ESP32 WROOM web radio – mp3 player

can be operated via:

web interface

touch screen

rotary encoder

After programming once, all parameters can be adjusted via web page.

Maximum 75 radio stations can be programmed

If there is no network connection, the WiFi data can be entered via a web page, the IP address can also be chosen yourself.
See explanation later in this manual.

Tone control possible via web page

mp3 player plays up to 8000+ mp3 files in random order.

Uses the ESP32-audioI2S library >> good sound quality

more info about this library;
https://github.com/schreibfaul1/ESP32-audioI2S/wiki

library on github:
https://github.com/schreibfaul1/ESP32-audioI2S

I2S decoding with PCM5102A

SD card to store station data and MP3s.

Before starting with the web radio, a few useful URLs.

You can find a lot of useful information about ESP32 here :

The ESP32 is programmed with the Arduino IDE. How to install the IDE and the necessary ESP32 software on your PC can be found here, both for Windows and for Linux.
https://randomnerdtutorials.com/installing-the-esp32-board-in-arduino-ide-windows-instructions/
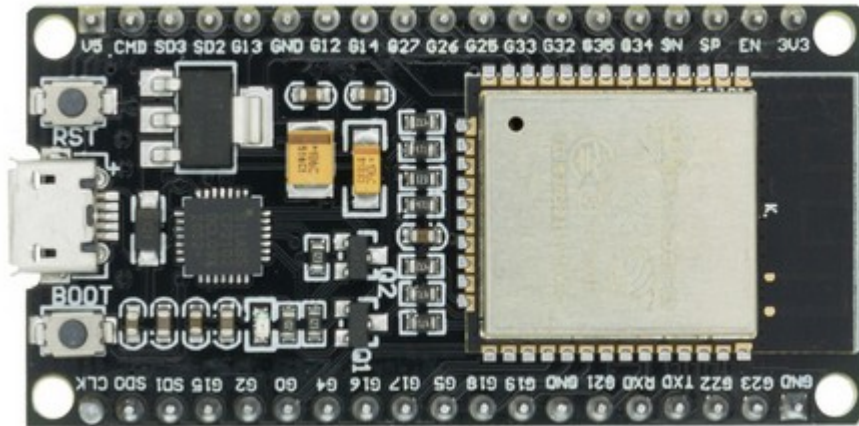
Learn more about ESP32 and much more
https://randomnerdtutorials.com/projects-esp32/

Internet streaming adresses:
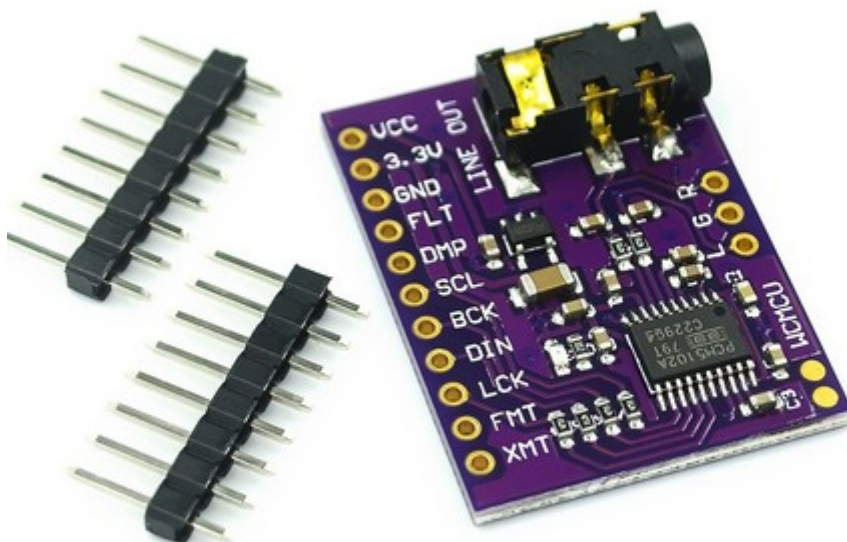https://www.hendrikjansen.nl/henk/streaming.html#cz

