Loco Controller Firmware Build and Flashing Guide

Introduction

The Loco Controller is designed to be simple to upgrade to encourage experimentation and modification of its firmware and so the firmware is based around the popular and Arduino framework. In order to be able to modify the supplied examples and download to the hardware it's necessary to install the free and cross-platform Arduino IDE.

Prerequisites

MacOS - Version 10.15: "Catalina" or newer, 64 bits
Linux - 64 bit
Windows - Win 10 and newer, 64 bit

Step by step guide

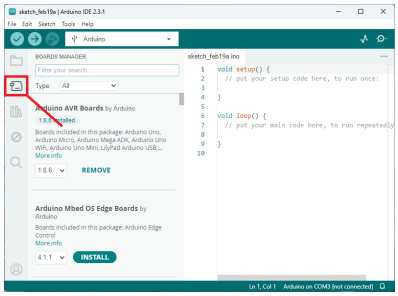
The guide below is a quick walkthrough of installing the IDE and building and flashing the LocoController's firmware. For more detail see the Random Nerd guide 'Installing an ESP32 Board in Arduino IDE 2 (Windows, Mac OS X, Linux)' and Seeed Studio's Wiki on the ESP32C6. Some of the examples require that the ESP32C6's flash based file system se set up for more details on this see Random Nerd's guide 'Install ESP32 LittleFS Uploader (Upload Files to the Filesystem)'

Step 1 - Install the Arduino IDE 2

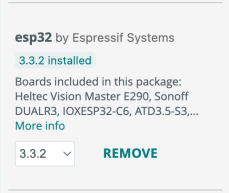
Before proceeding make sure you have the Arduino IDE 2 installed on your computer, this can be obtained from the Arduino download page. The IDE is cross-platform and will work with MacOS, Linux and Windows and detailed install instructions for each OS can be found here. The examples are tested with version 2.3.6.

Step 2 - Install the ESP32 Add-on

Once the IDE is installed the next step is add the ESP32 board packages. Open the Boards Manager by navigating to Tools > Board > Boards Manager… or simply click the Boards Manager icon in the LH sidebar.

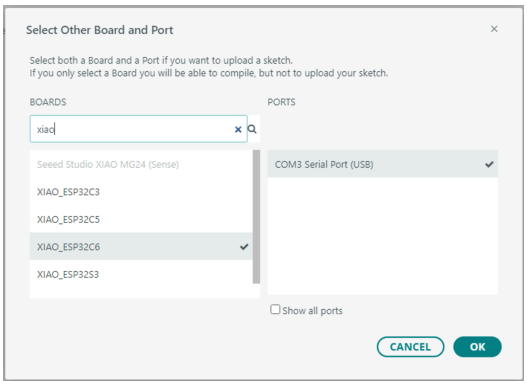


In the search box type ‘ESP32’ and hit the install button for the package ‘esp32 by Espressif Systems’ The install should only take a few seconds, when it’s finished close and reopen the IDE.



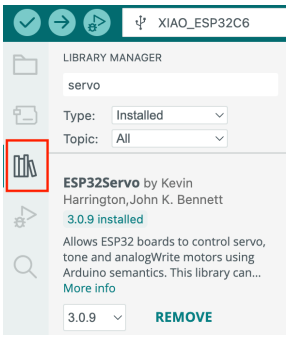
Step 3 - Select the XIAO ESP32C6 board

Before the sketch can be compiled the IDE needs to know the type and serial port of the attached board. In the drop down list at the top of the IDE window choose ‘Select other board and port…’, search for ‘XIAO’ and select ‘ESP32C6’. To the Right Hand Side (RHS) of this dialog will be a list of attached serial devices, one of which will be the Loco Controller. A simple way to determine the correct port is to disconnect the unit and see which entry disappears. Reconnect the board and then select its entry in the list.



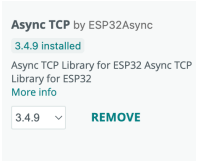
Step 4 - Add the Required Libraries

In order to compile the example sketches additional libraries are required to be installed. Open the Library Manager by navigating to Tools > Manage Libraries… or simply click the Library Manager icon in the left side bar.
Open the Boards Manager by navigating to Tools > Board > Boards Manager… or simply click the Boards Manager icon in the LH sidebar.

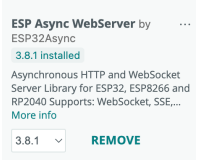


Search for and add the following libraries:-

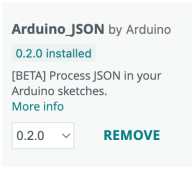
Async TCP (3.4.9) by ESP32 Async TCP



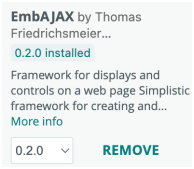
ESP Async WebServer (3.8.1) by ESP32Async



Arduino_JSON (0.2.0) by Arduino



EmbAJAX (0.2.0) by Thomas Friedrichsmeier



Step 5 - Install the LittleFS Uploader

The default example stores html and other files in its onboard flash filesystem (LittleFS). This uses a LittleFS upload plugin which needs to be installed separately. The instructions for this vary with OS so and Random Nerd has a good description of the process at 'Install ESP32 LittleFS Uploader (Upload Files to the Filesystem)'.

