

# ESP32 webradio – mp3 player with webinterface

First some useful url's.

How to program a ESP32 with the Arduino IDE

<https://randomnerdtutorials.com/installing-the-esp32-board-in-arduino-ide-windows-instructions/>

More info ESP32

<https://randomnerdtutorials.com/projects-esp32/>

Internet streaming adresses:

<https://www.hendrikjansen.nl/henk/streaming.html#cz>

Audio library

<https://github.com/schreibfaul1/ESP32-audioI2S>

## ESP32 webradio mp3 player with ESP32 WROVER en PCM5102 I2S DAC

### Partslist :

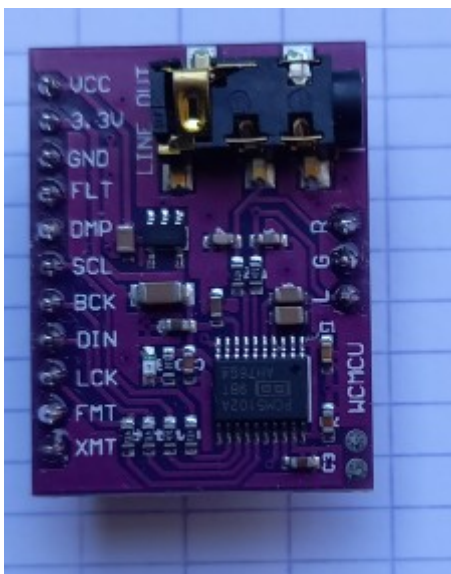
1 x ESP32 WROVER

<https://www.conrad.be/nl/p/espressif-esp32-wrover-e-m213eh3264ph3q0-draadloze-module-1-stuk-s-2383845.html>

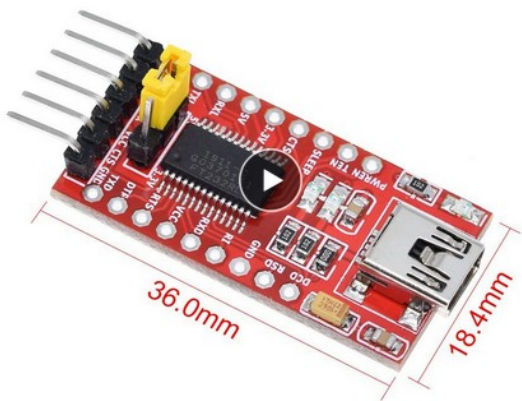


1 x PCM5102 I2S DAC

[https://nl.aliexpress.com/item/1005001626945377.html?spm=a2g0o.productlist.0.0.76164cf18calJ7&algo\\_pvid=4eb6a3bb-bd17-4a6c-83fd-1510f9c82983&algo\\_exp\\_id=4eb6a3bb-bd17-4a6c-83fd-1510f9c82983-7&pdp\\_ext\\_f=%7B%22sku\\_id%22%3A%221200001687474620%22%7D&pdp\\_npi=2%40dis%21EUR%21%217.51%21%21%21%21%21%402103255b16579152561736518e9e4c%211200001687474620%21sea](https://nl.aliexpress.com/item/1005001626945377.html?spm=a2g0o.productlist.0.0.76164cf18calJ7&algo_pvid=4eb6a3bb-bd17-4a6c-83fd-1510f9c82983&algo_exp_id=4eb6a3bb-bd17-4a6c-83fd-1510f9c82983-7&pdp_ext_f=%7B%22sku_id%22%3A%221200001687474620%22%7D&pdp_npi=2%40dis%21EUR%21%217.51%21%21%21%21%21%402103255b16579152561736518e9e4c%211200001687474620%21sea)



1x FTDI232 for programming the ESP32



1x part ic socket 6 pins to make connection FTDI232 <> ESP32

1x LM3940 5V to 3.3V

1x 47uF 16V

1x 100uF 16V

6x 10K

2x 100nF

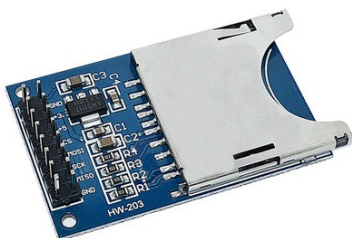
2x pushbutton N.O.

