

R909-SDR radio (Arduino+Si4732+Si5351a+TA2003+LM386)

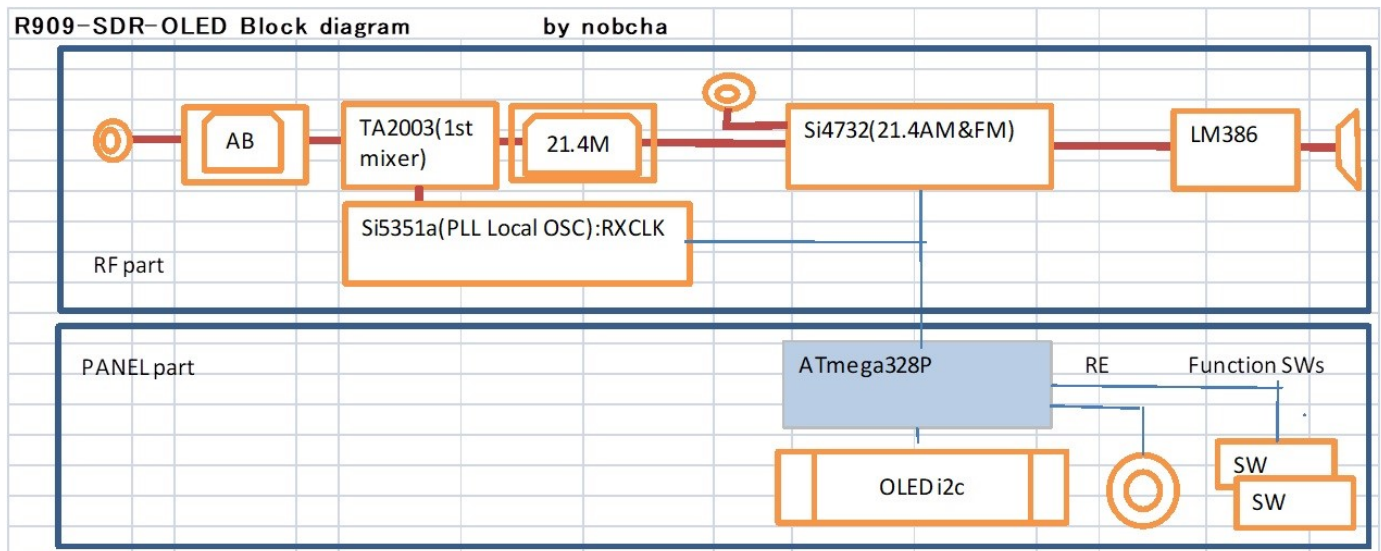
2024. 02. 09 tentative by nobcha

1. PREFACE



-The front view of this radio.

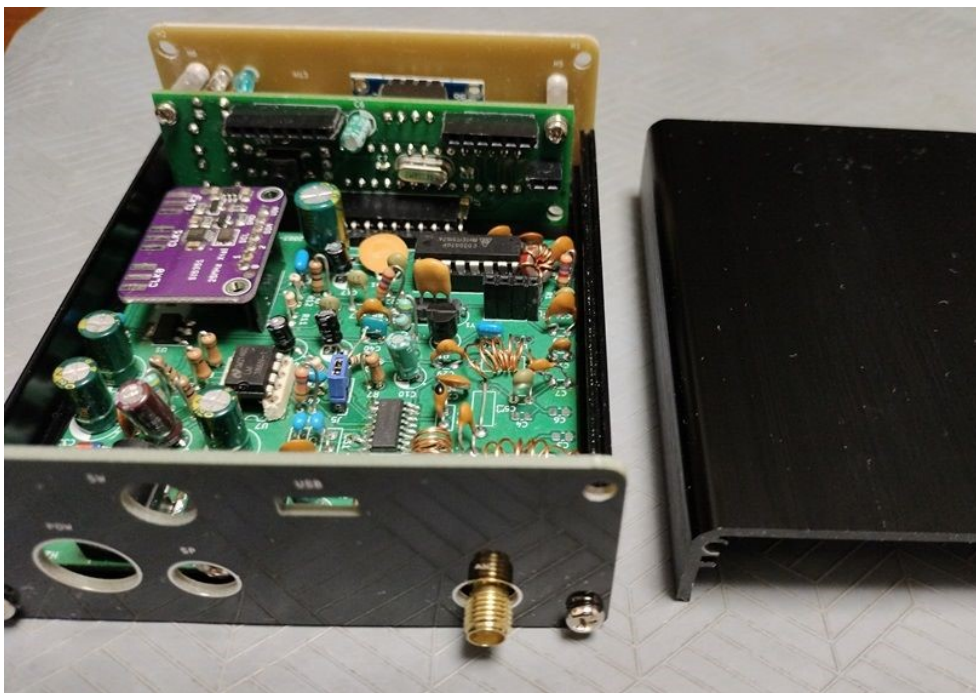
R909-4732(SDR) is a radio for the air band and the FM broadcasting. It is configured with Si5351a, Si4732, and TA2003 mainly. TA2003 and Si5351a are sharing the first mixer and the local oscillator. Si4732 is acting as a mother 21.4MHz receiver for the air band and the FM radio itself. Concerning of PU2CLR's advice, I adopted PU2CLR Si4735/32 library for this sketch. There are some kinds of display version, as SSD and WE1602A. I will introduce OLED version mainly.