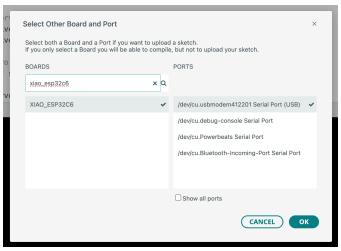
Restart the IDE at this point to ensure all the above changes are registered.

Step 6 - Load and Compile an Example Sketch

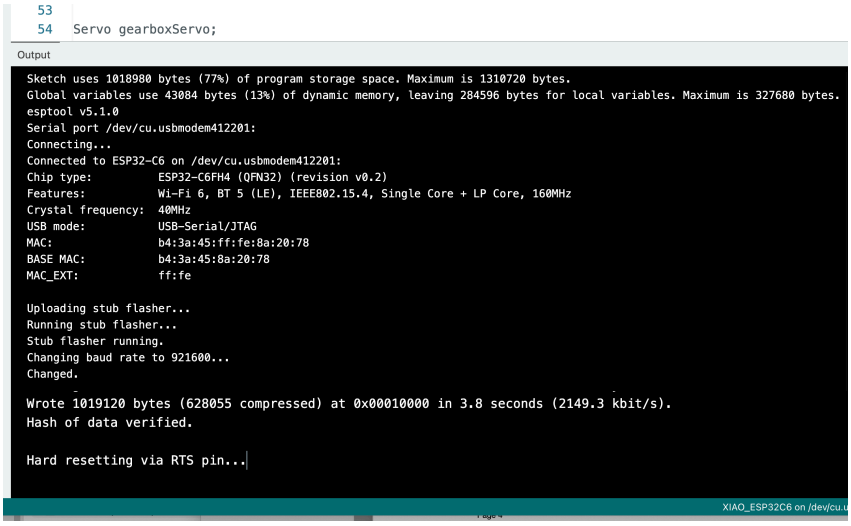
There are several example sketches in the distribution located in the 'firmware' folder. Each sketch has the extension .ino and opening this file will load the sketch into the IDE. Any modifications made can be tested with the 'Verify' button in the top bar.

Step 7 - Download to the Hardware

Check that the correct board and serial port are selected, search for 'XIAO_ESP32C6' and select this board. To the RHS of this dialog will be a list of attached serial devices, use the port identified in step 3. Reconnect the board and then select its entry in the list.



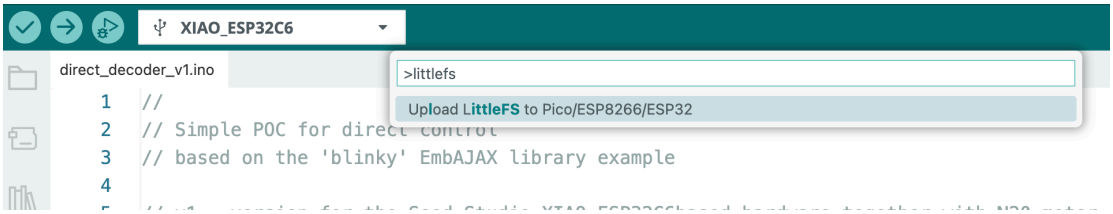
Once the board is selected close the dialog and hit the 'upload' button (right facing arrow). The firmware will compile and begin to download to the device ending with the message 'Hard resetting via RTS pin…'.



The example sketches will flash the ‘it’s alive’ yellow LED next to the USB-C connector indicating that the firmware has downloaded correctly and is running.

Some examples require loading files into the LittleFS filesystem which is part of the onboard flash memory. These reside in a folder named ‘data’ inside the same folder as the sketch and only need to be loaded before the first load of the sketch or whenever the files are changed.

To upload the files to the Loco Controller check that the serial monitor is closed (icon on the Right hand end of the top bar) then hold ‘⌘’ + ‘shift’ + ‘P’ on MacOS or ‘ctrl’ + ‘shift’ + ‘P’ on Windows to open the command line, search for ‘littleFS’ and select ‘LittleFS to Pico/ESP8266/ESP32’. The command takes a few seconds and ends with the message ‘completed upload’. If the upload fails with the error message ‘ERROR: No port specified, check IDE menus’ restart the IDE and try again.



Download Troubleshooting

If the ESP32C6’s bootloader is inactive the IDE won’t be able to connect to the device during flashing. If this happens press and hold the ‘BOOT’ button on the ESP32C6 module whilst applying power, then release. The ‘BOOT’ button is located next to the USB-C connector opposite pin 1.