1x SD card adapter

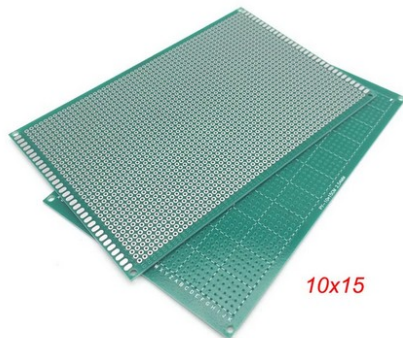


OR

[https://nl.aliexpress.com/item/32523546123.html?spm=a2g0o.productlist.0.0.7dec2586t99Fnp&algo\\_pvid=baa2af80-8137-4df6-b273-c525feec90d3&algo\\_exp\\_id=baa2af80-8137-4df6-b273-c525feec90d3-1&pdp\\_ext\\_f=%7B%22sku\\_id%22%3A%2210000002486114694%22%7D&pdp\\_npi=2%40dis%21EUR%21%210.9%21%21%21%21%21%40210318d116582454387168757eb008%2110000002486114694%21sea](https://nl.aliexpress.com/item/32523546123.html?spm=a2g0o.productlist.0.0.7dec2586t99Fnp&algo_pvid=baa2af80-8137-4df6-b273-c525feec90d3&algo_exp_id=baa2af80-8137-4df6-b273-c525feec90d3-1&pdp_ext_f=%7B%22sku_id%22%3A%2210000002486114694%22%7D&pdp_npi=2%40dis%21EUR%21%210.9%21%21%21%21%21%40210318d116582454387168757eb008%2110000002486114694%21sea)



1x PCB board single side 10x15cm



1x <https://www.conrad.be/nl/p/block-koperdraad-gelakt-buitendiameter-excl-isolatielak-0-22-mm-571-m-0-20-kg-605311.html>

*the varnish at the begin or the end is easy to remove with the soldering tip*



1 x SD card FAT32 formatted.

When use as mp3 player a fast.

1 x 5V 2A power supply (smartphone charger is OK)

1 x smartphone for servicing the webradio

1 x headphone / audio installation.

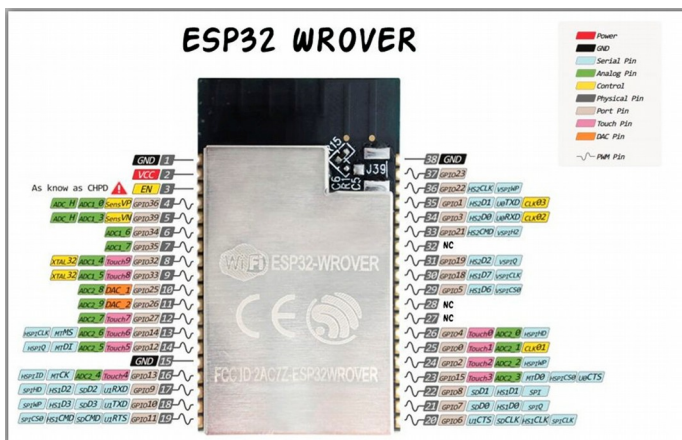
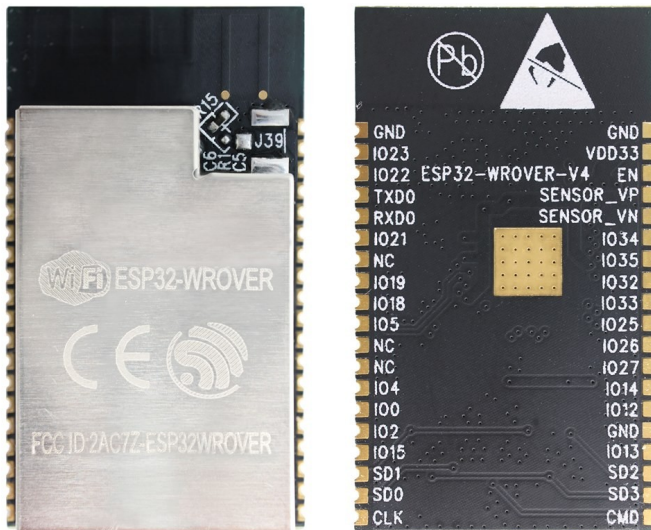
1x optioneel Hema phoneholde

<https://www.hema.com/nl-be/feest-cadeau/cadeau-thema/aardigheidje/telefoonhouder-hout-retro-tv-11.5x16.5x5.5-60350010.html>



1x some soldering experience can be a great help.

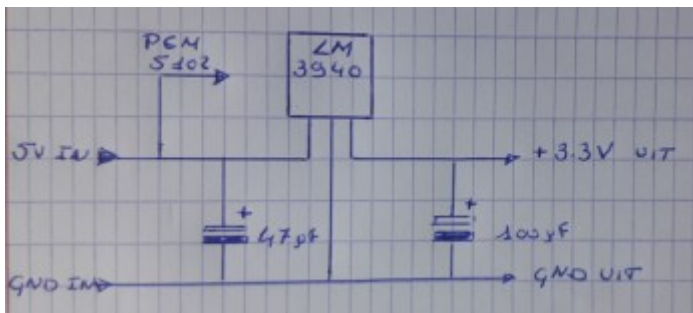
## ESP32 pin-out



Found the above images on the internet thanks to her/him who made them.