What do we need :
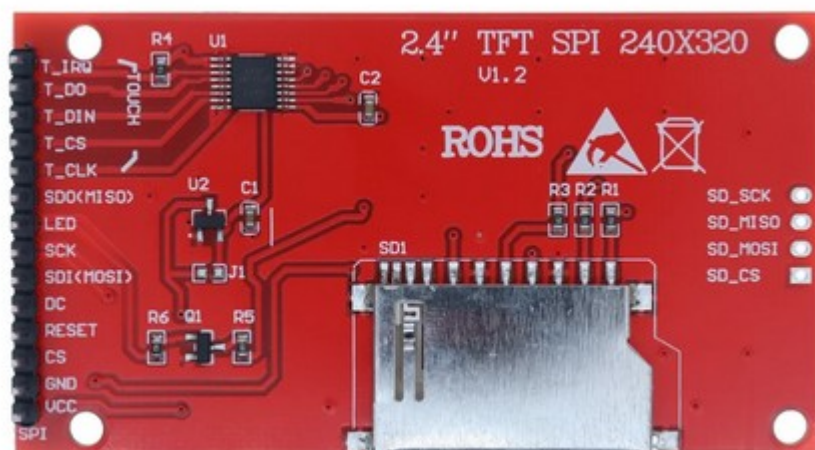
For parts see Aliexpress
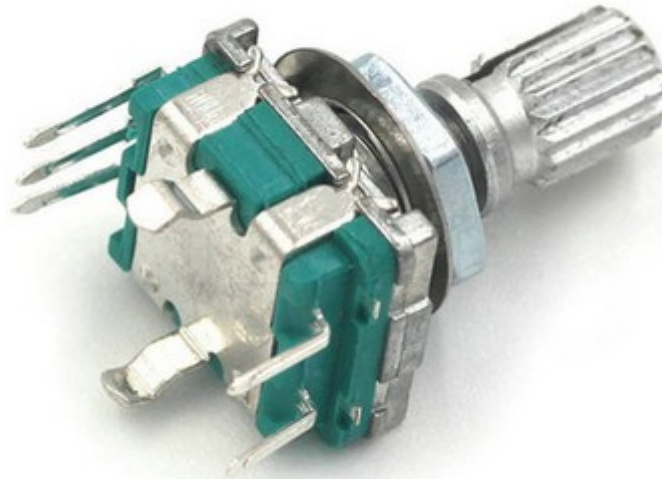
1 x ESP32 WROOM Devkit

1 x PCM5102 I2S DAC

1 x tft touchscreen 320x480 or 240x320 with SD card holder
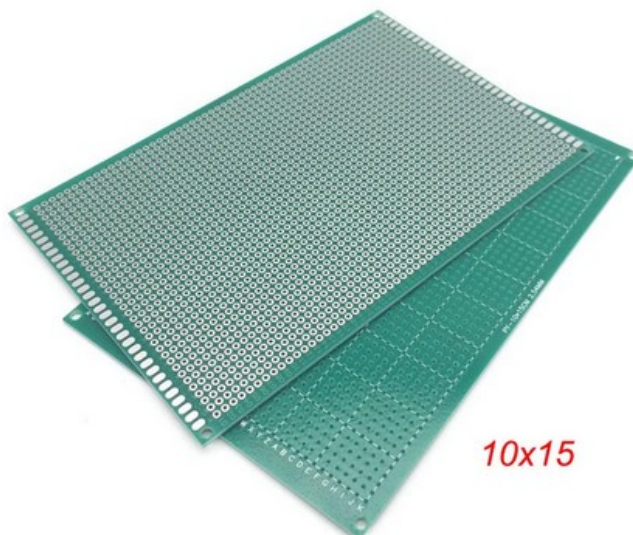
2 x EC11 rotary encoder with push button

8x resistor 10K

4x capacitor 100nF

1 SD card, if not used as an MP3 player, a minimum capacity is sufficient.
When used as an MP3 player, depending on the number of MP3 files.
Please note that there are still enough free bytes to create the mp3 lists.
See further in the manual.

