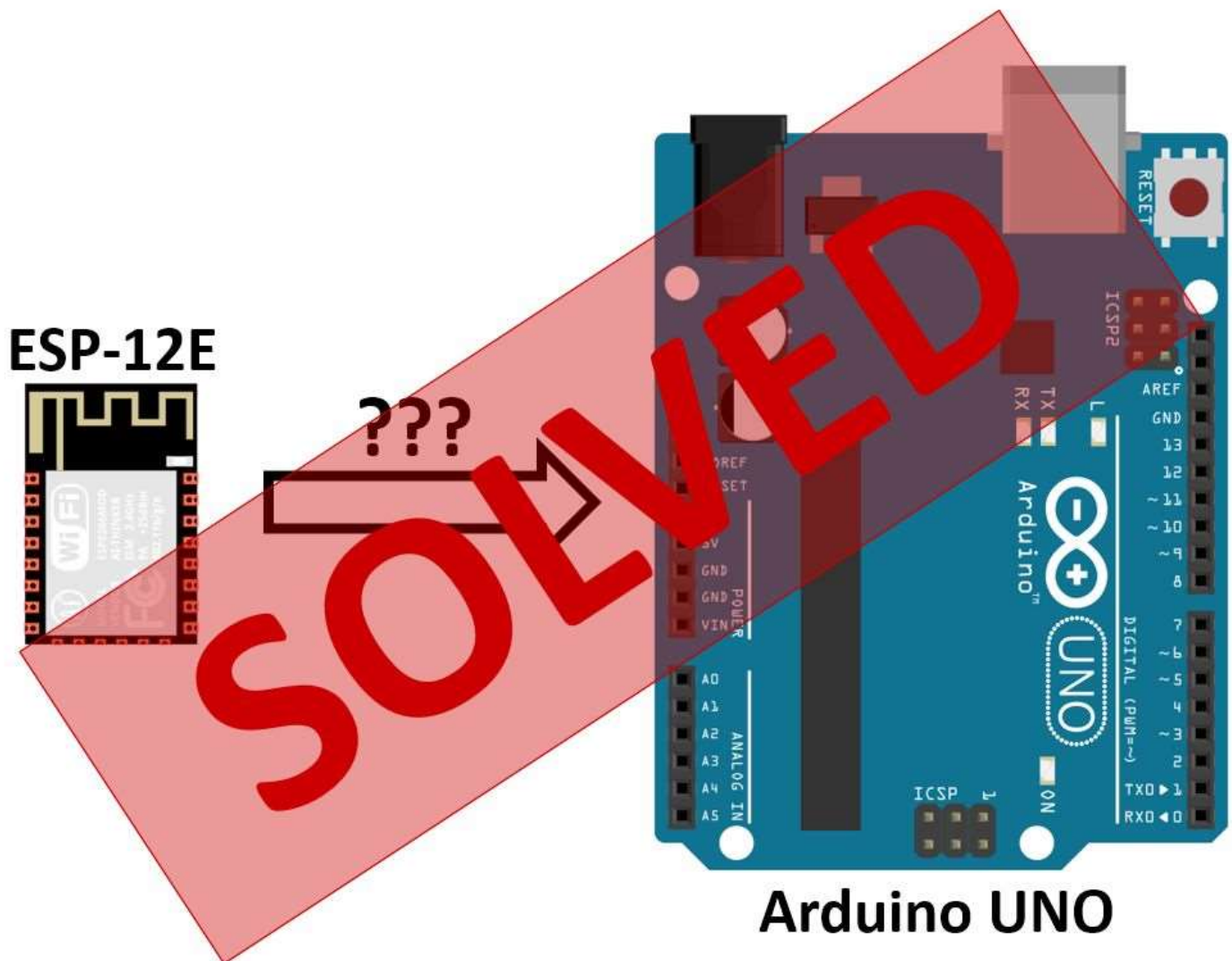
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This tutorial is the first of three parts for people who want to connect their ESP8266 through an Arduino UNO board. More specifically, I will be using the ESP-12E version of these wifi modules.

I personally had a lot of trouble when I started exploring ESP8266 boards. There is a lot of information out there but parsing through it is quite daunting for a beginner and I never found a tutorial to my liking on how to use them with Arduino Uno. I therefore decided to create my own tutorial with the knowledge I gathered from endless hours of looking on sites, blogs, forums, etc. so others don't have to go through the same tedious process.

Here's what the different parts will cover:

1. How to connect the ESP-12E to the UNO for basic operation and serial communication;
2. How to flash new firmware to the module;
3. How to upload your own sketches to your ESP-12E.

I'm assuming you already have some sort of breakout board (<http://bit.ly/2klbBn5>) for your module or a way to attach wires to the different pins. This series of tutorials will not cover how to build a breakout board. ankitdaf (<https://www.instructables.com/member/ankitdaf/>) has a good tutorial on this subject HERE (<https://www.instructables.com/id/Getting-Started-with-the-ESP8266-ESP-12/>) -- I'm using something very similar to his build.

I'm also not going to cover installing the Arduino IDE since you probably have it installed if you have an UNO. Here's the official link (<https://www.arduino.cc/en/main/software>) in case you don't have it.

Let me tell you from the start, **THIS CONFIGURATION WORKS!** I have used it successfully for a while now and it hasn't let me down (no resets or anything).

