Programming Raspberry Pi Pico with Arduino IDE

November 21, 2023

Notes:

- This tutorial is based on the tutorial available at `https://randomnerdtutorials.com/programming-raspberry-pi-pico-w-arduino-ide/#Raspberry-Pi-Pico-Boards-Manager`

1 Introduction

The Raspberry Pi Pico is a low-cost microcontroller board developed around the RP2040 chip by the Raspberry Pi Foundation and it can be programmed using MicroPython or C/C++ like the Arduino.

In this tutorial, you'll learn how to set up Arduino IDE to start programming your Raspberry Pico and Pico W boards with C/C++ programming language. Further, all steps to connect Raspberry Pi Pico to AntiX ARQCP virtual machine are also described.

At the end of this tutorial, messages sent by Raspberry Pi Pico should be printed on a terminal running on AntiX ARQCP virtual machine.

2 Installing Arduino IDE

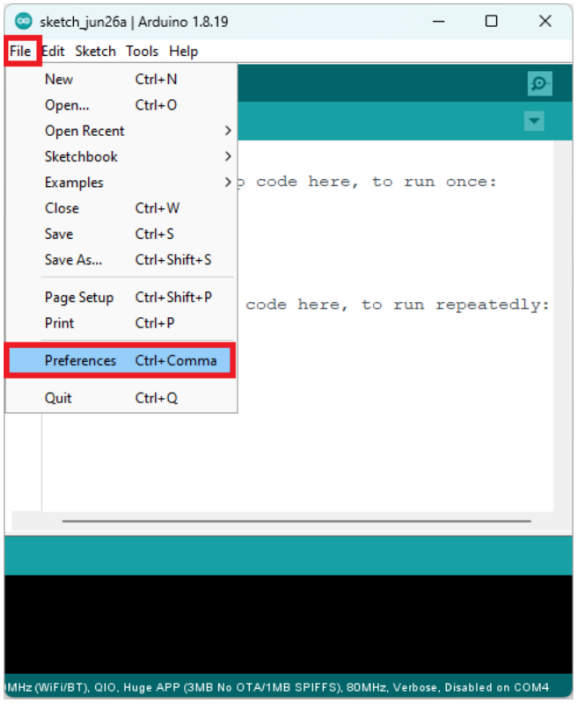
1. For installing Arduino IDE, first download it from `https://www.arduino.cc/en/software`.

and then, install it.

There are versions for Windows, Linux, and Mac OS (Intel and Apple Silicon).

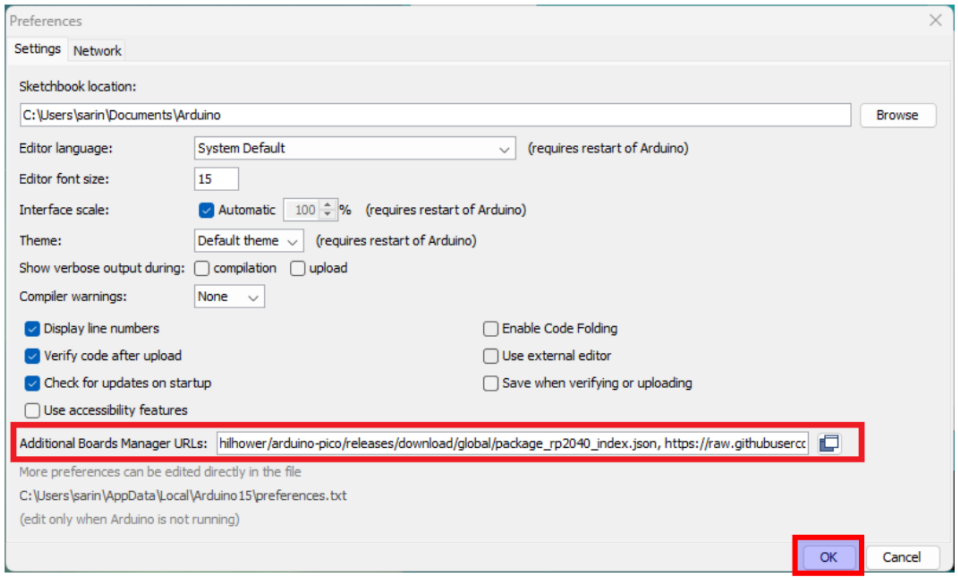
3 Adding the Raspberry Pi Pico to the Boards Manager

1. In the Arduino IDE for Windows, go to `File > Preferences`. In Mac OS, go to `Arduino IDE > Settings...`.



2. Enter the following URL into the `Additional Boards Manager URLs` field:

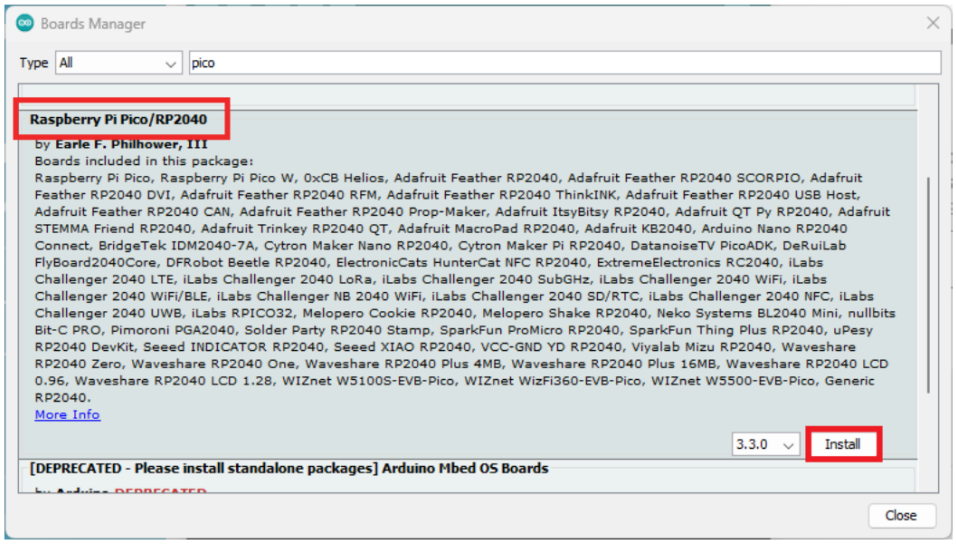
```
https://github.com/earlephilhower/arduino-pico/releases/download/global/package_rp2040_index.json
```



and then, click on `OK`.

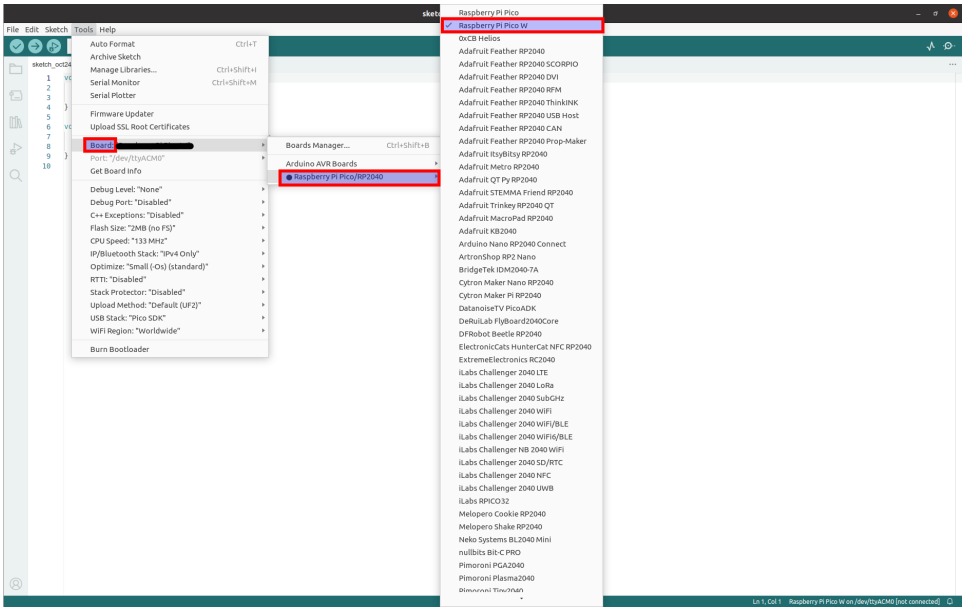
3. Open the Boards Manager. Go to `Tools > Board > Boards Manager...`

4. Search for `pico` and install the `Raspberry Pi Pico/RP2040` boards.



and then, install it.