1x PCB experimental board 10x15cm

10x15

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

lacquer at the beginning or end is easy to remove with soldering iron with a little solder on the tip

Other wire is of course also possible, but I have not had a bad experience with this kind of wire

1x Soldering experience is also helpful

Connections

ESP32 WROOM

3 x GND in	<<	GND of power supply (connect all GND connections)	
1 x 5V in	<<	5V of power supply	
3.3V	>>	Led TFT	
GPIO25	>>	DIN	PCM5102A
GPIO26	>>	LCK	PCM5102A
GPIO27	>>	BCK	PCM5102A

GPIO12	>>	TOUCH_MISO	(T_DO)
GPIO13	>>	TFT_MOSI	(SDI)
	>>	TOUCH_MOSI	(T_DIN)
GPIO14	>>	TFT_CLK	(SCK)
	>>	TOUCH_CLK	(T_CLK)
GPIO15	>>	TFT_CS	(CS)
GPIO04	>>	TOUCH_CS	(T_CS)
GPIO02	>>	TFT_DC	(DC)
ENABLE	>>	TFT_RESET	(RESET) ENABLE = ESP RESET pin 2

GPIO05	>>	SD_CS
GPIO23	>>	SD_MOSI
GPIO19	>>	SD_MISO
GPIO18	>>	SD_SCK
GPIO34	>>	STATION_A
GPIO35	>>	STATION_B
GPIO33	>>	STATION_OK
GPIO16	>>	VOLUME_A
GPIO17	>>	VOLUME_B

ESP32 DEVKIT

TFT LED
TFT RESET

STATION_A
STATION_B
T_IRQ
STATION_OK
PCM5102A DIN
PCM5102A LCK
PCM5102A BCK
TFT SCK / T_CLK
T_DO
GND
TFT SDI / T_DIN

5V in

GND
SD_MOSI

GND
SD_MISO
SD_SCK
SD_CS
VOLUME_B
VOLUME_A
T_CS
TFT DC
TFT CS

TFT / TOUCH
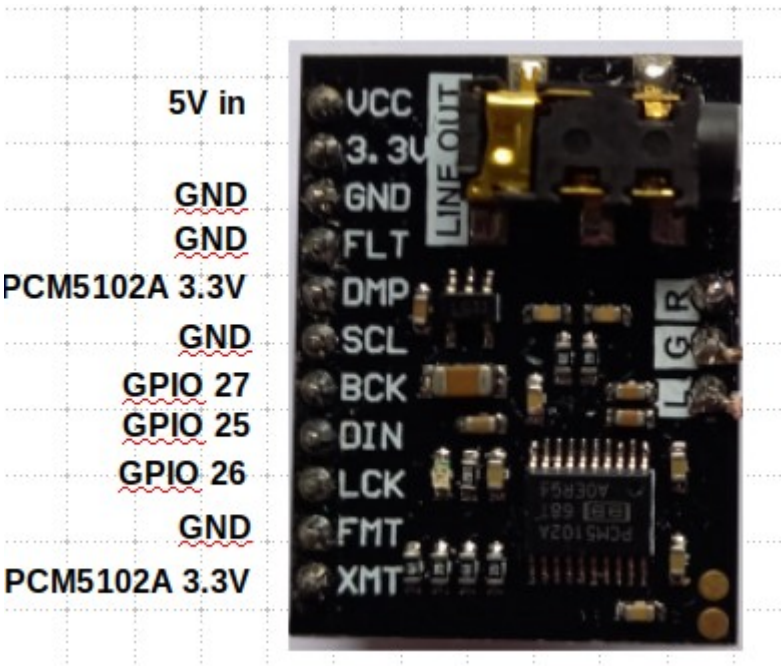
TFT SDI(MOSI)   >>   GPIO13
TFT SCK   >>   GPIO14
TFT CS   >>   GPIO15
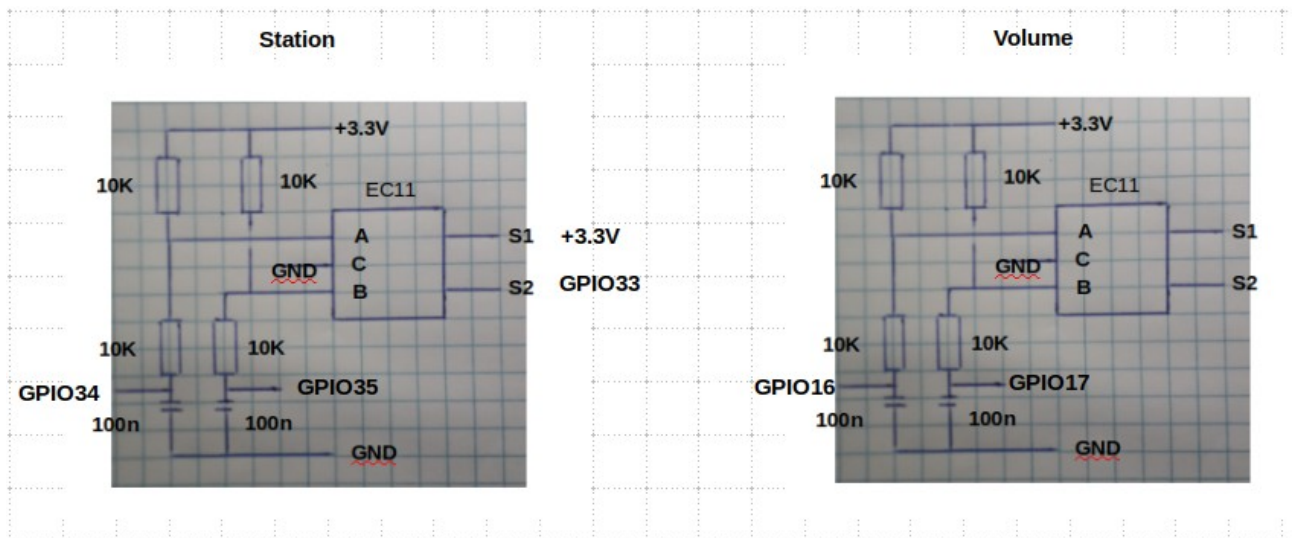TFT DC   >>   GPIO02
TFT RESET   >>   ESP32 EN (pin 2)