What you'll need:

-
- Arduino UNO board Download Favorite
 - ESP-12E module (have not tested this on other versions but it might work, give it a try)
 - 3.3V power source, don't use Arduino 3.3V pin
 - I'm using a 5V USB phone charger and a [step-down voltage converter](http://bit.ly/2kl9dfP) (<http://bit.ly/2kl9dfP>)
 - use something that's capable of providing at least 500mA just to be sure as some people have been noticing spikes of up to 420mA in ESP modules
 - EDIT: I'm actually using mine just under 3.6V and it seems to perform better than it did at 3.3V.
 - jumper wires
 - 4 x 10kΩ resistors
 - a breadboard
 - 2 push buttons (optional but recommended for ease of use)
 - a 470uF capacitor (optional but recommended for stability)



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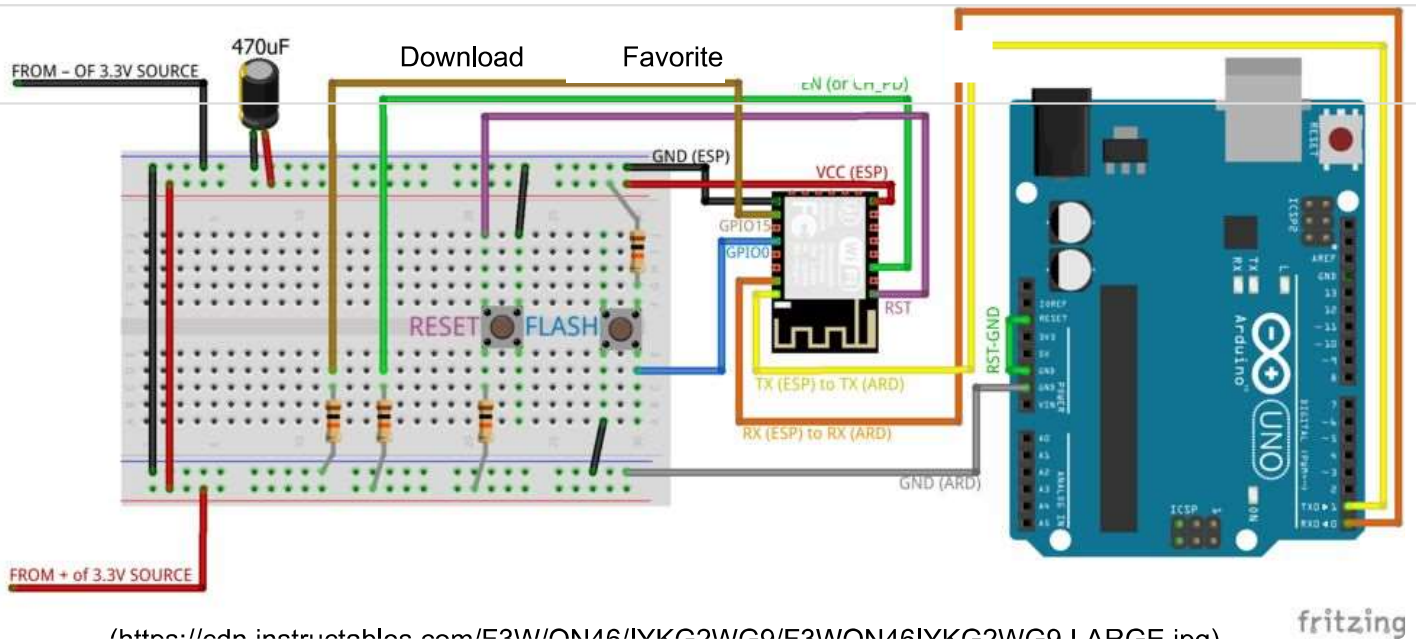
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Step 1: Make the Connections



Start with the diagram and refer to the description below if something is not clear.

Here's a nice, large diagram that hasn't been compressed if you need it: [WIRING DIAGRAM \(https://s24.postimg.org/sgpzfztr91/ESP12_Flash_config.png\)](https://s24.postimg.org/sgpzfztr91/ESP12_Flash_config.png).

WARNING: Again, do not use the 3.3V pin on the Arduino UNO to power your ESP module. The ESP draws more current than the 3.3V pin can provide.

FROM POWER SOURCE TO BREADBOARD:

+3.3V to positive rail of breadboard

GND/Negative to negative rail of breadboard

There is also a 470µF capacitor connected between the positive and negative rails of the breadboard. This is a polarized capacitor so be careful with the wiring: the side with the stripe usually indicates the negative pole, so connect this to the negative rail and the other to the positive rail.

FROM ESP TO BREADBOARD:

GND to negative rail of breadboard

EN (or CH_PD) pulled high (to 3.3V) with a 10kΩ resistor

RST normally pulled high with a 10kΩ resistor but connected to GND when "RESET" button is pushed

GPIO15 pulled down (to GND) with a 10kΩ resistor

GPIO0:

- Normal operation: pulled high with 10kΩ resistor OR floating (not connected to anything)
- Flashing/uploading: Connected to GND when "FLASH" button is pushed

If you don't want to use the buttons:

- *RST should be pulled high; manually connect-and-disconnect to GND when a reset of the ESP is required; alternative: leave RST pulled high and power off/on the ESP by disconnecting and reconnecting the VCC line*
- *GPIO0 should not be connected to anything for normal operation but manually connect it to GND when you want to flash firmware or upload sketches*

FROM ESP TO ARDUINO:

TX on ESP to TX pin on Arduino (pin #1)

RX on ESP to RX pin on Arduino (pin #0)

RESET pin must be connected to GND pin (this disables board resetting on serial com initialization in Arduino)

If you've connected everything correctly, you should at least see the blue LED on the ESP flash when you reset/reboot it.