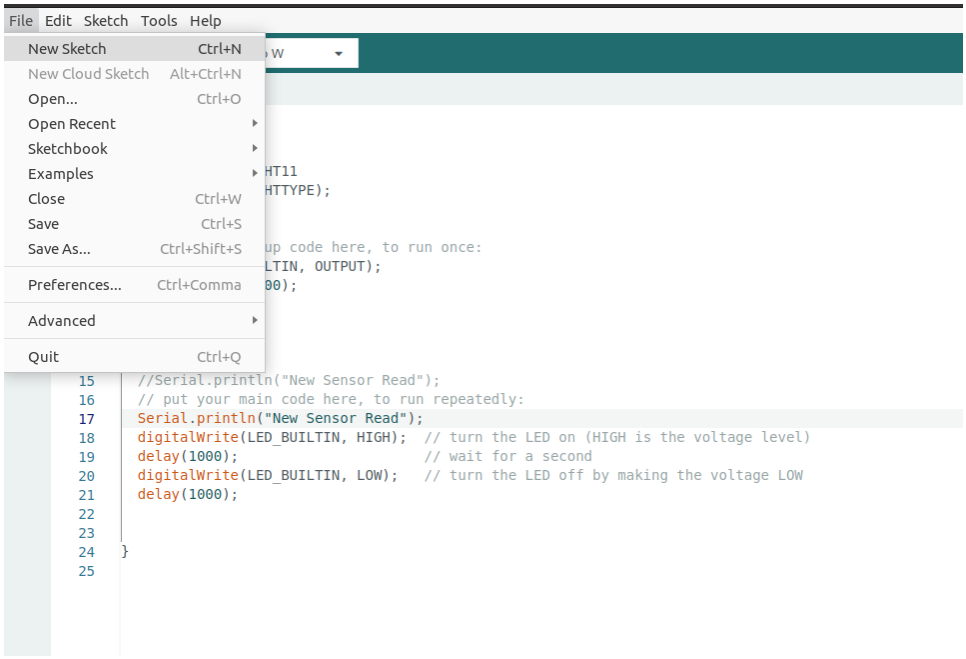
5. Go to `Tools > Board > Raspberry Pi Pico/RP2040` and select `Raspberry Pi Pico W`



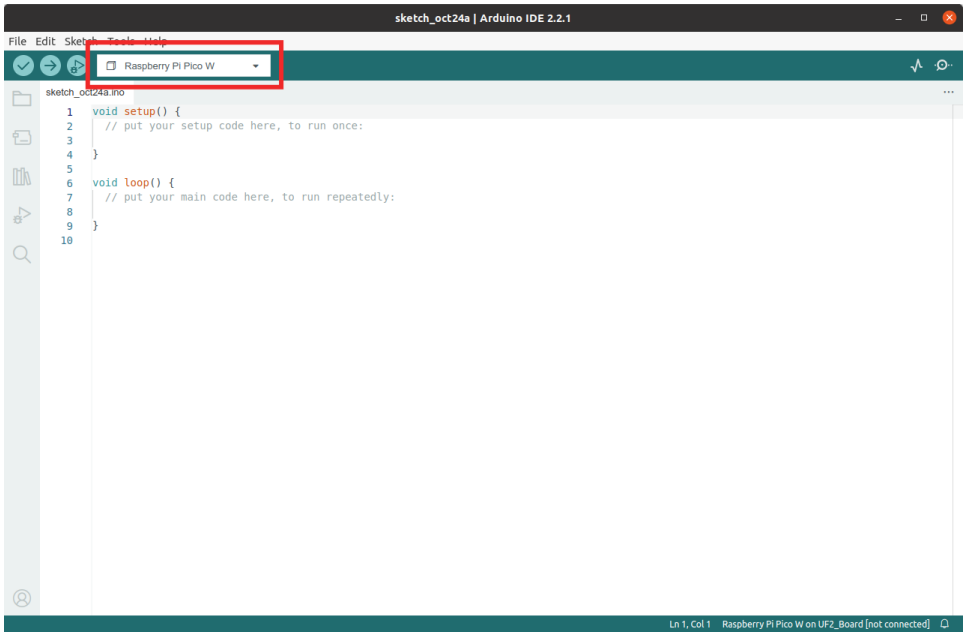
4 Programming

4.1 Create a new Sketch

1. In the Arduino IDE, go `File > New Sketch`



and you got:



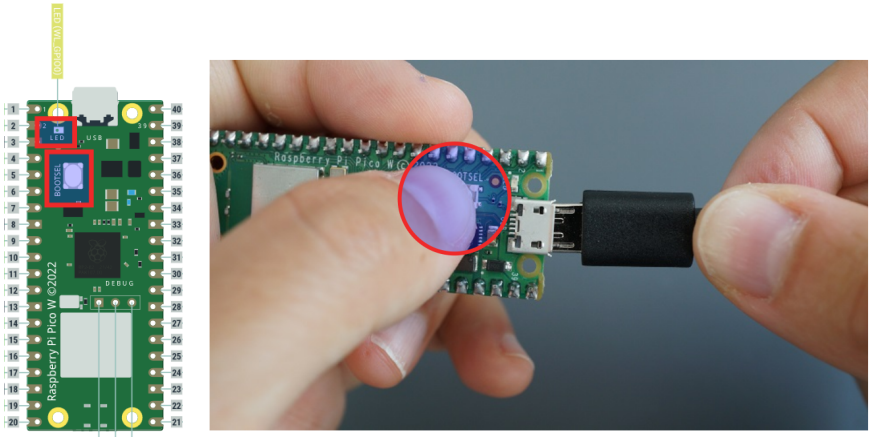
2. Code `setup` and `loop` functions as follows:

```
void setup() {
   // put your setup code here, to run once:
   // initialize digital pin LED_BUILTIN as an output.
   pinMode(LED_BUILTIN, OUTPUT);

}

void loop() {
   // put your main code here, to run repeatedly:
    // turn the LED on (HIGH is the voltage level)
   digitalWrite(LED_BUILTIN, HIGH);
   // wait for a second
   delay(1000);
    // turn the LED off by making the voltage LOW
   digitalWrite(LED_BUILTIN, LOW);
   // wait for a second
   delay(1000);
}
```

4.2 Connecting the Raspberry Pi Pico in BOOTLOADER mode

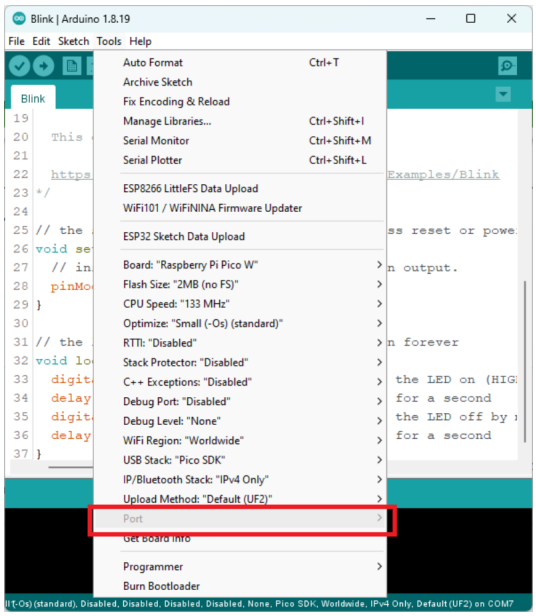
1. Set the BOOTLOADER mode

   - For you to be able to upload code to the Raspberry Pi Pico, it needs to be in bootloader mode.
   - For that, connect the Raspberry Pi Pico to your computer while **holding the BOOTSEL button at the same time**.

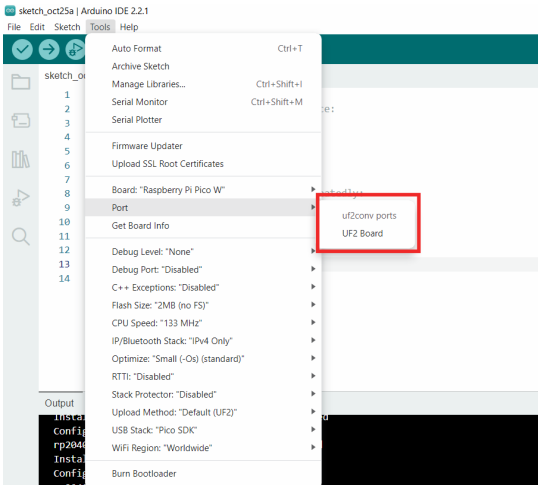


2. Select your COM port in `Tools > Port`.

   - It may be the case that the COM port is grayed out. If that's the case, don't worry. It will automatically find the port once you hit the upload button.

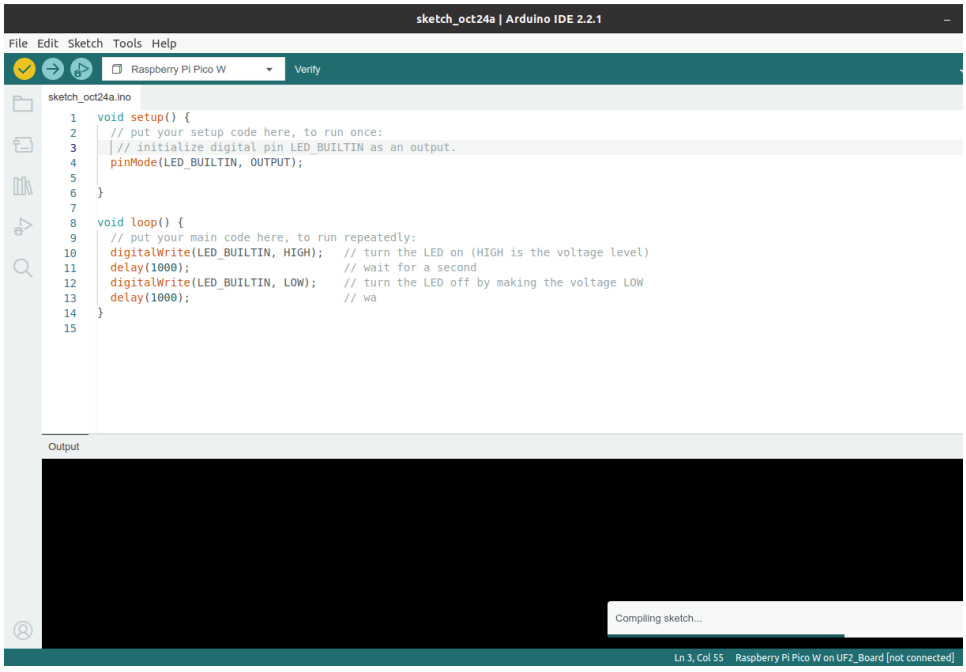


   - In Mac OS, select the UF2 port (or `/dev/cu.usbmodem14101` if it is already available)