T_IRQ   >>   GPIO32
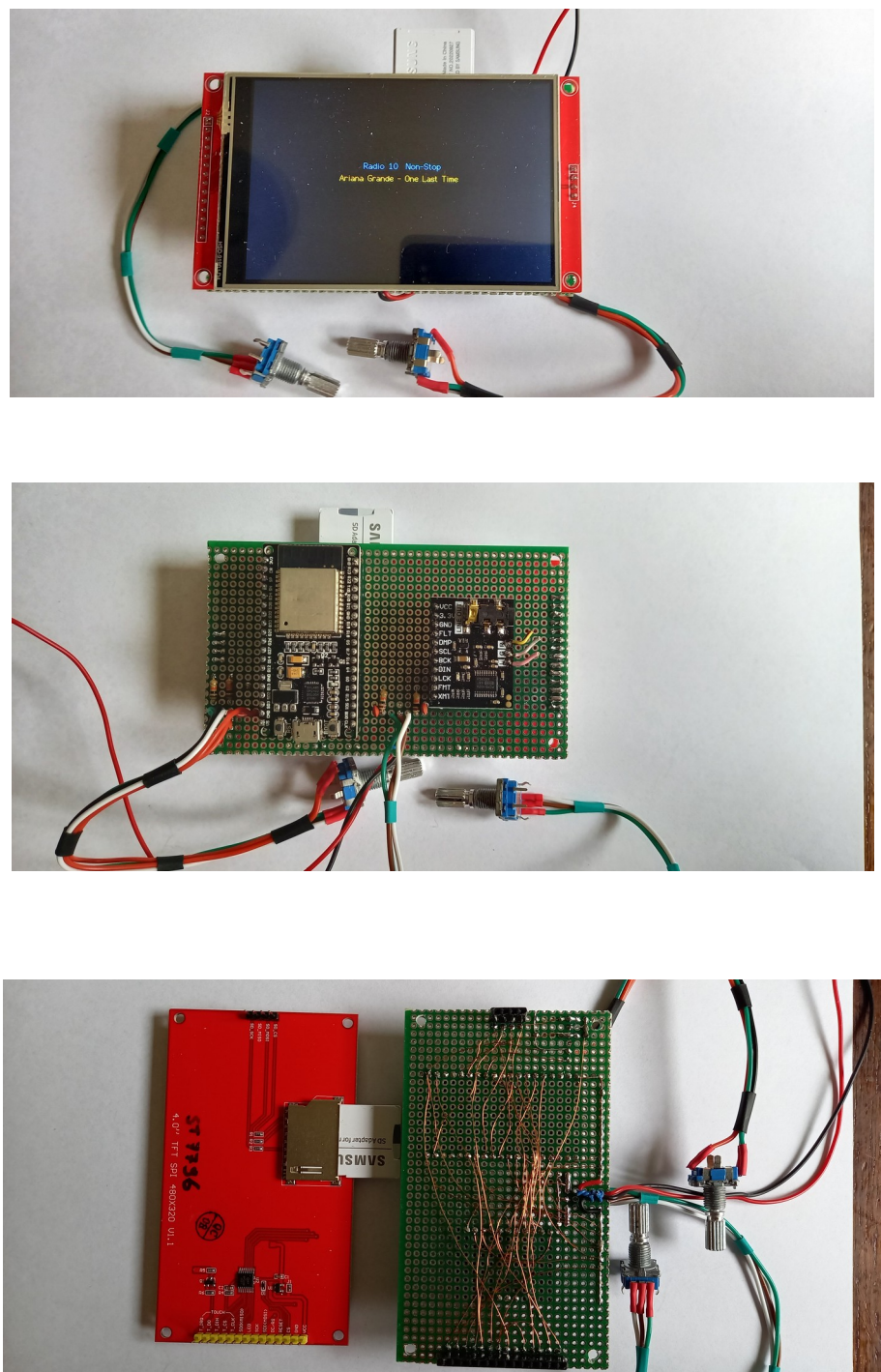T_DO   >>   GPIO12
T_DIN   >>   GPIO13
T_CS   >>   GPIO04
T_CLK   >>   GPIO14