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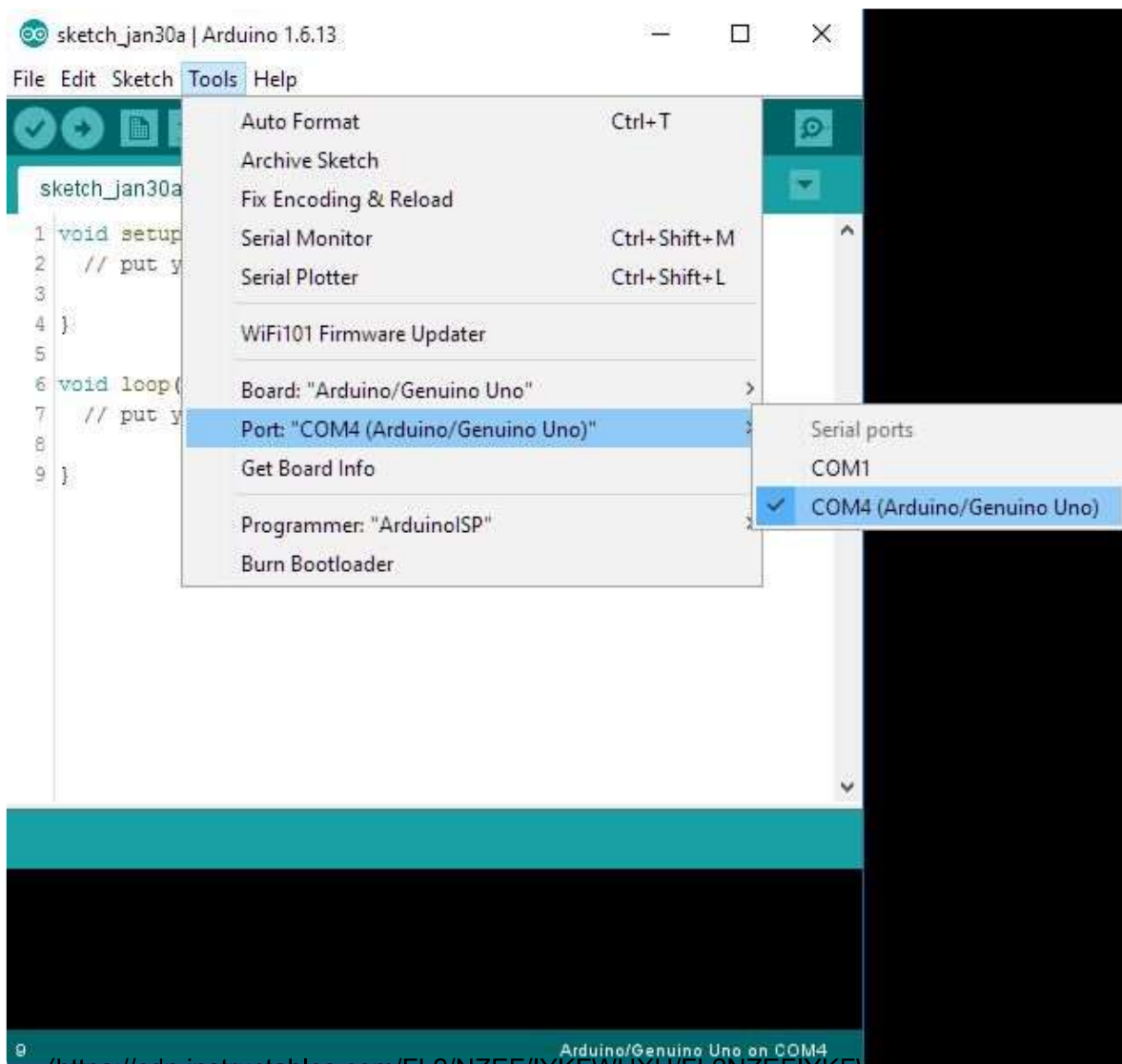
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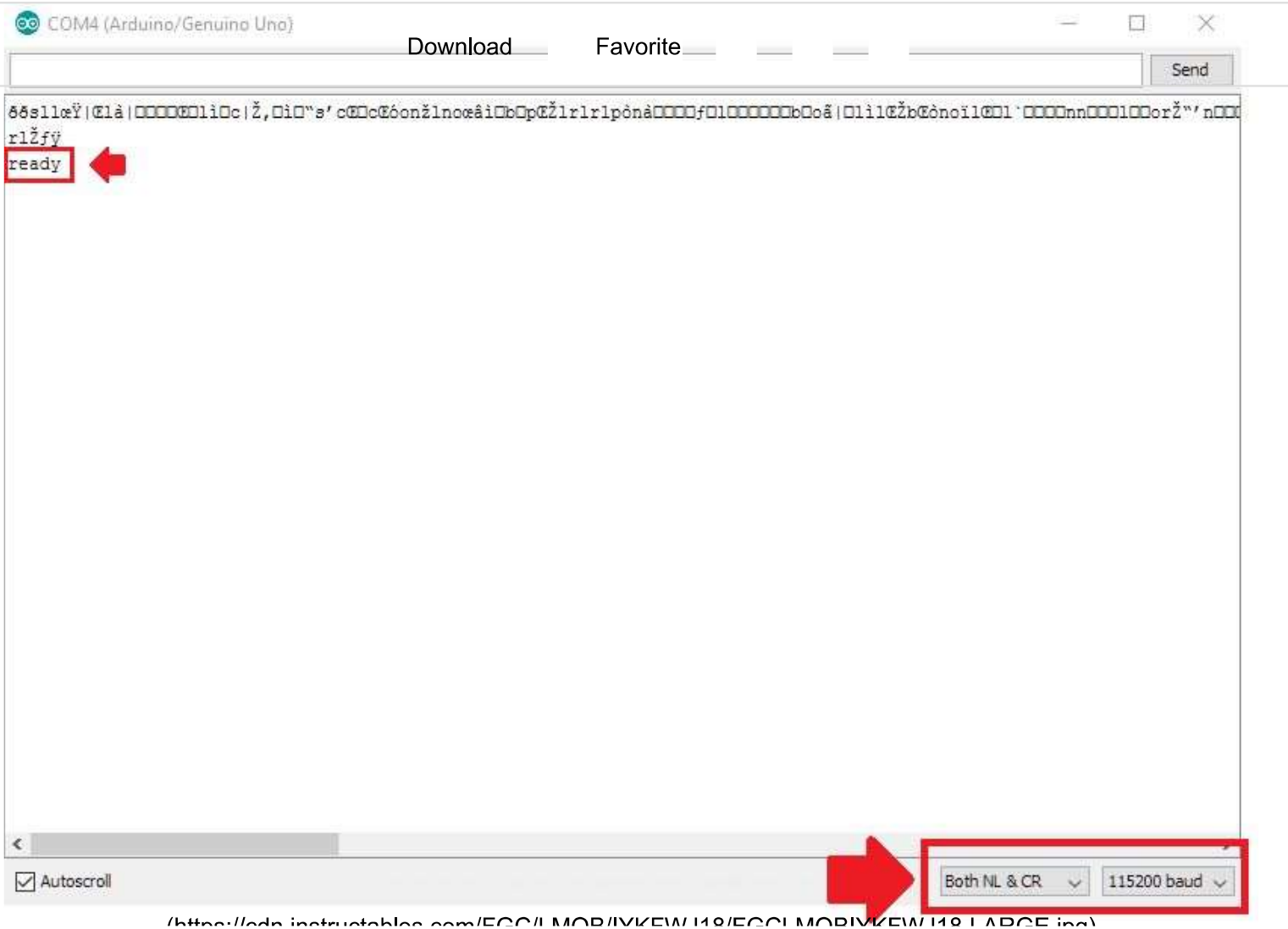