## POWER CONNECTIONS ESP32-WROVER

**ALL** GND connections (1, 15, 38) >> GND  
VCC (2) >> 3.3V from LM3940



### FTDI232 (switch to 3.3V !!!)

part from IC socket 6 pins

numbered from left to right 1 > 6

plug in FTDI232 with components up, see picture below.

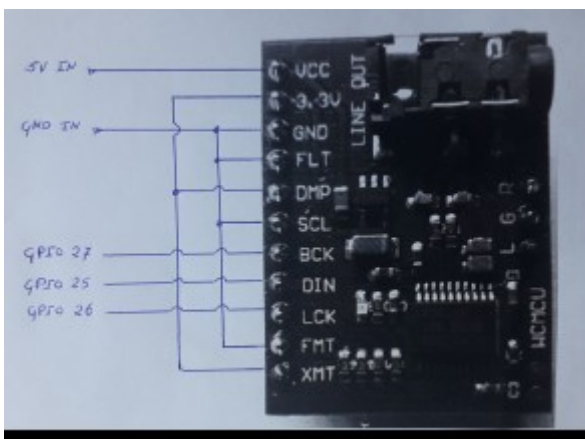
1	GND	>>	GND ESP32
2		>>	N.C.
3		>>	N.C.
4	TX FTDI232	>>	RX ESP32 GPIO3 (34)
5	RX FTDI232	>>	TX ESP32 GPIO1 (35)
6		>>	N.C.



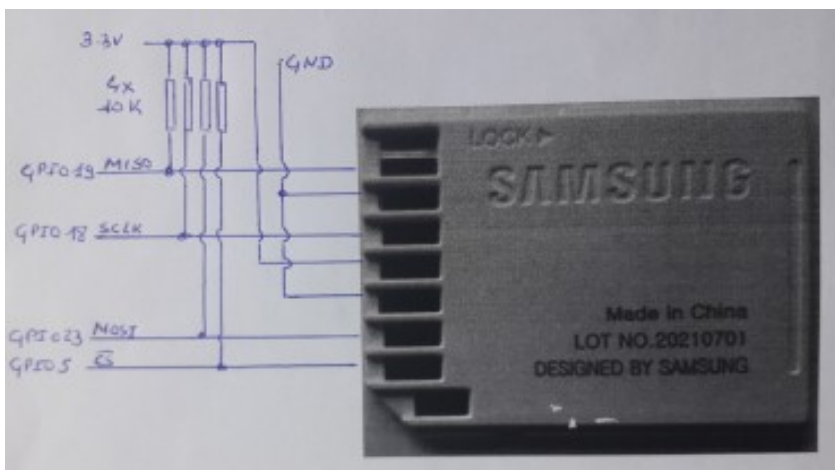


## PCM5102

VCC	>>	5V (input LM3940)
GND	>>	GND ESP32
FLT	>>	GND ESP32
DMP	>>	3.3V out PCM5102 module
SCL	>>	GND ESP32
BCK	>>	GPIO27 ESP32 (12)
DIN	>>	GPIO25 ESP32 (10)
LCK	>>	GPIO26 ESP32 (11)
FMT	>>	GND ESP32
XMT	>>	3.3V out PCM5102 module