PCM5102A

GND	<<	GND in
VCC	<<	5V in
FLT	<<	GND
DMP	<<	3.3V PCM5102A
SCL	<<	GND
BCK	<<	GPIO27
DIN	<<	GPIO25
LCK	<<	GPIO26
FMT	<<	GND
XMT	<<	3.3V PCM5102A

S1
S2
B
C
A

Station

+3.3V

10K   10K   EC11

A
C   S1   +3.3V
GND
B   S2   GPIO33

10K   10K

GPIO34   GPIO35

100n   100n

GND

Volume

+3.3V

10K   10K   EC11

A
C   S1
GND
B   S2

10K   10K

GPIO16   GPIO17

100n   100n

GND

End result

TFT eSPI settings

User_Setup.h

select driver, here ST7796, check TFT screen which driver should be selected.

```
// Only define one driver, the other ones must be commented out
//#define ILI9341_DRIVER       // Generic driver for common displays
//#define ILI9341_2_DRIVER     // Alternative ILI9341 driver, see https://github.com/Bodmer/TFT_eSPI/issues/1172
//#define ST7735_DRIVER        // Define additional parameters below for this display
//#define ILI9163_DRIVER       // Define additional parameters below for this display
//#define S6D02A1_DRIVER
//#define RPI_ILI9486_DRIVER // 20MHz maximum SPI
//#define HX8357D_DRIVER
//#define ILI9481_DRIVER
//#define ILI9486_DRIVER
//#define ILI9488_DRIVER       // WARNING: Do not connect ILI9488 display SDO to MISO if other devices share the SPI bus (TFT SDO does NOT tristate when CS is high)
//#define ST7789_DRIVER        // Full configuration option, define additional parameters below for this display
//#define ST7789_2_DRIVER      // Minimal configuration option, define additional parameters below for this display
//#define R61581_DRIVER
//#define RM68140_DRIVER
#define ST7796_DRIVER
//#define SSD1351_DRIVER
//#define SSD1963_480_DRIVER
//#define SSD1963_800_DRIVER
//#define SSD1963_800ALT_DRIVER
//#define ILI9225_DRIVER
//#define GC9A01_DRIVER
```

Use the following settings

```
// ###### EDIT THE PIN NUMBERS IN THE LINES FOLLOWING TO SUIT YOUR ESP32 SETUP   ######

// For ESP32 Dev board (only tested with ILI9341 display)
// The hardware SPI can be mapped to any pins

#define TFT_MISO 12
#define TFT_MOSI 13
#define TFT_SCLK 14
#define TFT_CS   15  // Chip select control pin
#define TFT_DC    2  // Data Command control pin
#define TFT_RST  -1  // Reset pin (could connect to RST pin)
//#define TFT_RST  -1  // Set TFT_RST to -1 if display RESET is connected to ESP32 board RST

// For ESP32 Dev board (only tested with GC9A01 display)
// The hardware SPI can be mapped to any pins

//#define TFT_MOSI 15 // In some display driver board, it might be written as "SDA" and so on.
//#define TFT_SCLK 14
//#define TFT_CS    4  // Chip select control pin
//#define TFT_DC    2  // Data Command control pin
//#define TFT_RST  -1  // Reset pin (could connect to Arduino RESET pin)
//#define TFT_BL   22  // LED back-light

#define TOUCH_CS 4     // Chip select pin (T_CS) of touch screen
```