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Step 2: Open Arduino IDE and the Serial Monitor





You should now be all set to communicate with your ESP through the Arduino UNO from the Serial Monitor.

All my ESPs have come preloaded with the AT commands library. That being said, there are people out there saying that their ESPs came with nothing on them initially and that they had to flash one firmware or another. We'll find out either way in this step

Open the Arduino IDE, select the Port to which your Arduino UNO is connected and then open the Serial Monitor.

In the bottom-right corner of the Serial Monitor select 115200 as the baud rate. You should also have "Both NL & CR" selected.

Make sure all the connections from the previous step are correct -- we're aiming for basic operation here, not flashing, so GPIO0 should be pulled high or left disconnected.

Reset/reboot the ESP module. If everything is in order, in the serial monitor you should see some mumbo-jumbo characters at first followed by "ready". If it shows this, you're ready to test a few commands so proceed to the next step.



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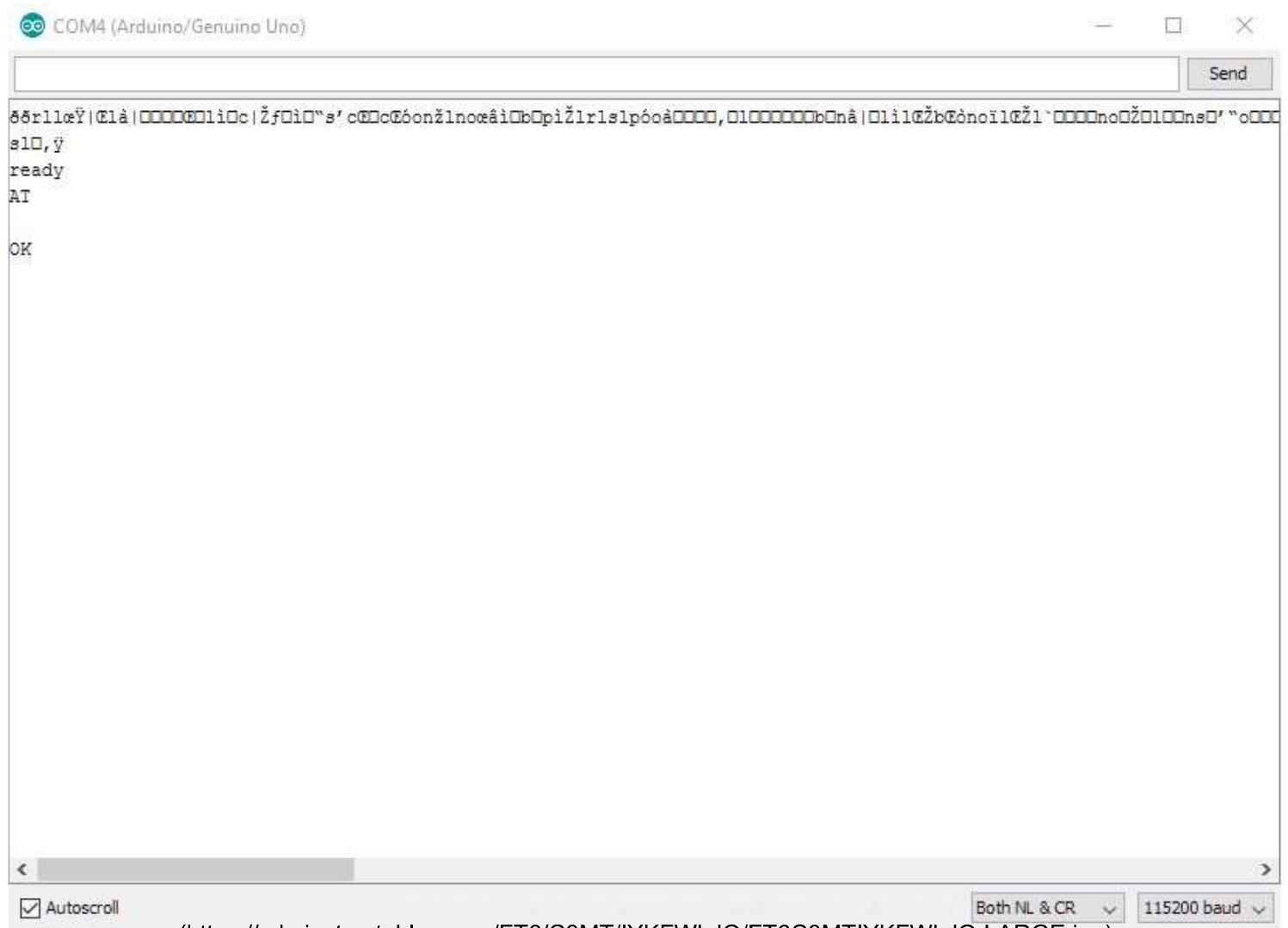
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Step 3: AT Commands