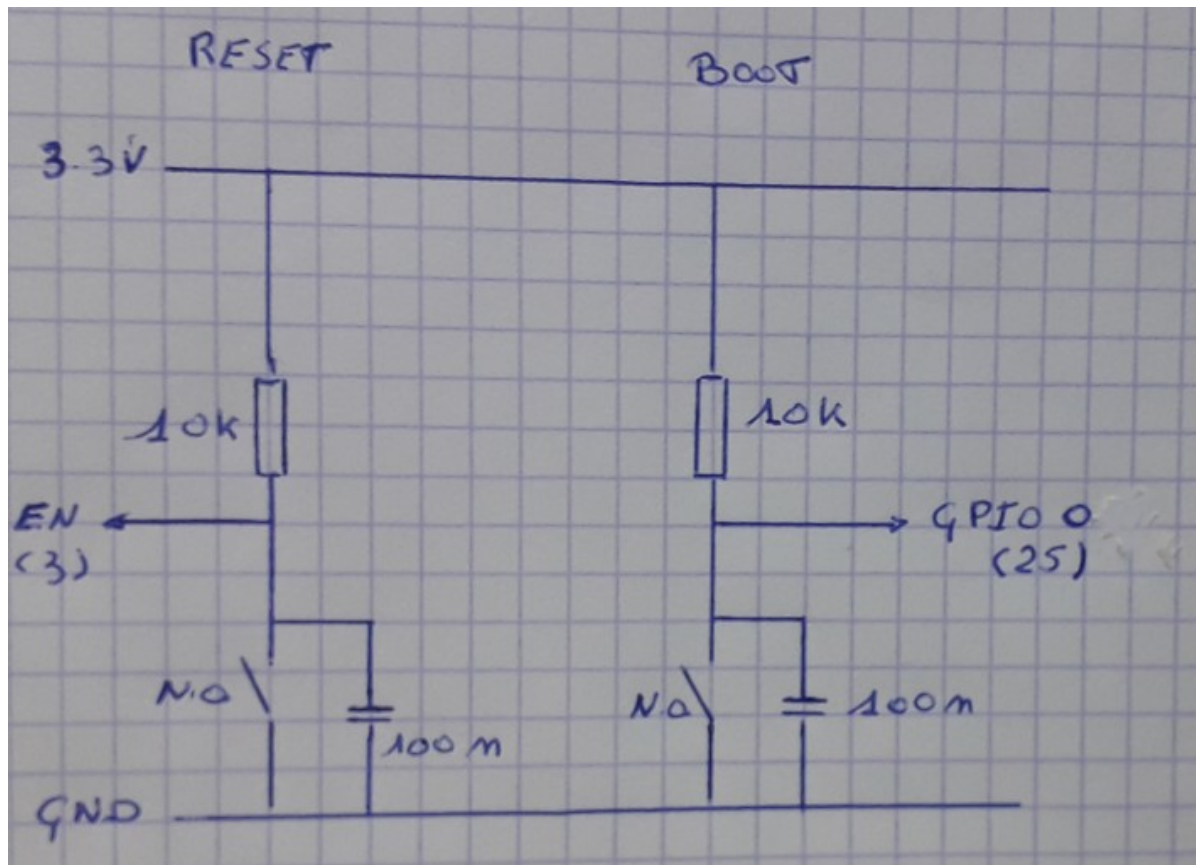


## SD kaart



MISO	>>	GPIO19(31)
SCLK	>>	GPIO18(30)
MOSI	>>	GPIO23(37)
CS	>>	GPIO5(29)