TFT_RST -1   TFT_RST connected to RESET (EN) ESP32

Computer programming

Go to : https://github.com/thieu-b55/ESP32-webradio-easy-control

download the zip file : SD card files.zip and unzip.
download the program : ESP32_WROOM_webradio_tft_240_320.ino
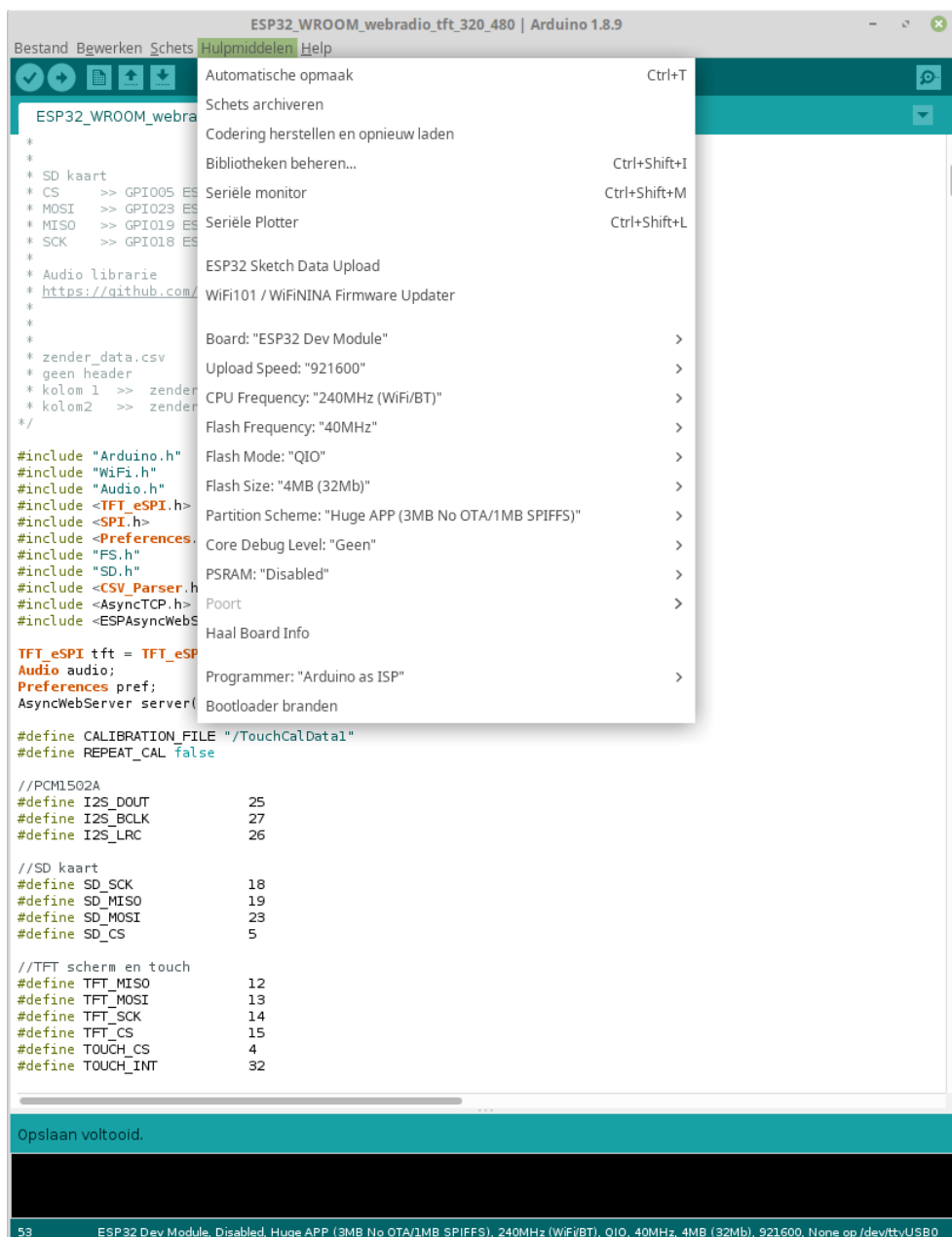   or
                       ESP32_WROOM_webradio_tft_320_480.ino

Copy the files you find in the SD card files folder (total, pswd, ssid and zender_data.csv) to the SD card and place the SD card in the SD card adapter or holder.