Now we're ready to type a few commands to see the serial monitor. Just type the desired command

Here's a list of the most common commands used.

AT check if the module is connected properly and its functioning, the module will reply with an acknowledgment.

AT+RST reset the wifi module. It's good practice to reset it before or after it has been programmed.

AT+GMR list the firmware version installed on the ESP8266.

AT+CWLAP detect the Access points (wifi networks) available in the area and their signal strengths. LAP means List Access Points

AT+CWJAP="SSID","PASSWORD" connects the ESP8266 to the specified SSID in the AT command mentioned in the previous code. JAP means Join Access Point

AT+CWJAP="", "" disconnect from all access points

AT+CIFSR display the obtained IP address and the MAC address of the ESP.

AT+CWMODE= sets the wifi mode. Reset with AT+RST after changing wifi mode.

AT+CWMODE? will tell you which wifi mode the module is set to. 1 is STATION (used to connect to other networks, this is what you use to measure sensor data and send it to a website), 2 is Access Point (a wifi network in itself), and 3 is a hybrid STATION-ACCESS POINT.

If you want to go more in-depth with AT commands, here is the [official documentation](https://espressif.com/sites/default/files/documentation/4a-esp8266_at_instruction_set_en.pdf) (https://espressif.com/sites/default/files/documentation/4a-esp8266_at_instruction_set_en.pdf) with all the possible AT instructions. And just in case they decide to move it, I've attached the 2016 document below.

In the next tutorial, we'll see how we can set up the ESP-12E with the ESP Flash Tool 2.4.