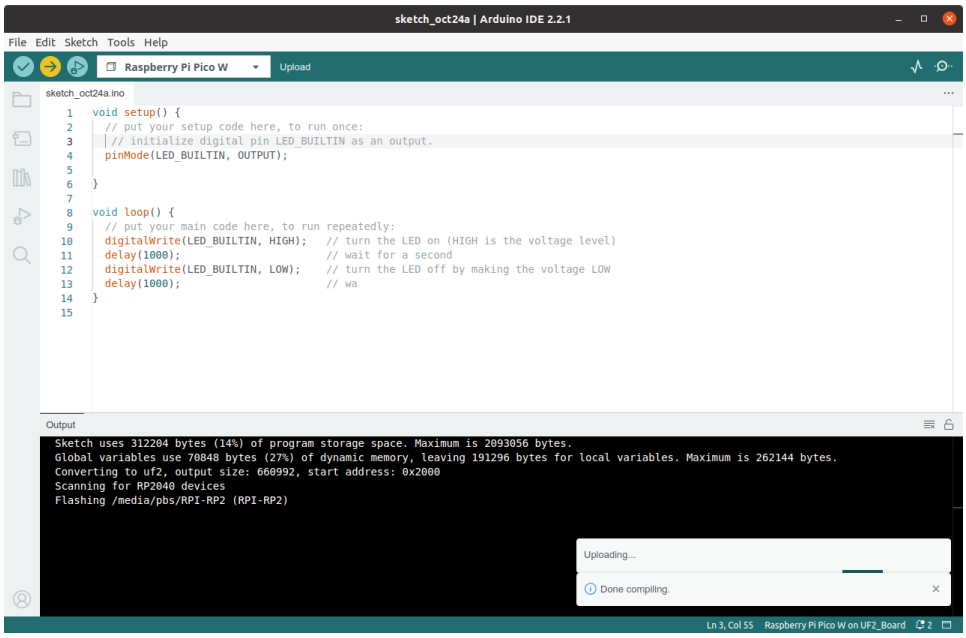
4.3 Compiling and uploading code

1. In the Arduino IDE, select `Sketch > Verify/Compile` (or using the first toolbar option)

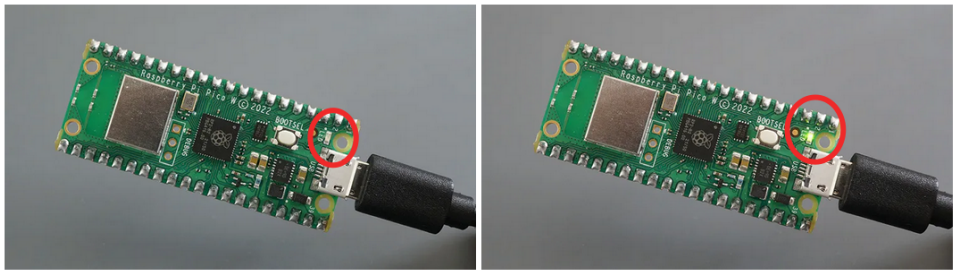


2. In the Arduino IDE, select `Sketch > Upload` (or using the second toolbar option). In Mac OS, check if /dev/cu.usbmodem14101 port

is selected prior to upload the sketch.



3. If everything went as expected, the Raspberry Pi Pico onboard LED should be blinking every second.

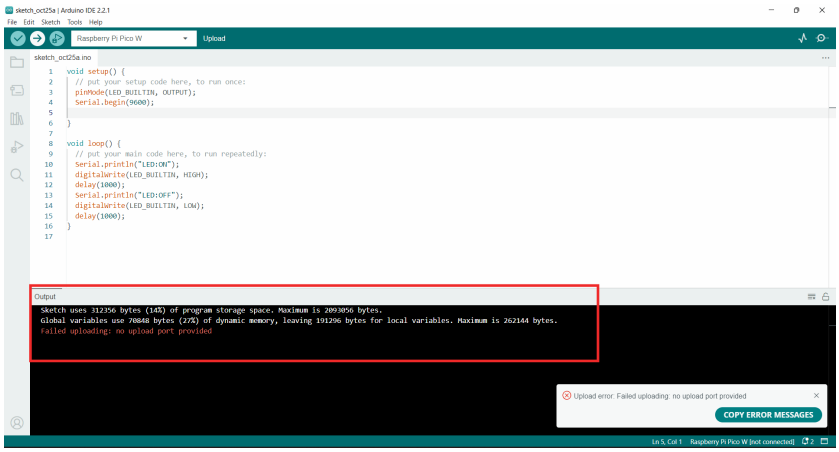


4.4 Sending message to serial monitor

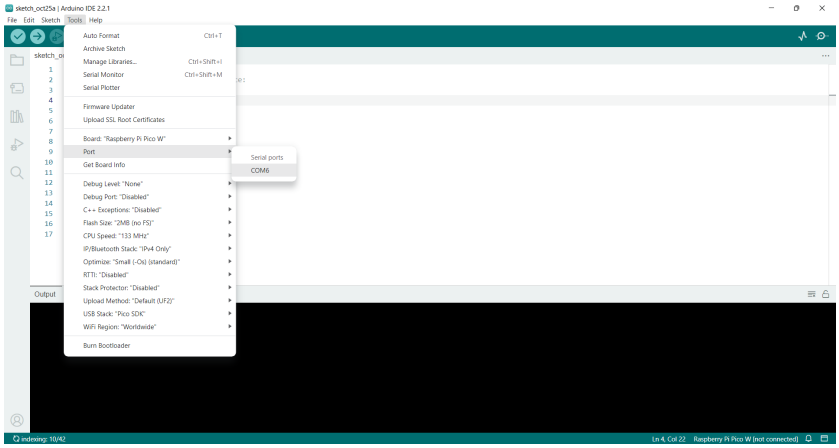
1. Update the sketch code as follows (red text):

```
void setup() {
   // put your setup code here, to run once:
   // initialize digital pin LED_BUILTIN as an output.
   pinMode(LED_BUILTIN, OUTPUT);
   // opens serial port, sets data rate to 9600 bps
   Serial.begin(9600);

}

void loop() {
   // put your main code here, to run repeatedly:
   Serial.println("LED: ON");
   // turn the LED on (HIGH is the voltage level)
   digitalWrite(LED_BUILTIN, HIGH);
   // wait for a second
   delay(1000);
   Serial.println("LED: OFF");
   // turn the LED off by making the voltage LOW
   digitalWrite(LED_BUILTIN, LOW);
   // wait for a second
   delay(1000);
}
```

2. Compile and upload.
   - **Windows operating system**:
     - If you got an error like this :



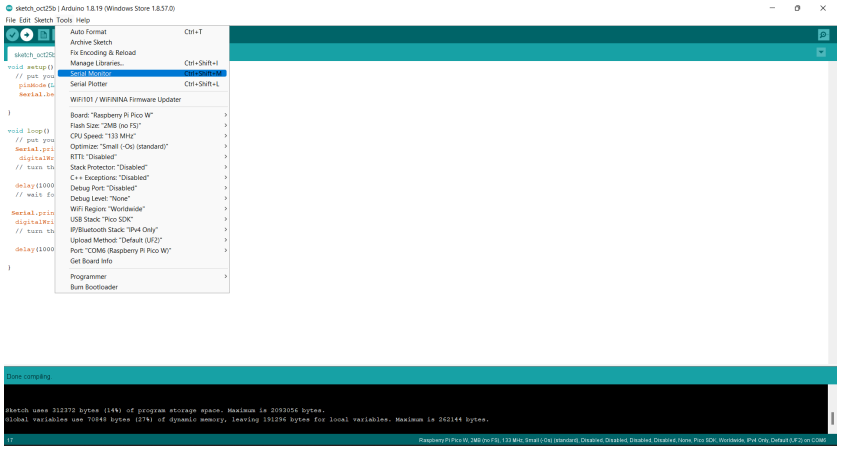
– With the board connect to the computer, close the arduino IDE, open it and then check the port by selecting `Tools > Port` and if it appears (`Serial ports`) some COM port select it.



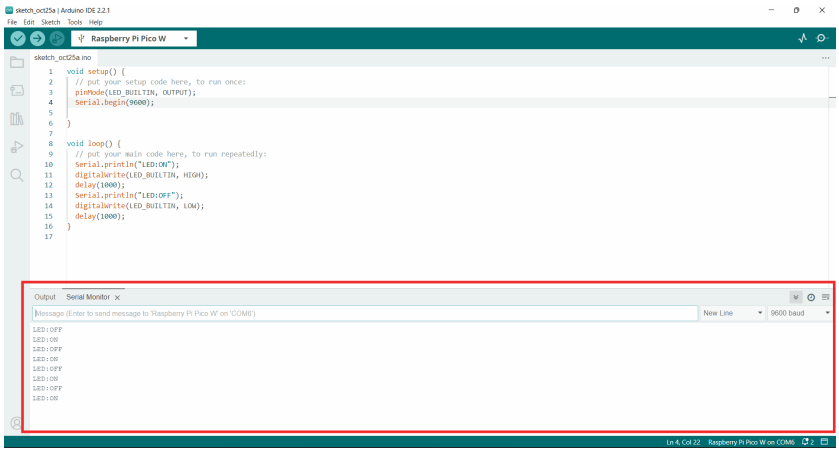
  * **Note**: in this case it has assigned `COM6` port, but could be other.