Open the program.
Settings of the Arduino IDE see screen print. Port setting depends on your configuration.

Upload program

ESP32_WROOM_webradio_tft_320_480 | Arduino 1.8.9

Bestand Bewerken Schets Hulpmiddelen Help

ESP32_WROOM_webradio_tft_320_480

```
/*
 * MIT License
 *
 * Copyright (c) 2023 thieu-b55
 *
 * Permission is hereby granted, free of charge, to any person obtaining a copy
 * of this software and associated documentation files (the "Software"), to deal
 * in the Software without restriction, including without limitation the rights
 * to use, copy, modify, merge, publish, distribute, sublicense, and/or sell
 * copies of the Software, and to permit persons to whom the Software is
 * furnished to do so, subject to the following conditions:
 *
 * The above copyright notice and this permission notice shall be included in all
 * copies or substantial portions of the Software.
 *
 * THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR
 * IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY,
 * FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE
 * AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER
 * LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM,
 * OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE
 * SOFTWARE.
 */
/*
 * ESP32 WROOM Module
 * Partition Scheme:
 * Huge APP(3MB No OTA/1MB SPISS)
 *
 * Flash Frequency 40MHz
 *
 *
 * PCM5102A
 * FLT   >>   GND
 * DMP   >>   3.3V
 * SCL   >>   GND
 * BCK   >>   GPIO27 ESP32
 * DIN   >>   GPIO25 ESP32
 * LCK   >>   GPIO26 ESP32
 * FMT   >>   GND
 * XMT   >>   3.3V
 * VCC   >>   5V
 * GND   >>   GND
 *
 *
 * TFT ST7796 Driver
 * instellingen TFT scherm
 * aanpassen in .../libraries/TFT_eSPI/User_Setup.h
 *
 * TFT_MOSI    >>   GPIO13
 * TFT_CLK     >>   GPIO14
 * TFT_CS      >>   GPIO15
 * TFT_DC      >>   GPIO02
 * TFT_RESET   >>   ESP32 EN (Pin 2)
 * TFT_LED     >>   ESP32 3.3V
 * TOUCH_MISO  >>   GPIO12
 * TOUCH_MOSI  >>   GPIO13
 * TOUCH_CLK   >>   GPIO14
 * TOUCH_CS    >>   GPIO04
```

Bezig met het compileren van de schets...

ESP32 Dev Module, Disabled, Huge APP (3MB No OTA/1MB SPIFFS), 240MHz (WiFi/BT), QIO, 40MHz, 4MB (32Mb), 921600, None op /dev/ttyUSB0

For the 1st use, the network data has not yet been entered. Do this first.
This also applies when used outside the range of the set network.

Connect smartphone connection to
network : **ESP32 web radio**
password : **ESP32pswd**

Open the web page at address 192.168.4.1

Under the titleESP Netwerk instellingen

In the ssid field enter the name of your WiFi network
in the field pswd enter the password for your network

default IP address is 192.168.1.177.

Below **Gewenst IP address ...**
can you enter a different IP address.
Software does not check entered values.
Push **Bevestig** and the ESP32 reboots itself.

Control via web page

If the network information has been entered correctly, the ESP32webradio network will no longer be available.
Connect your smartphone to the home network and go to the web page at address 192.168.1.177 or the IP address of your choice, here 192.168.1.211

The set channel is now available via the audio output.

How does it work :

Channel selection

Under the text ESP32 internetradio

Here : Radio 10 Non-Stop this is the currently selected station.
If the artist and title of the current file are sent along, this will be placed under the selected channel.

In the next box you can use the <-> <+> and <OK> key to select another station.

There is also a choice in the drop-down list **mp3 lijst maken** and **mp3 speler** more about this later
in the manual.