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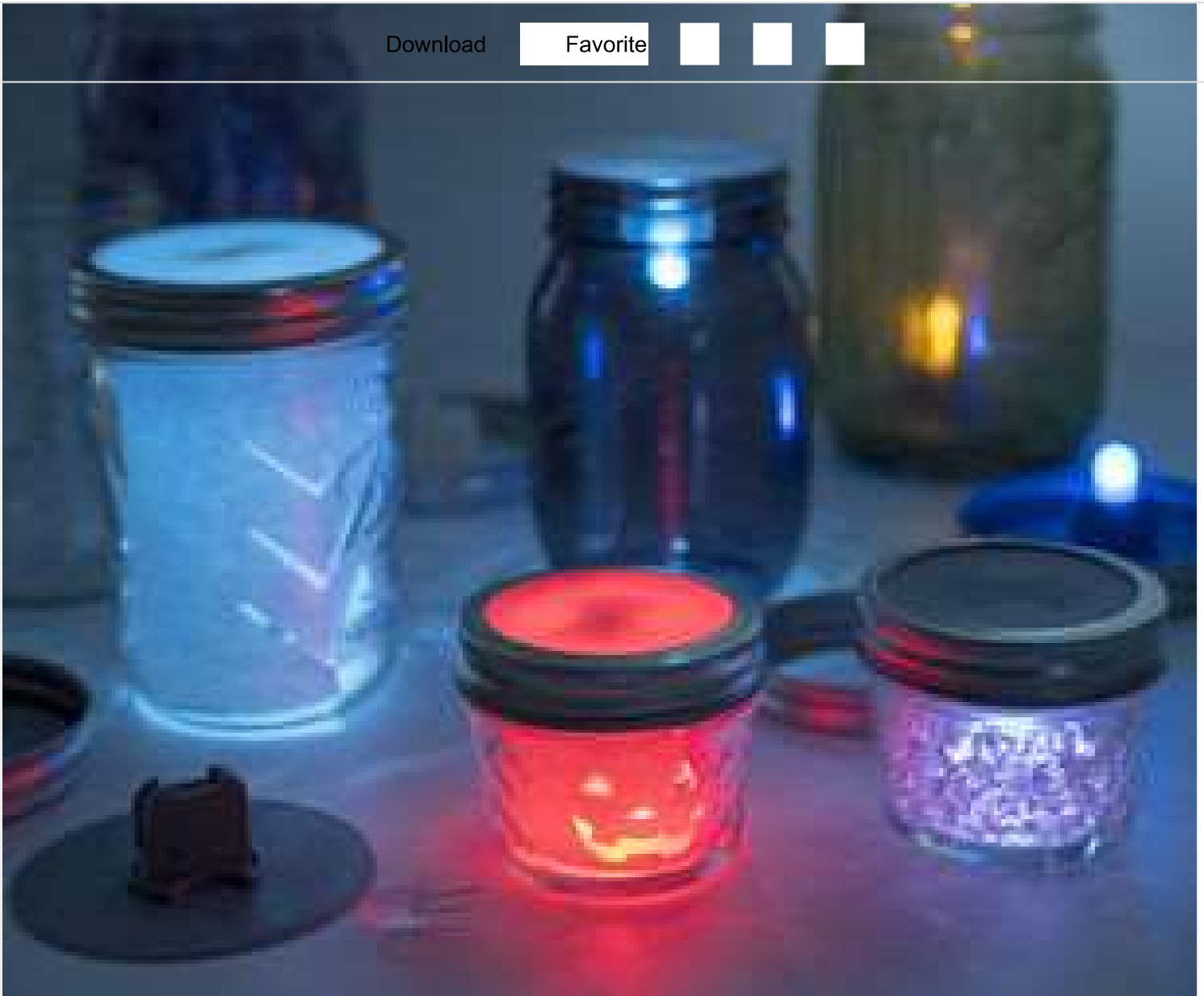
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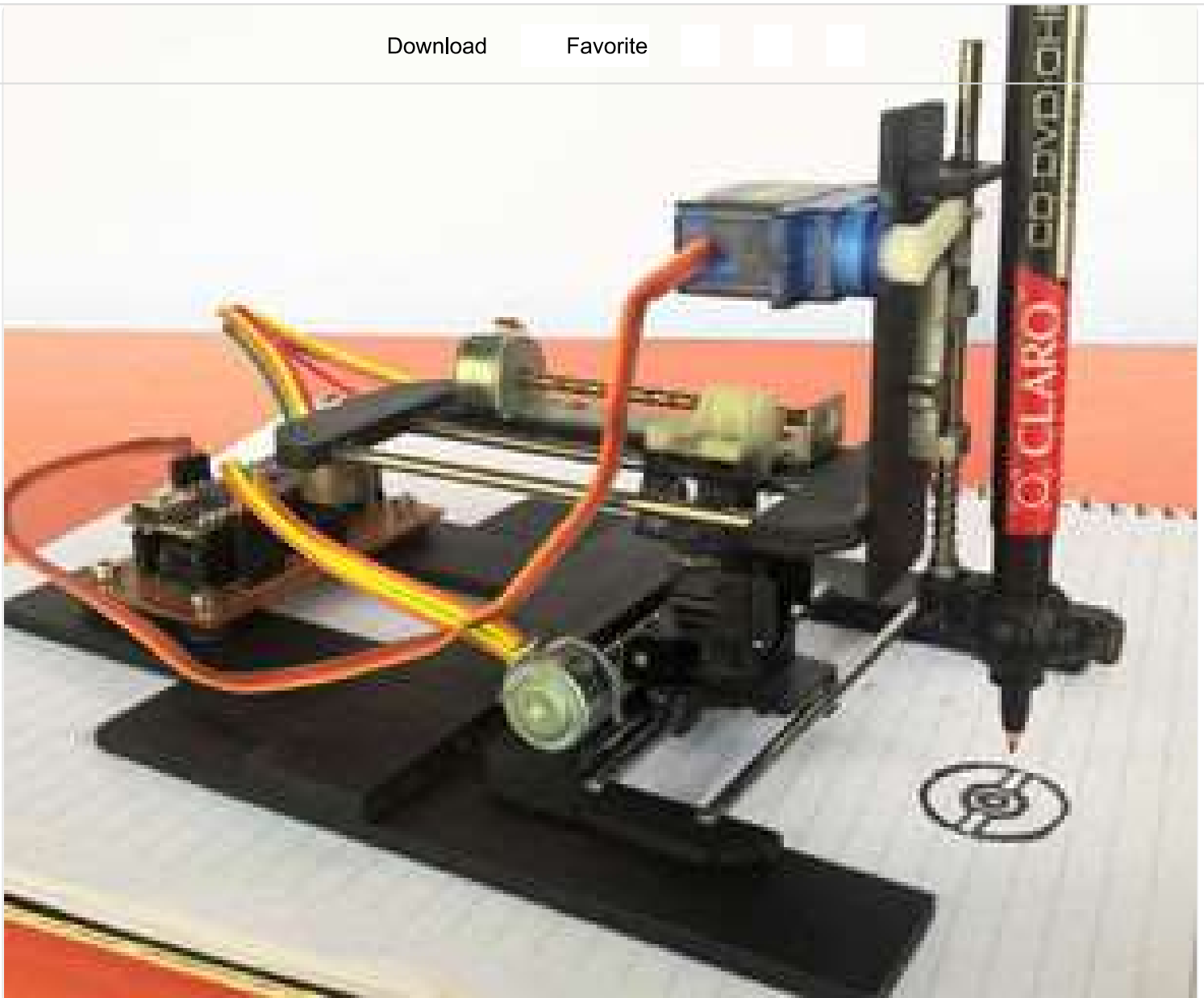