## Reset / Boot



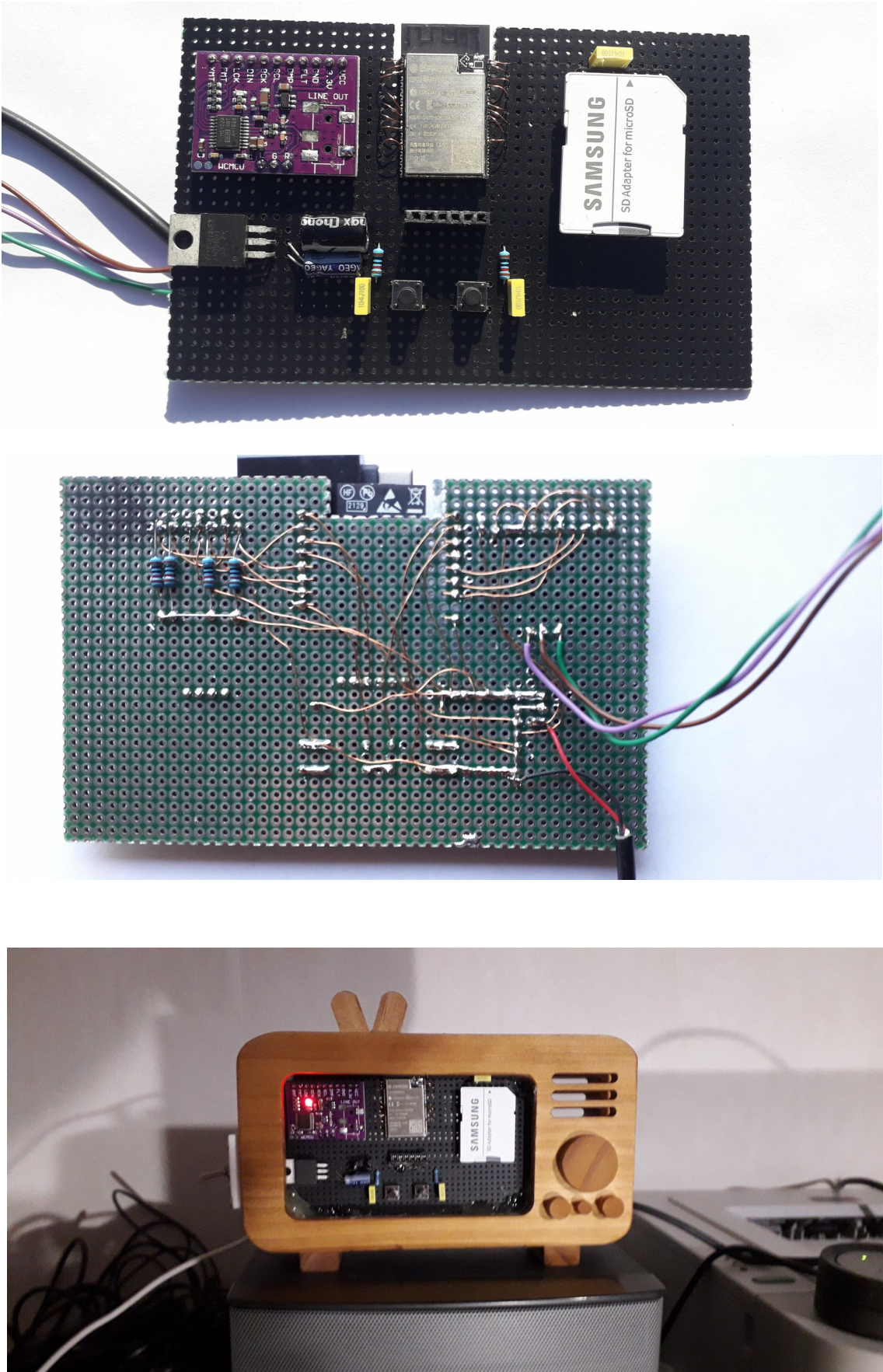
Reset ESP32  
Push Reset button

Program Mode ESP32  
First push Reset  
Push Boot  
Release Reset  
Release Boot

To program ESP put ESP32 in program mode  
After programming push Reset



End result



Download and install in the Arduino IDE :

Audio library

<https://github.com/schreibfaul1/ESP32-audioI2S>

Goto <https://github.com/thieu-b55/ESP32-audiokit-webradio-webinterface>

download zipfile : SD card files.zip.  
download programm : ESP32\_webradio\_WROVER.ino

Unzip the zipfile and copy the 4 files (totaal, pswd, ssid en zender\_data.csv) to the SD card and put card in the SD card holder.

**The following is only necessary is you want to use the mp3 player.**

These are the settings for my Linux Mint operating system,

Change <gebruikersnaam> in your username.

In the `/home/<gebruikersnaam>/arduino-1.8.6/hardware/expressif/esp32/libraries/SD/src/` folder open the file SD.h and change the frequency as shown in the screenshot.  
frequency=25000000

```
#ifndef SD_H
#define SD_H

#include "FS.h"
#include "SPI.h"
#include "sd_defines.h"

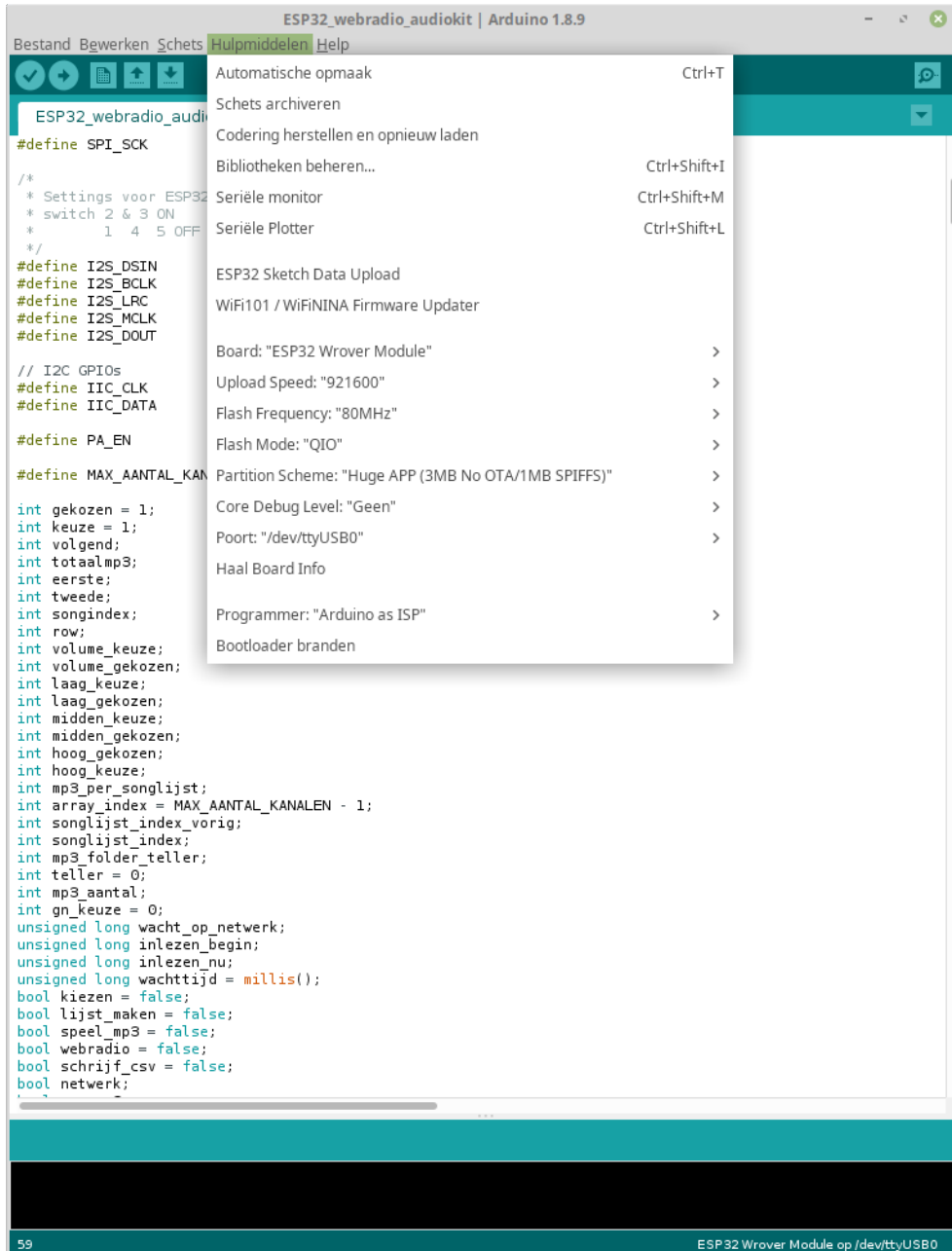
namespace fs
{
class SDFS : public FS
{
protected:
    uint8_t _pdrv;

public:
    SDFS(FSImplPtr impl);
    bool begin(uint8_t ssPin=SS, SPIClass &spi=SPI, uint32_t frequency=25000000, const char * mountpoint="/sd");
    void end();
    sdcard_type_t cardType();
    uint64_t cardSize();
};
```