– Upload it again.

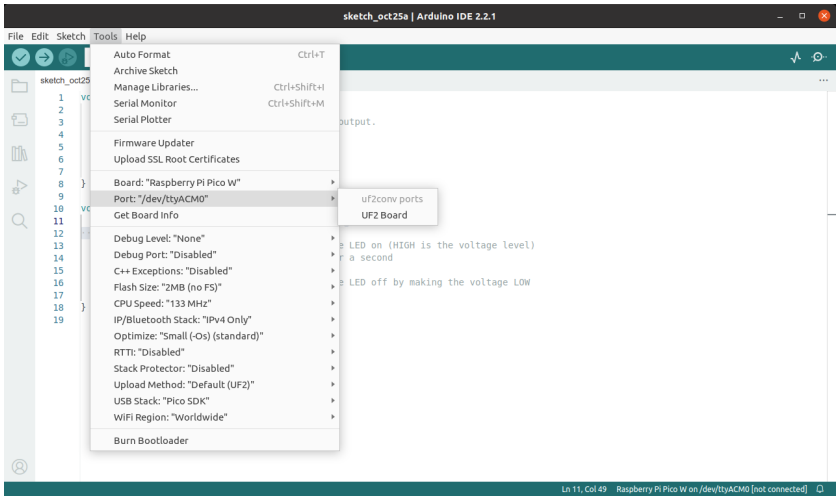
– Open the Serial Monitor `Tools > Serial Monitor`



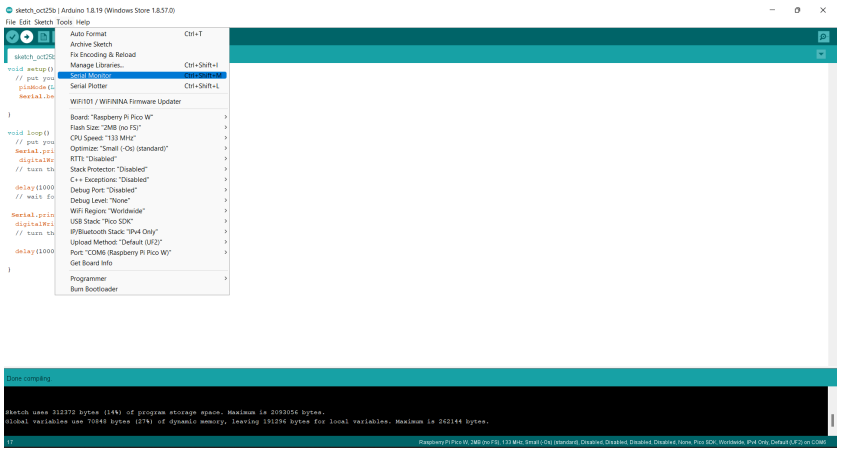
– And you can check messages on console



- **Ubuntu operating system**
  - If you get an error, close the Arduino IDE an re-open with device connected.
  - When a port is assigned you must get something like this:

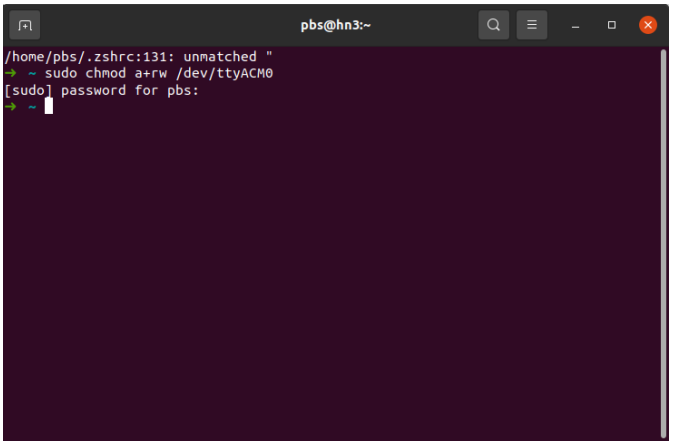


  - Upload it again.
  - Open the Serial Monitor `Tools > Serial Monitor`



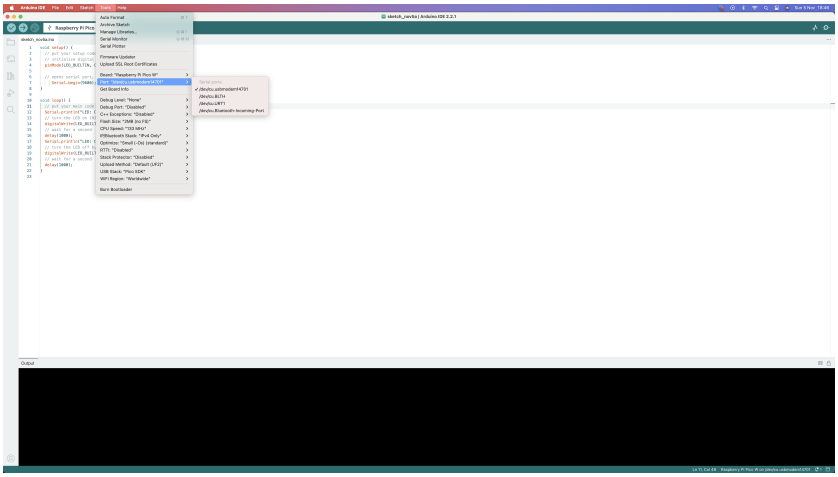
– And you, probably, will get an error like this:

– Open a terminal and type: `sudo chmod a+rw /dev/ttyACM0`

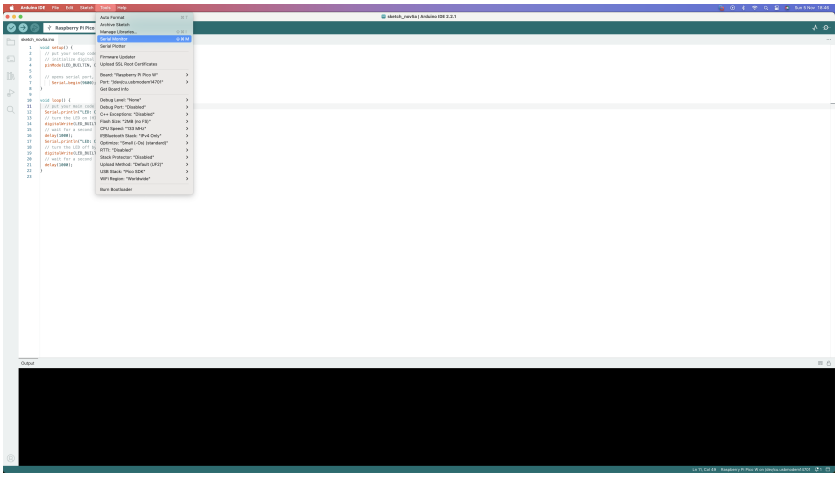


- Close the serial monitor console and reopen it.

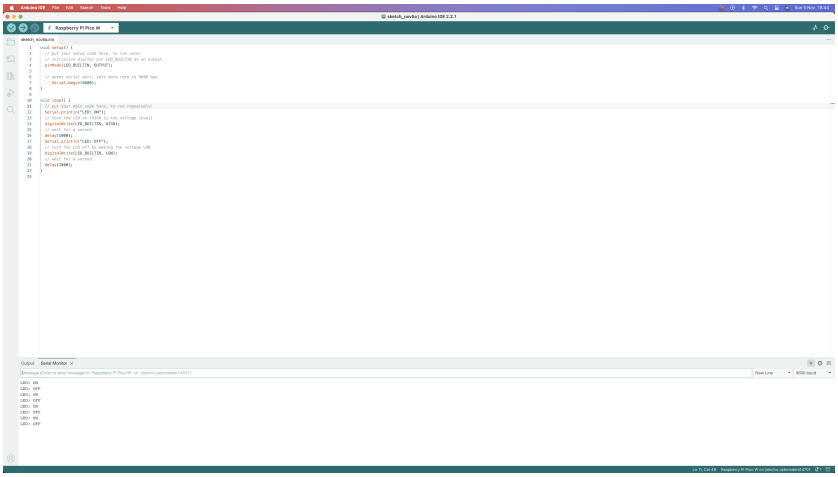
- **Mac OS**
  - If you get an error, close the Arduino IDE an reopen it with the Pico device connected
  - When a port is assigned you must get something like this:



– Upload it again
– Open the Serial Monitor `Tools > Serial Monitor`



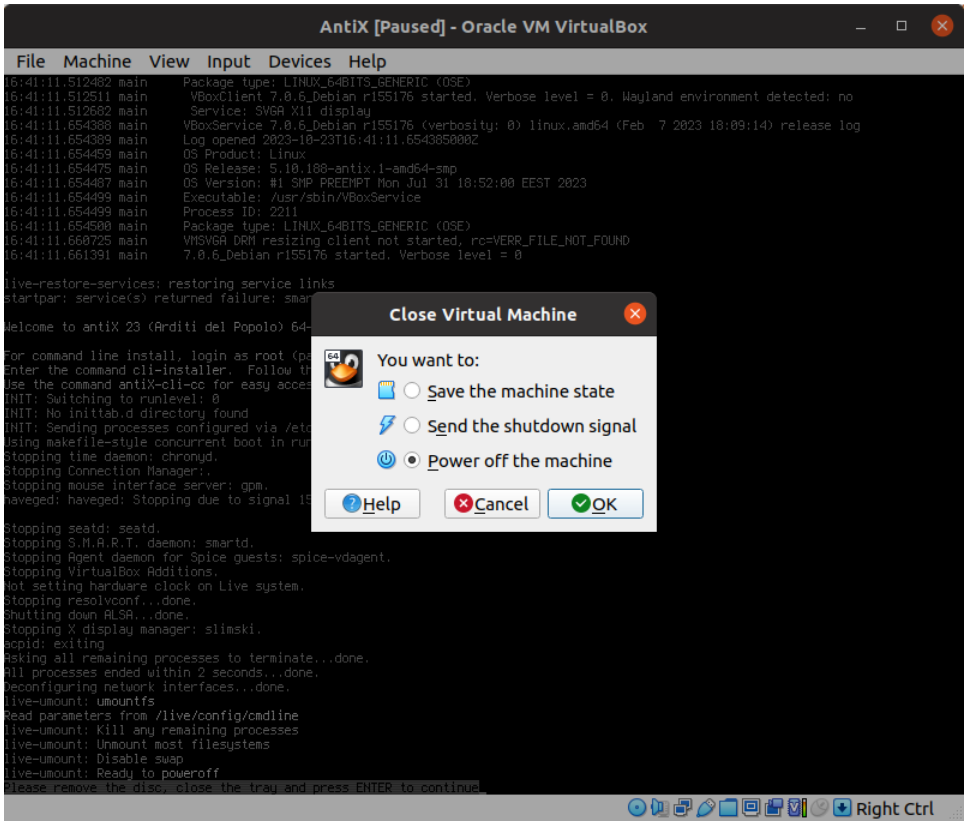
– And you can check messages on console



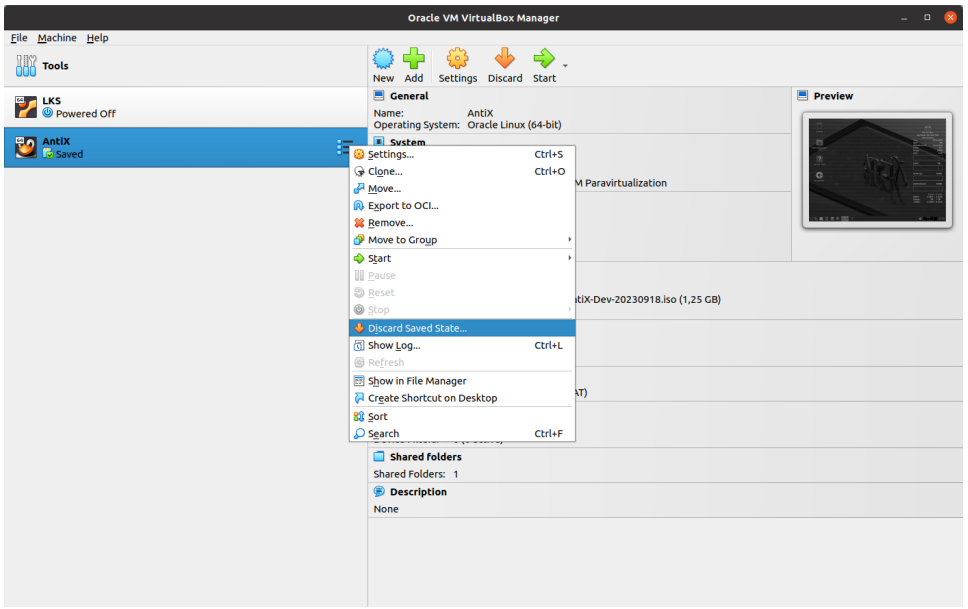
5 Connecting to `AntiX` (ARQCP Virtual Machine)

5.1 Windows operating system

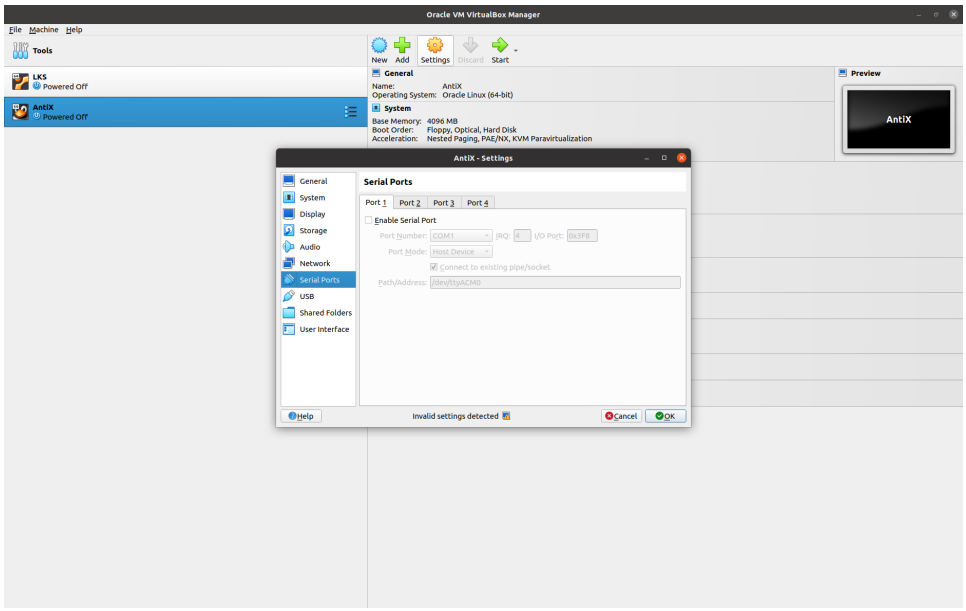
1. Power off the ARQCP Virtual machine (`AntiX`), if it is running



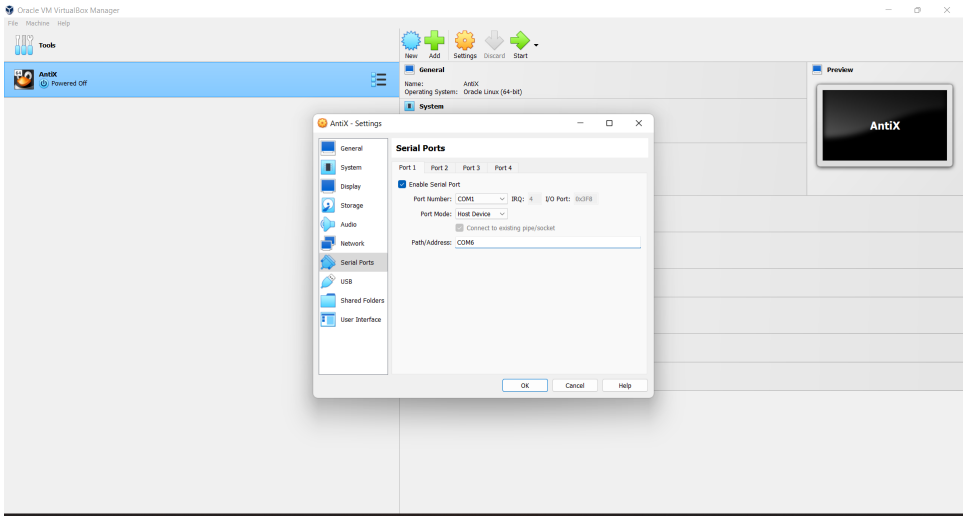
or in the Oracle `VM Virtual Box Manager`, right-click on `AntiX`, select `Discard Saved State`



2. In the Oracle `VM Virtual Box Manager`, select the `AntiX`, then click on `Settings` and select `Serial Ports`.



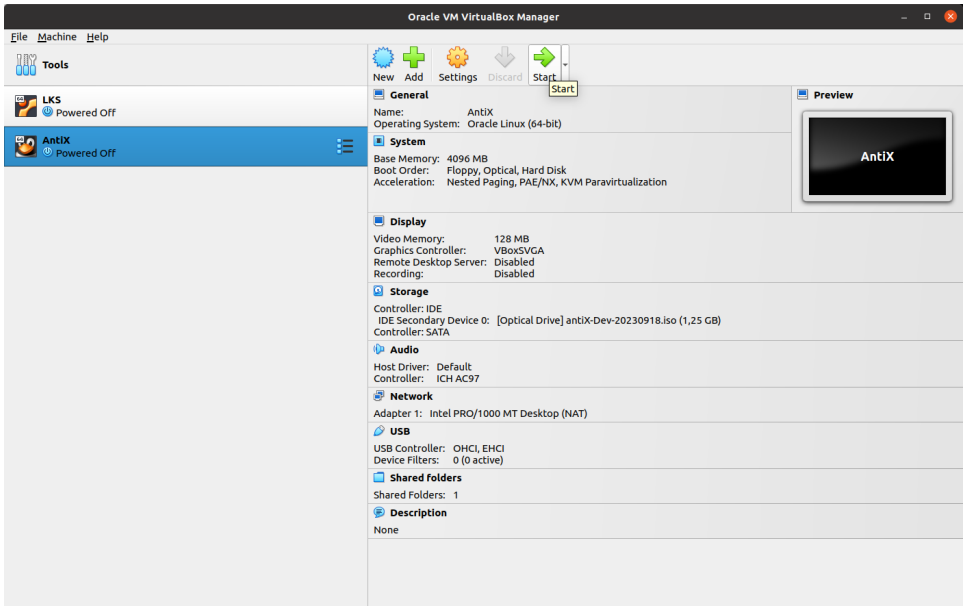
3. Enable Serial Port by checking it and fill in the form as follows:



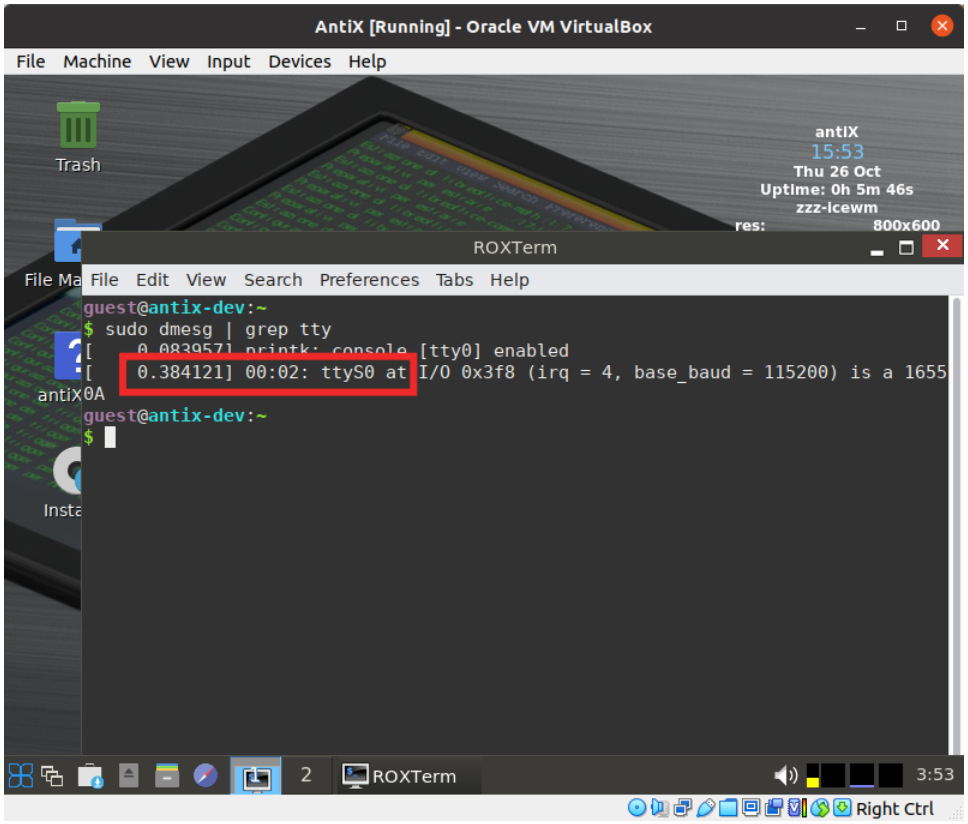
- **Note**: Here we are filling in the `Path/Address` with `COM6`, because it was the previously assigned port. Therefore, if your

system has assigned a different COM port you must fill in with such port.

4. Start the `AntiX` machine

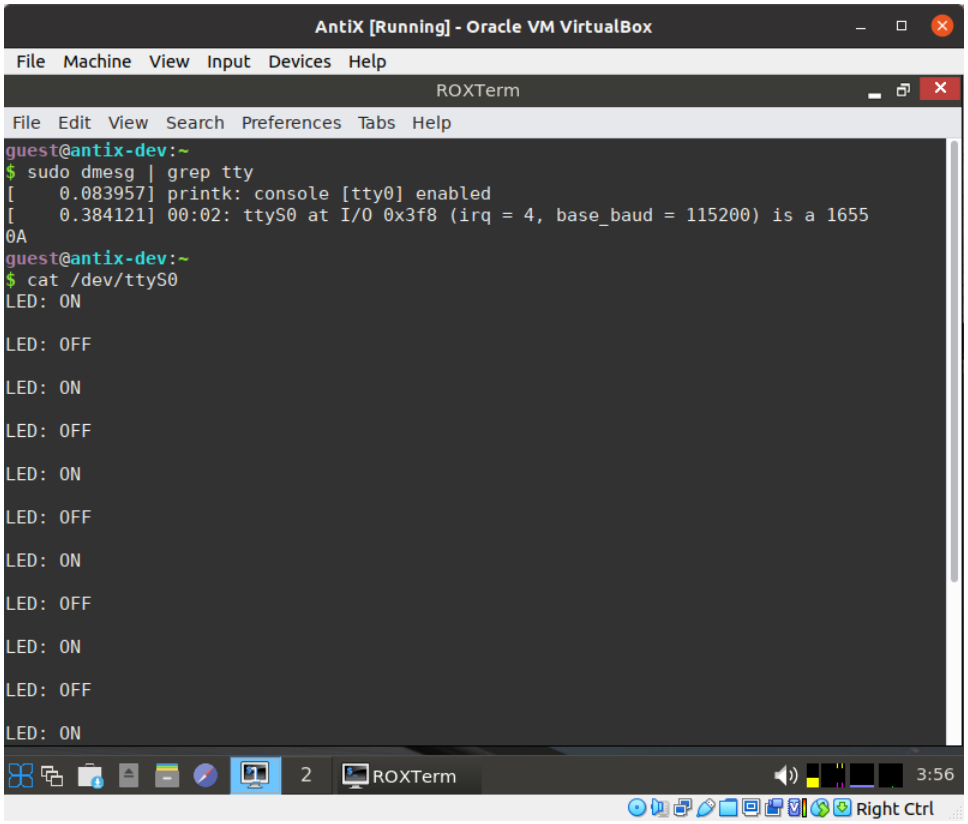


5. Open a console (probably, you have to configure again the keyboard for `Portuguese`) and type `sudo dmesg | grep tty` (the password is: guest)



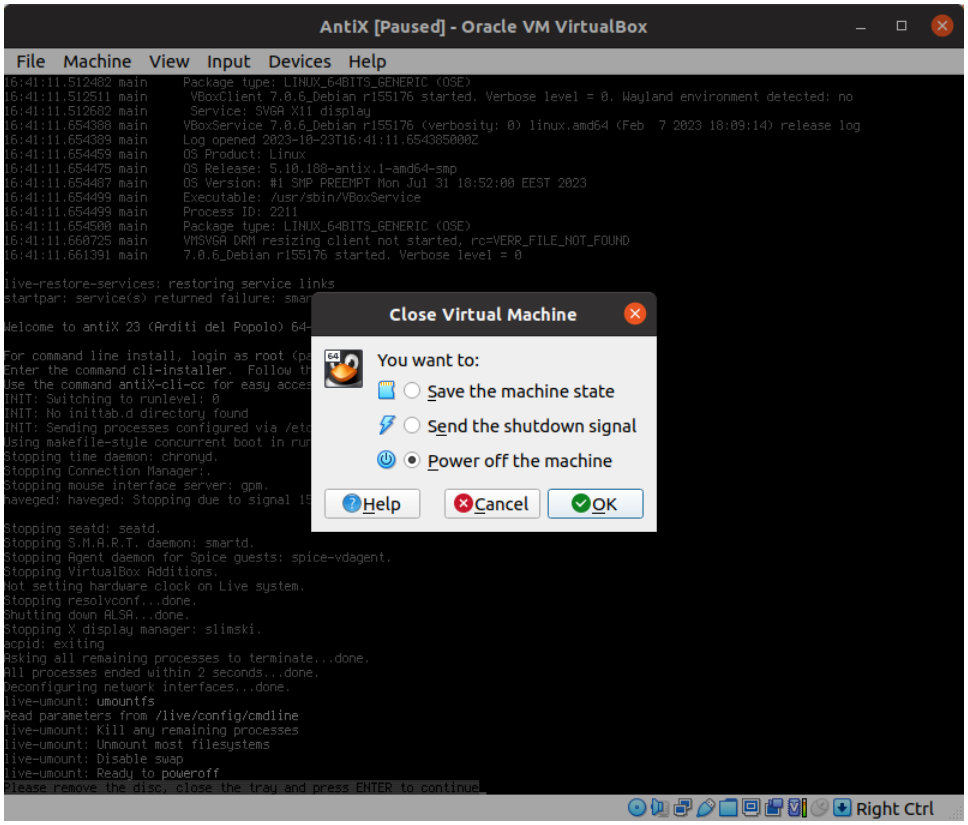
In this case it assigns the `ttyS0` port.