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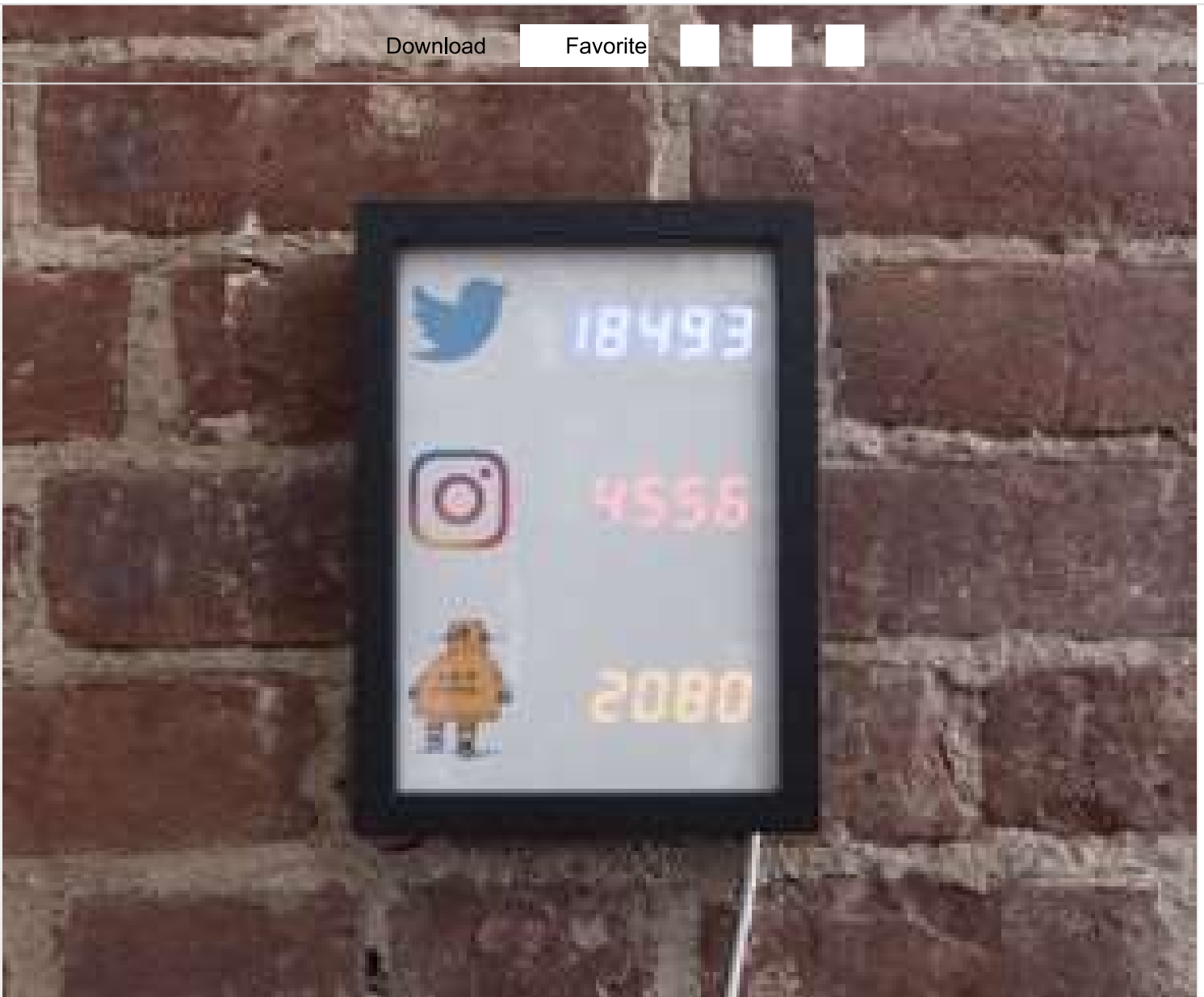
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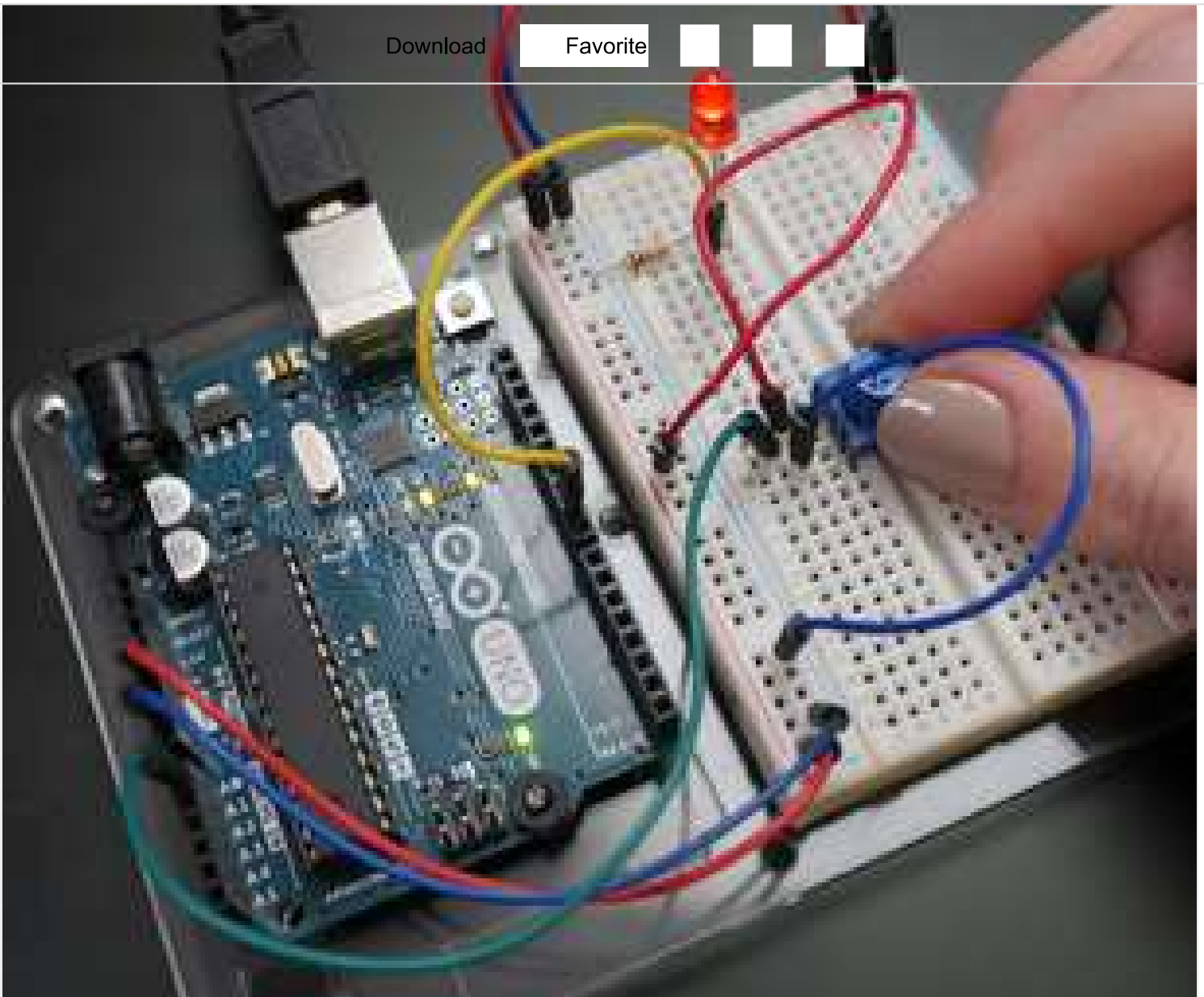
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3 Questions