Maybe things are different in your Linux distribution or operating system but look for the SD folder in `../hardware/expressif/esp32/libraries/` another possibly installed SD librarie will not be used.

Open the program ESP32\_webradio\_WROVER.ino in the Arduino IDE.

Settings see screenprint. Port setting depends on your configuration.



## Verify program



The screenshot shows the Arduino IDE interface with the file 'ESP32\_webradio\_audiokit' open. The code is a C++ program for an ESP32-based web radio. It includes various boolean and character array declarations for controlling the radio's functions, such as selecting stations, playing MP3 files, and managing volume. The code is currently in the 'Verify' state, as indicated by the status bar at the bottom which says 'Bezig met het compileren van de schets...' (Working on compiling the sketch...). The progress bar shows that the compilation is in progress.

```
ESP32_webradio_audiokit | Arduino 1.8.9
Bestand Bewerken Schets Hulpmiddelen Help

ESP32_webradio_audiokit

unsigned long wachttijd = millis();
bool kiezen = false;
bool lijst_maken = false;
bool speel_mp3 = false;
bool webradio = false;
bool schrijf_csv = false;
bool netwerk;
bool nog_mp3;
bool mp3_ok;
bool mp3_lijt_maken = false;
bool ssid_ingevoeld = false;
bool pswd_ingevoeld = false;
bool songlijsten = false;
char songfile[200];
char mp3file[200];
char song[200];
char datastring[200];
char password[40];
char ssid[40];
char charZenderFile[12];
char speler[20];
char gn_actie[20];
char gn_selectie[20];
char zendernaam[40];
char charUrlFile[12];
char url[100];
char mp3_dir[10];
char folder_mp3[10];
char aantal_mp3[10];
char songlijst_dir[12];
char totaal_mp3[15];
char mp3_lijt_folder[10];
char mp3_lijt_aantal[5];
char leeg[0];
const char* KEUZEMIN_INPUT = "minKeuze";
const char* KEUZEPLUS_INPUT = "plusKeuze";
const char* BEVESTIGKEUZE_INPUT = "bevestigKeuze";
const char* LAAG = "laag_keuze";
const char* MIDDEN = "midden_keuze";
const char* HOOG = "hoog_keuze";
const char* VOLUME = "volume_keuze";
const char* VOLUME_BEVESTIG = "bevestig_volume";
const char* APssid = "ESP32webradio";
const char* APpswd = "ESP32pswd";
const char* STA_SSID = "ssid";
const char* STA_PSWD = "pswd";
const char* ZENDER = "zender";
const char* URL = "url";
const char* ARRAY_MIN = "array_index_min";
const char* ARRAY_PLUS = "array_index_plus";
const char* BEVESTIG_ZENDER = "bevestig_zender";
const char* MIN_INPUT = "min";
const char* PLUS_INPUT = "plus";
const char* BEVESTIG_MP3 = "bevestig_mp3";
String zenderarray[MAX_AANTAL_KANALEN];
```

Bezig met het compileren van de schets...