6. From the terminal type `cat /dev/ttyS0` and you get the messages from raspberry Pi Pico device.

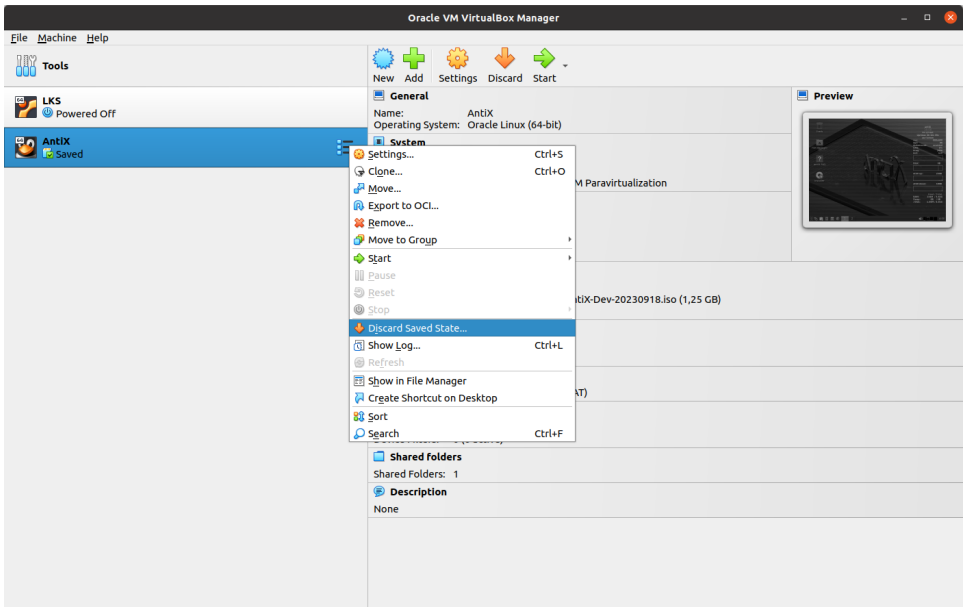


5.2 Ubuntu operating system

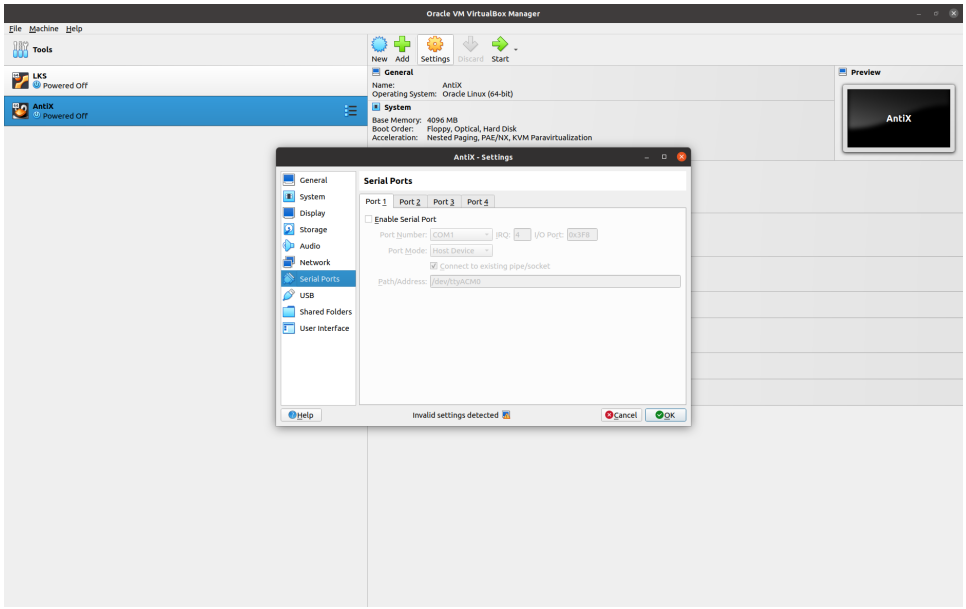
1. Power off the ARQCP Virtual machine (`AntiX`)



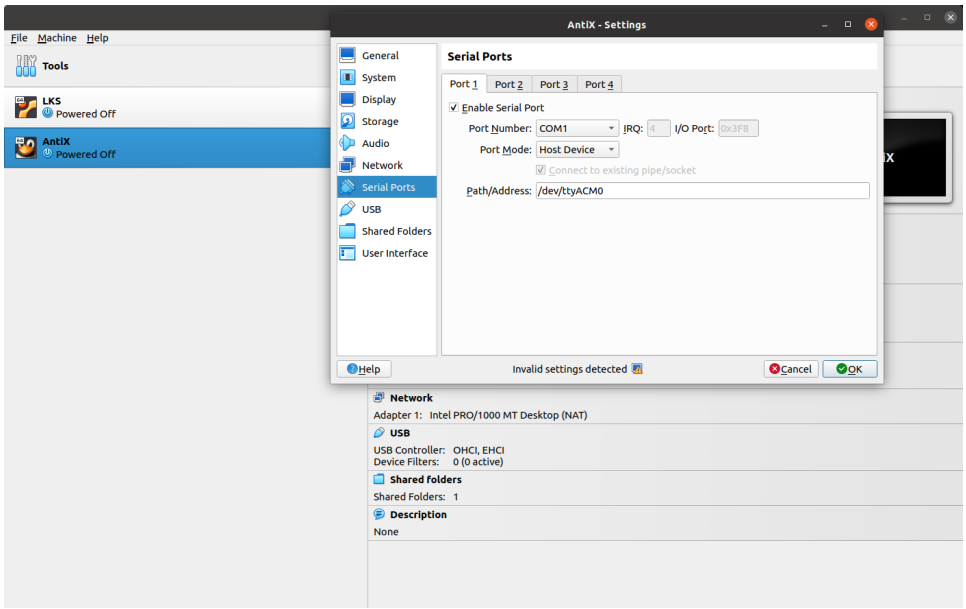
or in the Oracle `VM Virtual Box Manager`, right-click on `AntiX`, select `Discard Saved State`



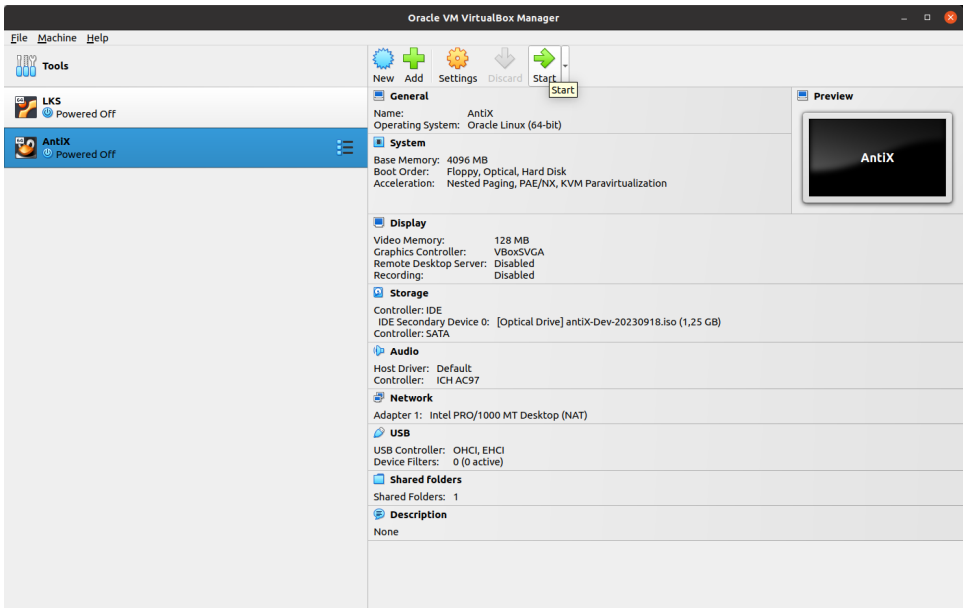
2. In the Oracle `VM Virtual Box Manager`, select the `AntiX`, then click on `Settings` and select `Serial Ports`.



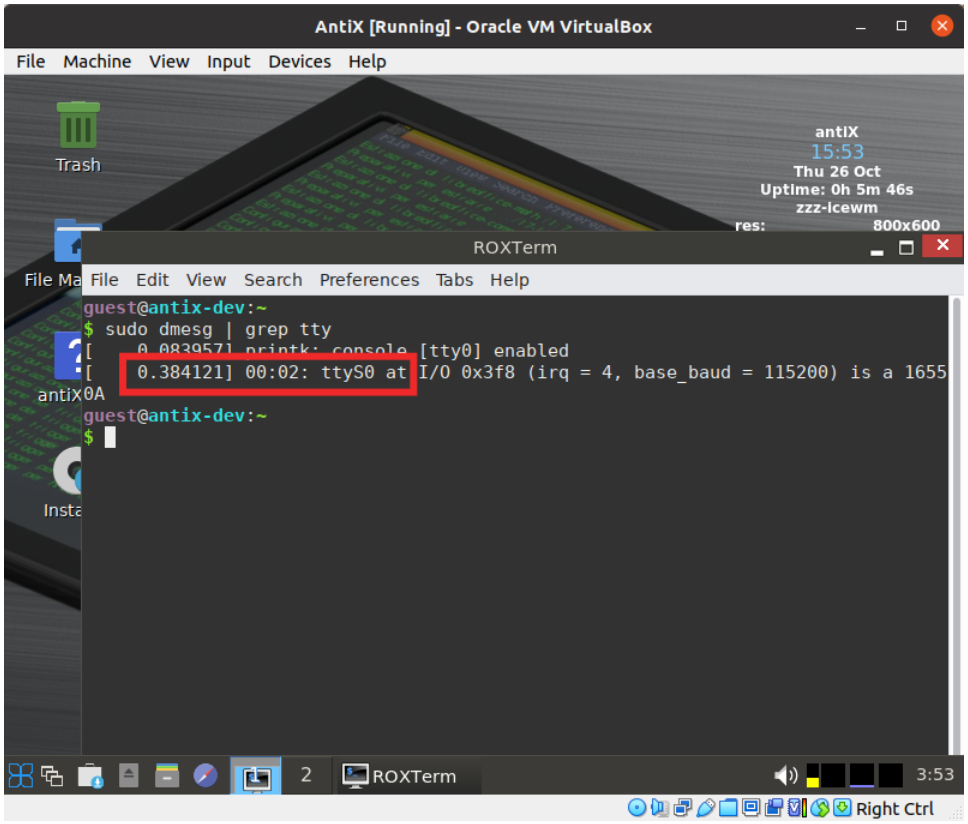
3. Enable Serial Port by checking it and fill in the form as follows:



4. Start the `AntiX` machine

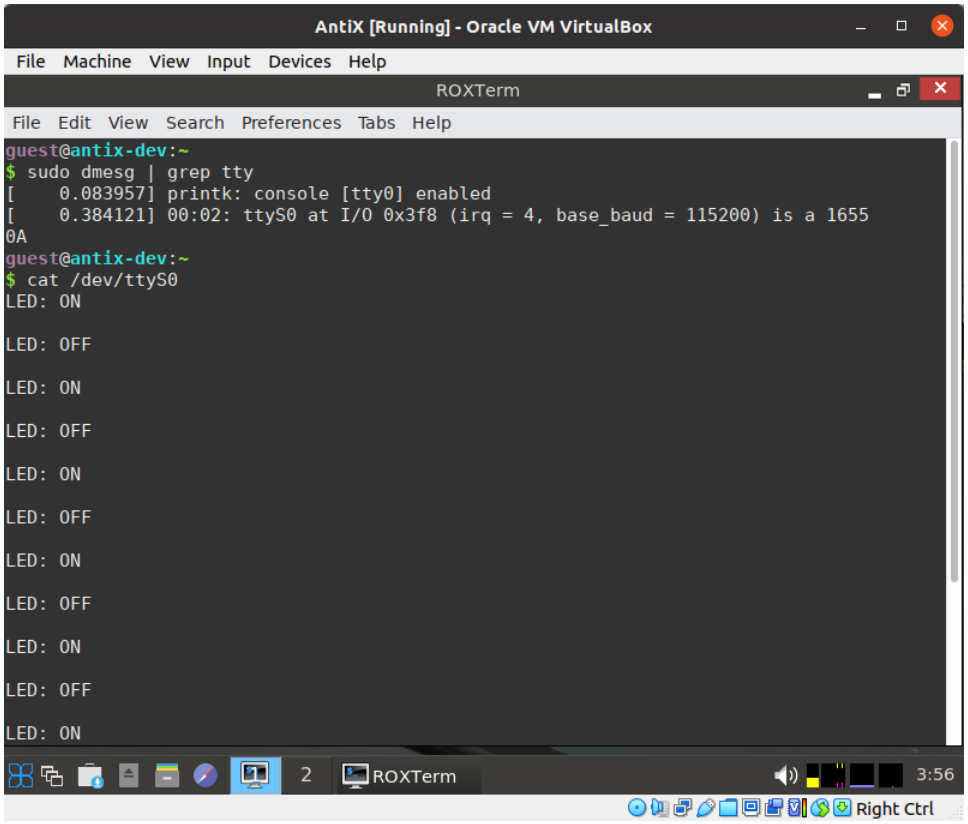


5. Open a console (probably, you have to configure gain the keyboard for `Portuguese`) and type `sudo dmesg | grep tty` (the password is: guest)



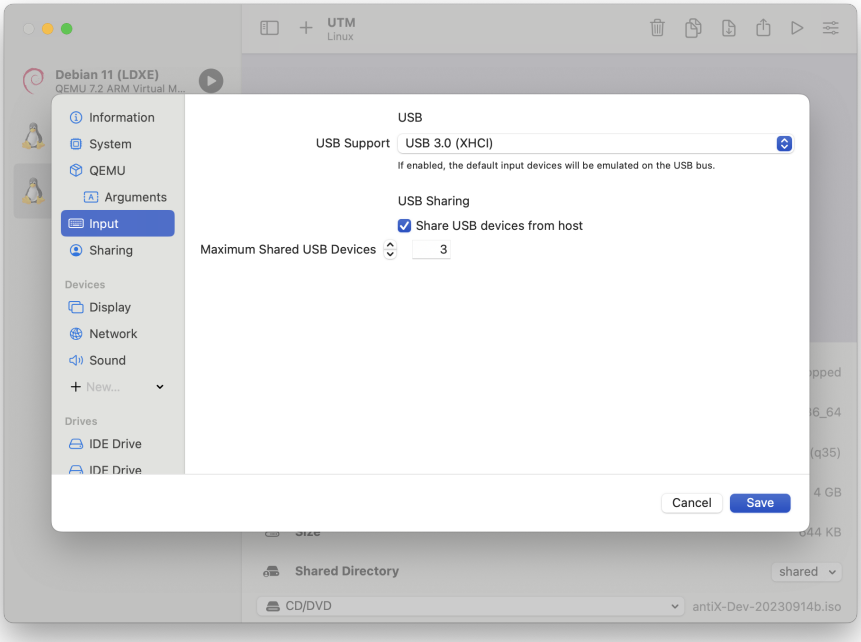
In this case it assigns the `ttyS0` port.

6. From the terminal type `cat /dev/ttyS0` and you get the messages from raspberry Pi Pico device.



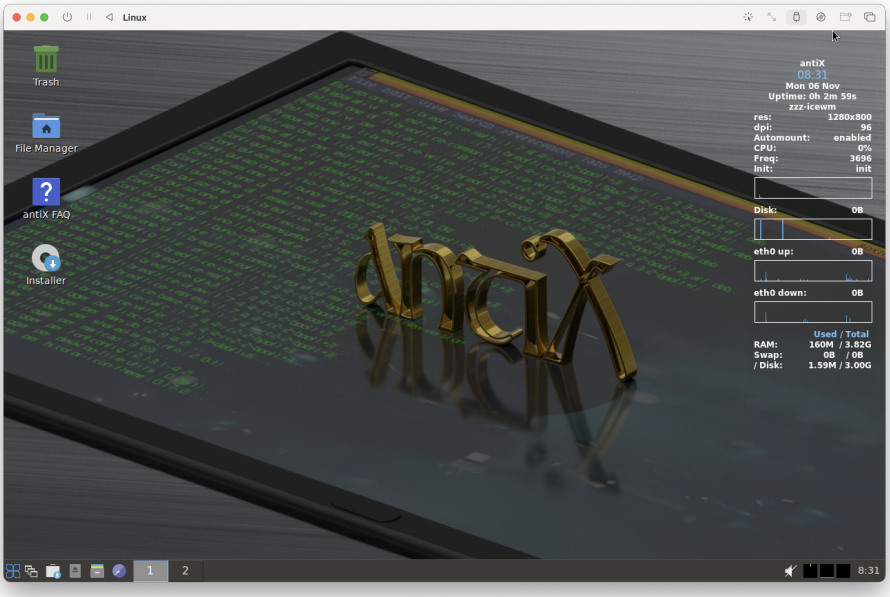
5.3 UTM on Mac OS

1. Power off the ARQCP Virtual machine (`AntiX`)
2. In UTM, in the virtual machine configuration, make sure that "USB sharing" is enabled.

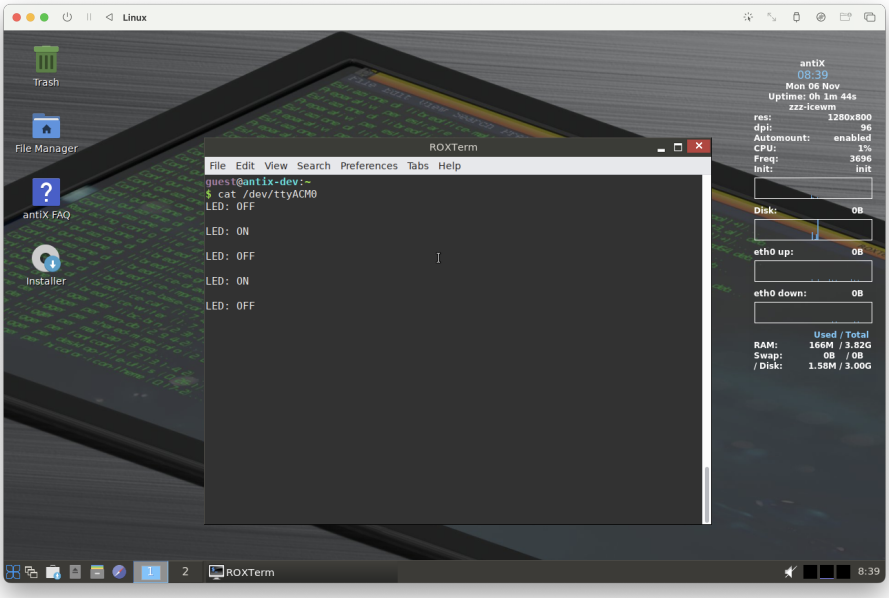


3. Once the virtual machine is started, plug in the device and you should see a prompt to attach the device

4. You can also press the USB button on the toolbar to see a list of devices which you can attach or detach



5. From the terminal type `cat /dev/ttyACM0` and you get the messages from the Raspberry Pi Pico device



6. If you have any error along these steps, try to quit UTM and reopen it