-Block diagram

To operate the radio, you shall use the rotary encoder, encoder push switch, and function switches.

There are two PCBs as Panel and RF. They are connecting by pin header connector. The ATmega328P with the Arduino boot loader, the switches, and the display are locating on the Panel PCB.



-The inside of R909-SDR radio

2. The details of R909-4732

2.1 Specification

.Band coverage Air band AM: 118-136MHz, FM: 76-109MHz

.Sensitivity -85dBm

.Power supply DC+12V about 110 mA

.Audio output 1W max, 2.5 jack

.Case size 38h x 88w x 100d, weight: about 250grm

2.2 Circuit and PCBs

There are 2 PCBs of RF and PANEL. RF PCB is containing the front end filter, TA2003 mixer, Si4732 radio, Si5351a frequency module, LM386 audio AMP, and the power circuit. PANEL PCB is holding ATmega328P with boot loader, OLED display module, and the switches.

-RF circuit diagram

-PANEL circuit diagram

2.3 Operation

Operation is depending on the rotary encoder and the rotary encoder's push switch. There are 3 modes, to select a function (FUNC), to change parameter at every function mode, and to memory the parameter into EEPROM. FUNC mode is to select every function. You shall select the function by rotating and determine the one by single pushing. In every function mode you can change the parameter by rotating and store the parameter on to EEPROM by double pushing. To escape out from every function mode to push rotary encoder switch single. Rotating, one pushing, and two pushing is the identical operation for this sketch.

There are 10 major functions in this radio machine control.

.Func: To decide every function

.FRQ: To determine the frequency stepped by the step frequency

.STP: To select the step frequency from 10Hz, 1kHz, 10kHz, 100kHz, 1MHz, and 25kHz

.MEM: To set the memory channel number for EEPROM 50channels

.SCN: To scan the memory channel number for EEPROM 50channels

.VOL: To control volume level

.SQU: To control squelch level

.BAND: To alternate AM or FM

.BAND_W: To select the band width frequency from 1Hz, 1.5kHz, 2kHz, 4kHz, and 6kHz

.F_COR: To correct the basic crystal 25MHz frequency error

-Operation flow

-Youtube video

2.4 About sketches

Some libraries and common sketch are included. Many thanks for providing those materials. They are PU2CLR's 4735 library, Adafruits OLED libraries, TJ lab's Si5351a sketch, and Ben Buxton's rotary encoder library.

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There are the sketches to test the hardware, as i2c scanner and USB serial controlling Si4732.

3. How to assemble the PCB and to connect with PCBs and module.

3.1 PANEL PCB

There are used the surface mounting CRs for this PCB. You shall solder the surface mounting CRs at first. Please take care of the parts which must be soldered on B side. Next the crystal and the aluminum capacitors are soldered. ATmega328P should be mounted with the IC socket to be replaced as needed. J and J are used on demanded. The switches and LEDs are mounted to take care of combining with the front panel PCB.

The assembled PCB could be tested by i2c scanning sketch. When the OLED shows its own i2c address of 0x10 on it, testing result is OK.

-Photo of assembled PANEL PCB

3.2 RF PCB

Prior to solder the parts you shall wind the coils. You should wire 4 air core coils and 1 troidul coil as below.

-Coils for R909-4732(SDR)

At first you shall solder the surface mounting parts as Si4732, SGA2751 and some LCs.

After then you solder the DIP type LCR and pin header connectors.

If you would like to check digital connection between PANEL and RF PCB, you can use i2c scanner program. When you find Si4732 address of 0x60, it works well. And USB serial controlling Si4732 sketch is useful to tune RF analogue part.

3. To install the PCBs in the case

4. How to remodel the sketch

5. References and thanks

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