Asked by sanjeev9392 (/member/sanjeev9392/) 1 day ago

Answer

hi i connected the circuit same as above but i am getting error like
error: espcomm_upload_mem failed though all the connections are correct and i have attached the error
screen shot below please help me am confused i tried other circuits for programming its not working can
u send the schematic of the same circuit ton sanjeevrao9392@gmail.com
(mailto:sanjeevrao9392@gmail.com)



(<https://cdn.instructables.com/F2M/87L2/JDUKM9DW/F2M87L2JDUKM9DW.LARGE.jpg>)

Asked by [sanjeev9392 \(/member/sanjeev9392/\)](/member/sanjeev9392/) 1 day ago

Answer

hi i connected the circuit same as above but i am getting error like
error: espcomm_upload_mem failed

Asked by [nookesh \(/member/nookesh/\)](/member/nookesh/) on Step 3 12 days ago

Answer

Can I program the micro controller present in ESP-12E using the above connections(using above connections)?

Ask Question

23 Comments



[LiwaaK \(/member/LiwaaK/\)](/member/LiwaaK/) 8 weeks ago
(</member/LiwaaK/>)
Reply

Does it work with esp-07



VicCnd (/member/VicCnd/) 2 months ago
(/member/VicCnd/)

Reply

Hello, thank you for the tutorial! I need some help, the esp blinks when i power it and reset it but i dont get anything in the monitor. I tried different baud rates but nothing prints. Any suggestions?



PrinceG38 (/member/PrinceG38/) 2 months ago
(/member/PrinceG38/)

Reply

Is there a tutorial for uploading sketch using this connection , thank you



hikaru mounir (/member/hikaru+mounir/) 7 months ago
(/member/hikaru+mounir/)

Reply

thanks a lot for this instructables.

i ve a question :

can i use the same connections as shown in Step 1 ?

knowing that i have ESP-12F and an Arduino UNO R3 (see the picture)



(<https://cdn.instructables.com/FF3/1HT2/J5CQ9FFI/FF31HT2J5CQ9FFI.LARGE.jpg>)



Tstef (author) 6 months ago reply to hikaru mounir (/member/hikaru mounir/)
(/member/Tstef/)

Reply

Yes, same connections.



hikaru mounir (/member/hikaru+mounir/) 3 months ago reply to Tstef (/member/Tstef/)

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thank's for the answer again,

it's been a while since I logged in to instructables.

I was very busy with my study.



hikaru mounir ([/member/hikaru+mounir/](#)) 7 months ago in reply to hikaru mounir

([/member/hikaru+mounir/](#))

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picture:

<https://i.ebayimg.com/images/g/aF4AAOSwoydWsmLD/s-l300.jpg>



Vito8 ([/member/Vito8/](#)) 3 months ago

([/member/Vito8/](#))

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Thanks for the awesome tut. I am able to send the AT commands through the serial monitor, but I cant upload my sketch. How can I upload my sketch to esp-12e and how to communicate with arduino?



Vito8 ([/member/Vito8/](#)) 3 months ago in reply to Vito8 ([/member/Vito8/](#))

([/member/Vito8/](#))

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ok I got it. I have to press reset and flash to flash some sketches to esp 8266



vinutp1989 ([/member/vinutp1989/](#)) 4 months ago

([/member/vinutp1989/](#))

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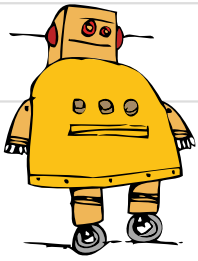
i made the connections as above,initially its worked properly

but some time later i cant send AT comd and whn i reseting serial moritor showing garbage

valule what may be the fault i checked mor

pls help me its urgent

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