Upload program

Program Mode ESP32

First push Reset

Push Boot

Release Reset

Release Boot

After programming push Reset



```
ESP32_webradio_audiokit | Arduino 1.8.9
Bestand Bewerken Schets Hulpmiddelen Help

ESP32_webradio_audiokit
* kolom 1 >> zender naam
* kolom2 >> zender url
*/

#include "Arduino.h"
#include "WiFi.h"
#include "Audio.h"
#include <SPI.h>
#include <Preferences.h>
#include "FS.h"
#include "SD.h"
#include <CSV_Parser.h>
#include <AsyncTCP.h>
#include <ESPAsyncWebServer.h>
#include "Wire.h"
#include "ES8388.h"

static ES8388 dac;
int volume = 80;

Audio audio;
Preferences pref;
AsyncWebServer server(80);

#define SD_CS          13
#define SPI_MOSI       15
#define SPI_MISO       2
#define SPI_SCK        14

/*
 * Settings voor ESP32-A1S v2.2 (ES8388)
 * switch 2 & 3 ON
 *      1 4 5 OFF
 */
#define I2S_DSIN       26
#define I2S_BCLK       27
#define I2S_LRC        25
#define I2S_MCLK       0
#define I2S_DOUT       35

// I2C GPIOs
#define IIC_CLK        32
#define IIC_DATA       33

#define PA_EN          21

#define MAX_AANTAL_KANALEN 75

int gekozen = 1;
int keuze = 1;
int volgend;
int totaalmp3;
int eerste;
int tweede;
int songindex;
```

Bezig met het compileren van de schets...

First you have to fill in your WiFi credentials

Connect your smartphone to the WiFi network :

## ESP32webradio

### Open the webpage at adress 192.168.4.1

The screenshot shows a smartphone screen with a browser displaying the ESP32webradio web interface. The status bar at the top shows the time 20:41, VoLTE and LTE1 network indicators, and a 79% battery level. The browser address bar shows the URL 192.168.4.1. The main content area includes a 'Stop mp3 speler' button, volume controls with '-' and '+' buttons and an 'OK' button, and an EQ section with 'EQ -40 <-> 6' and 'Volume 0 <-> 21'. Below these are four input fields for L (3), M (0), H (0), and V (7), with an 'OK' button. A section titled 'ESP32 Netwerk instellingen' contains two input fields for 'ssid' and 'pswd', followed by a 'Bevestig' button. At the bottom, there is a navigation bar with icons for back, forward, home, star, and a menu icon.

### Under the titel **ESP Netwerk instellingen**

in the field **ssid** fill in the name of your WiFi network

in the field **pswd** fill in the password for this network

Push **Bevestig** the ESP32 will reset

If everything is OK, the network **ESP32webradio** is no longer available. Connect your smartphone with your WiFi network and open the webpage at 192.168.1.177.



20:48

VoWiFi LTE1 100%



192.168.1.177



## ESP32 internetradio webinterface

### Radio 10 Non-Stop

Chaka Khan - I'm Every Woman

Radio 10 Non-Stop

- + OK

EQ -40 <-> 6 Volume 0 <-> 21

L: 0 M: 0 H: 0 V: 4

OK

Instellen zender en url : 74

- + OK

thieu februari 2022



A internetradio should be available at the audio output.

## How does it works :

### Choose a station



**ESP32 internetradio webinterface**

**Veronica Rock Radio**

Gary Moore - Still Got The Blues (Albumversie)

Veronica Rock Radio

- + OK

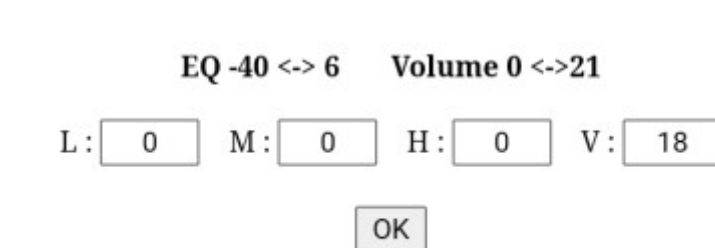
Below the text **ESP32 internetradio webinterface**

Here : Veronica Rock Radio is the station chosen at this moment.  
If songdata is available it will be shown below the station.

With the <-> <+> en <OK> buttons you can choose another station.

In the list there is also the choice **mp3 lijst maken** en **mp3 speler** more about this at the end of the manual.

### Volume and EQ



**EQ -40 <-> 6    Volume 0 <-> 21**

L:  M:  H:  V:

OK

**L** : low

**M**: middle

**H**: high

**V**: volume

L M H    between -40 en 6

V        between 0 en 21

confirm with <OK>

more info about volume and more

<https://github.com/schreibfaul1/ESP32-audioI2S/wiki>

## Setup Stations

**Instellen zender en url : 3**

Radio 2 Limburg

<http://icecast.vrtcdn.be/ra2lim-high.mp3>

-

+

OK

**Instellen zender en url : 74**

-

+

OK

Already filled in stations or empty positions can be changed at your own choice. Maximum is 75.

In the field below <Instellen zender en url : ..> you can fill in the name of the station.

In the field below this you have to fill in the url of this station.

Confirm with <OK>.