Volume and EQ

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

L : [0]   M : [0]   H : [0]   V : [18]

[OK]

L : low
M: midden
H: high

V: volume

L M H   can be set between -40 en 6
V   can be set between 0 en 21
confirm with <OK>
more info about volume, tone and much more
https://github.com/schreibfaul1/ESP32-audioI2S/wiki

Set channels

Instellen zender en url : 3

Radio 2 Limburg

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

\[- \] \[+ \] \[OK \]

Instellen zender en url : 74

\[- \] \[+ \] \[OK \]

**Very important :
when entering a web address for a radio station
DO NOT use https:// address but http://. Omitting the "s" when entering works
in most cases. When using an https:// address, your own web page does not work
or works very slowly.**

Already set channels or still empty positions can be changed as desired. Maximum channels that
can be set is 75.
In the first box below <Instellen zender en url : ..> you can enter any name for the channel.
The web address of the sender must be entered in the second box.
Confirm with <OK>, go to a next or previous position with the <-><+> keys.
Empty positions are not displayed when searching for another channel.

mp3 player.

You can use this option with or without a network connection.

The mp3 files are played in random order so we need to do some things first.
With more than about 100 mp3 files, it is wise to divide them over different folders.
Starting from mp3_0 and so on mp3_1, mp3_2.
How much mp3_. folders you have is not important but they should follow each other. So after mp3_0 follows mp3_1. If there is no mp3_x folder immediately following an mp3_x folder, the program will stop searching.
Best is as much mp3_. folders if there are mp3s in a folder.
900 mp3s would then be 30 mp3_. folders with 30 mp3s each.
The number of files in the songlistx folders created when creating the mp3 list is determined by the number of mp3 files in the mp3_0 folder.

Important:
If this is not the 1st time you are making an mp3 list, you must first delete all songlistx folders from the SD card.

Screenshot of SD card with mp3_. folders that have not yet been imported.

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

Once you've copied all your mp3s to the SD card and deleted any songlistx folders, put the SD card back in its slot.

In the channel selection section go to <mp3 lijst maken> and press <OK>

ESP32 internetradio

Radio 10 Non-Stop

Donna Summer - Could It Be Magic

mp3 lijst maken

-		OK		+

Reading starts

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 : [0]   M : [0]   H : [0]   V : [4]

[OK]

Instellen zender en url : 74

The progress of the reading can be followed by pressing the top right on the reload sign.

After reading all mp3 files, the web radio switches to mp3 player

Screenshot of 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

To avoid a possibly endless loop in the event of an error during mp3 playback, it will always start as web radio or stop mp3 if there is no internet connection.

Operation rotary encoders / touch screen

Turning the rotary encoders or tapping the screen (best with the supplied pen) gives the following screen.
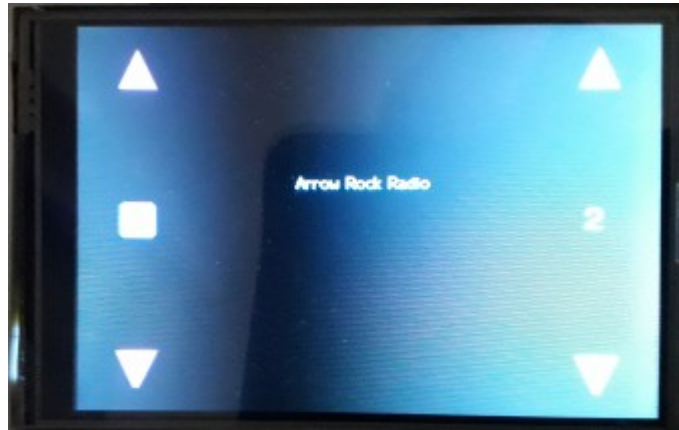

Photo not so good.

Turning the volume rotary encoder instantly changes the sound level which is also visible in the center right of the screen.
Turning the station rotary encoder changes the station name in the center of the screen.
Select by pressing the station rotary encoder.
Rotary encoders work best with a smooth, constant rotational movement. Turning (too) fast gives a bad result.

Touch screen, this works best with the included pen
Volume can be adjusted by pressing the left arrows.
Another station can be selected with the up/down arrows. Accept by pressing the square left center.

That was it,
enjoy the music,
regards,
thieu-b55