## mp3 player

This option can be used when you have connection with your WiFi network or with the ESP32webradio network page 192.168.4.1 when you don't have connection with a WiFi network.

To avoid unwanted silence between two mp3 files it is important to use a fast SD card and change the SPI speed to 25Mhz. **see page 10 of this manual**

The mp3 files are played at random, to make this possible we have to do some things first. When you have more than 100 mp3 files it is a good idea to divide these files in more folders. Starting at mp3\_0, mp3\_1, mp3\_2 and so on. How many of these folders you have is not important but they must be in sequence. First mp3\_0 then mp3\_1 ... the program stops searching when there is no next following mp3\_ folder.

When you have 1000 mp3 files you can divide these in 10 folders, from mp3\_0 to mp3\_9. It is not necessary to have exactly the same number of files in a folder but the more equal the better.

### Important:

**If this is not the first time you make a mp3 list you have to remove first all *sonlijstx* folders from the SD card.**

Screenprint from a SD card with mp3\_ folders not read by the program.



mp3_0	32,8 kB	map
mp3_1	32,8 kB	map
mp3_2	32,8 kB	map
mp3_3	32,8 kB	map
mp3_4	32,8 kB	map
mp3_5	32,8 kB	map
mp3_6	32,8 kB	map
mp3_7	32,8 kB	map
mp3_8	32,8 kB	map
mp3_9	32,8 kB	map
mp3_10	16,4 kB	map
pswd	20 byte	plattetekst-document
ssid	14 byte	plattetekst-document
totaal	4 byte	plattetekst-document
zender_data.csv	4,9 kB	CSV-document

After copying all your mp3's to the SD card and if necessary removing all songlistx folders, place the SD card in the holder.

In the part for choosing a station choose <mp3 lijst maken> and press <OK>

## ESP32 internetradio webinterface







**Radio 10 Non-Stop**




Blof - Dichterbij Dan Ooit

mp3 lijst maken

- + OK

Reading starts

20:53      100% 

  192.168.1.177 

---

### ESP32 internetradio webinterface

**Radio 10 Non-Stop**

Blof - Dichterbij Dan Ooit

mp3 lijst maken

- + OK

**inlezen van :**

**aantal mp3's ingelezen :**

0

**seconden reeds bezig :**

0







**EQ -40 <-> 6    Volume 0 <->21**

L:  M:  H:  V:

OK

**Instellen zender en url : 74**




---



---

The progress of the reading can be followed bij pressing the reload sign at the right upper corner.


20:53



100%



192.168.1.177



---

### ESP32 internetradio webinterface

Radio 10 Non-Stop

Blof - Dichterbij Dan Ooit

mp3 lijst maken

-

+

OK

inlezen van :

/mp3\_1

aantal mp3's ingelezen :

149

seconden reeds bezig :

8

EQ -40 <-> 6    Volume 0 <-> 21


L:  M:  H:  V:


OK


Instellen zender en url : 74


<

>















20:54



100%



192.168.1.177



---

### ESP32 internetradio webinterface

Radio 10 Non-Stop

Blof - Dichterbij Dan Ooit

mp3 lijst maken

-

+

OK

inlezen van :

/mp3\_10

aantal mp3's ingelezen :

1373

seconden reeds bezig :

65

EQ -40 <-> 6    Volume 0 <-> 21


L:  M:  H:  V:


OK


Instellen zender en url : 74


<

>









After finishing reading the webradio starts with the mp3 player.

ESP32 internetradio webinterface

mp3 speler

Bryan Adams - 18 Til I Die

mp3 speler



























-

+

OK



Screenprint from the SD card after reading the mp3\_.. folders

 mp3_0	32,8 kB map
 mp3_1	32,8 kB map
 mp3_2	32,8 kB map
 mp3_3	32,8 kB map
 mp3_4	32,8 kB map
 mp3_5	32,8 kB map
 mp3_6	32,8 kB map
 mp3_7	32,8 kB map
 mp3_8	32,8 kB map
 mp3_9	32,8 kB map
 mp3_10	16,4 kB map
 songlijst0	16,4 kB map
 songlijst1	16,4 kB map
 songlijst2	16,4 kB map
 songlijst3	16,4 kB map
 songlijst4	16,4 kB map
 songlijst5	16,4 kB map
 songlijst6	16,4 kB map
 songlijst7	16,4 kB map
 songlijst8	16,4 kB map
 songlijst9	16,4 kB map
 songlijst10	16,4 kB map
 pswd	20 byte plattetekst-document
 ssid	14 byte plattetekst-document
 totaal	4 byte plattetekst-document
 zender_data.csv	4,9 kB CSV-document

### Important:

**For avoiding endless loops with corrupt mp3 files, at startup the radio allways starts as webplayer. To start mp3 playing you have to choose <mp3 speler> just like you choose another station.**

That's all, enjoy the music  
greetings,  
thieu