

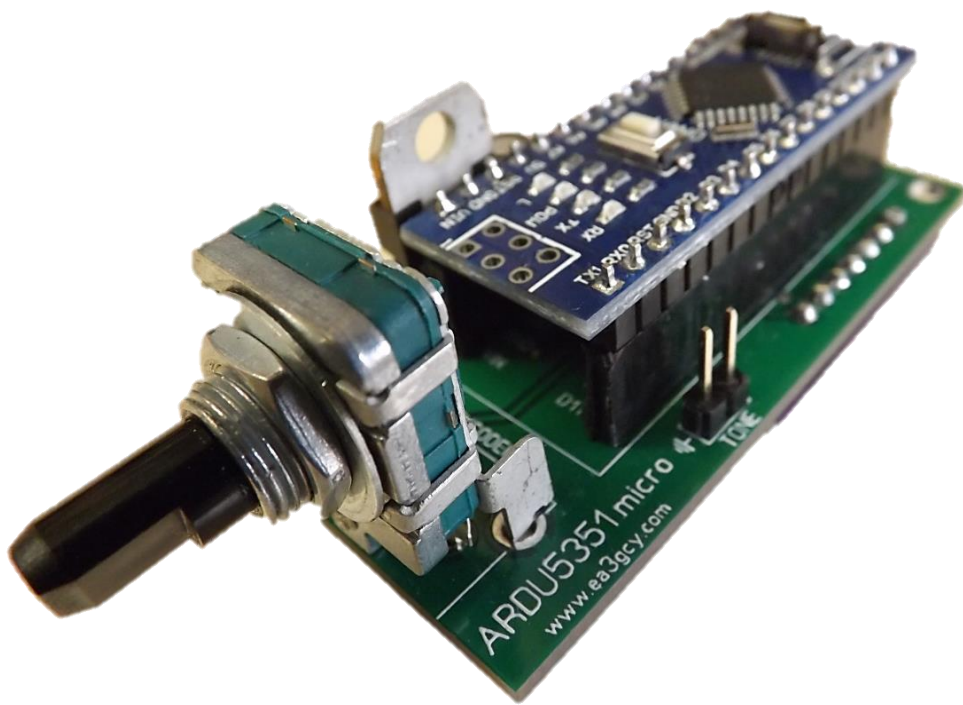
ARDU-5351 mini

Assembly manual

Last review: May 20, 2020

ea3gcy@gmail.com

Latest updates and news: www.grphamradiokits.com



Thanks for purchasing the “**ARDU-5351 mini**”

Enjoy building QRP ! 73 Javier Solans, ea3gcy

INTRODUCTION

The *ARDU-5351 mini* is a signal generator based on the SI5351 clock generator chip from Silicon Labs (www.silabs.com) and an Arduino Nano controller module.

The simple mechanical configuration with a single rotary encoder control with push button makes this VFO an extremely versatile “block” and easy to integrate into minimalist radio projects.

The uniqueness of this project is that it does not use a display and the frequency is CW announced when the push/button is pressed for 1 second or more.

- One variable frequency output (out 0) and one fixed output (out 1) to IF/BFO.
- Easy setup using the Arduino IDE Series Monitor.
- Very compact size.
- Simple control through an encoder with push button.
- Output frequency information by audible tone in CW code (three digits).
- Low current consumption.
- Wide frequency range.
- Automatic frequency save function.
- Frequency steps select by encoder push/button.
- IF offset function.
- Adjustable minimum and maximum frequencies
- SI5351 crystal frequency calibration.
- Easy assembly by clamping the rotary encoder shaft
- All SMD parts are soldered.

ELECTRIC SPECIFICATIONS

- Controls: Rotary encoder with push button.
- CW Tone Output: Buzzer.
- Signal outputs: 1 variable frequency (output 0) and 1 fixed IF/BFO (output 1).
- Frequency output range: 50kHz to 99.9MHz.
- Offset IF: $VFO = F + IF$, $VFO = F + IF$, $VFO = IF - F$, $OFFSET = 0$.
- Steps: 1kHz, 100Hz, 10Hz.
- Connectors: 2.45mm space pin strips.
- Power supply: 7 to 15V DC.
- Average current consumption: 50mA.
- PCB size: 55 x 30 mm

PART ONE:

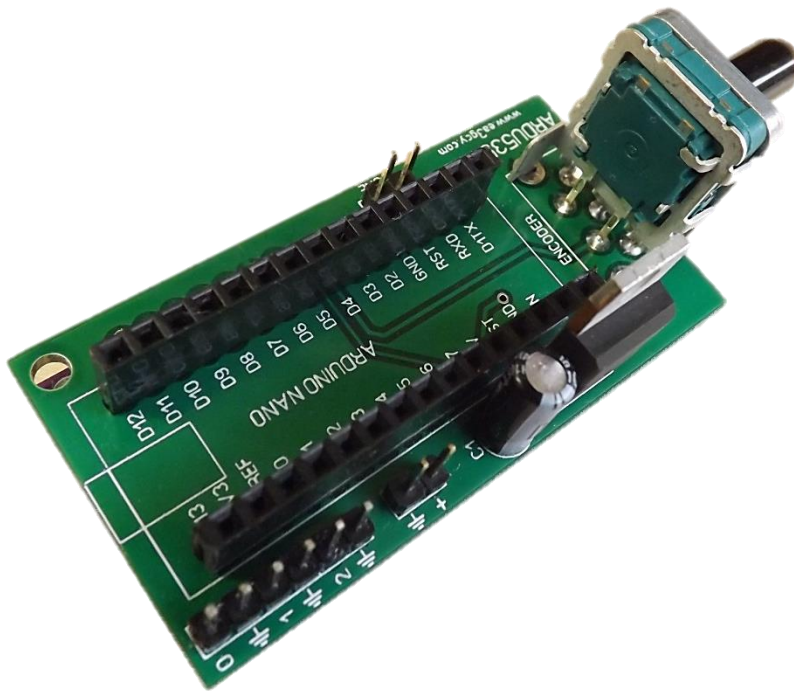
ASSEMBLY AND INSTALL

PLEASE, BEFORE YOU BEGIN THE ASSEMBLY, READ THE MANUAL COMPLETELY AT LEAST ONCE.

All SMD components are soldered at the factory.

There is very little assembly work. Special attention to the placement of the SI5351 module.

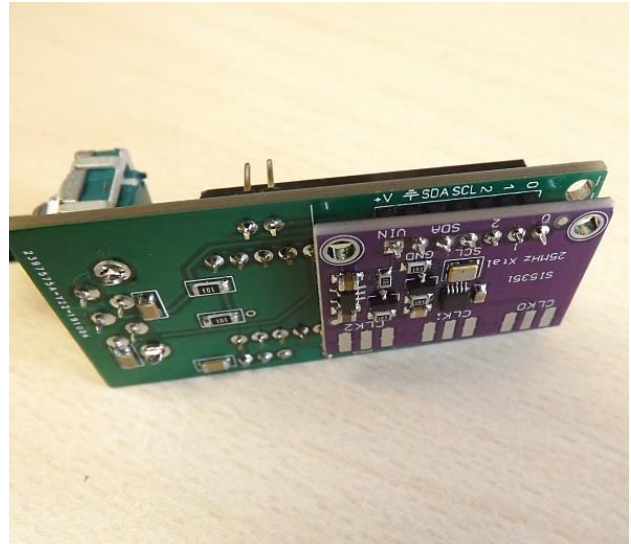
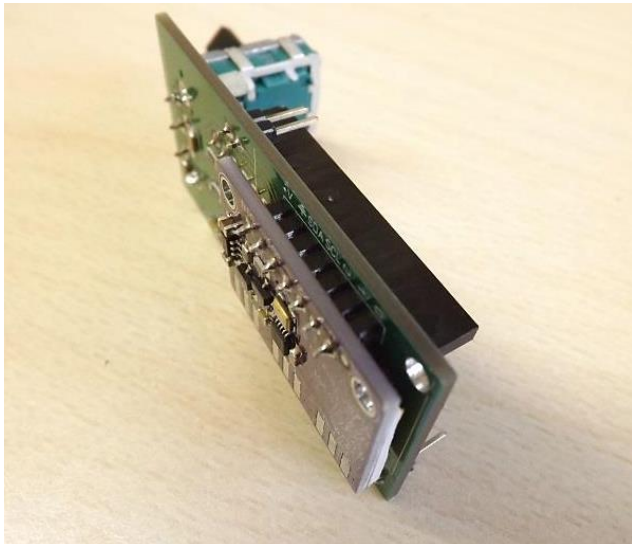
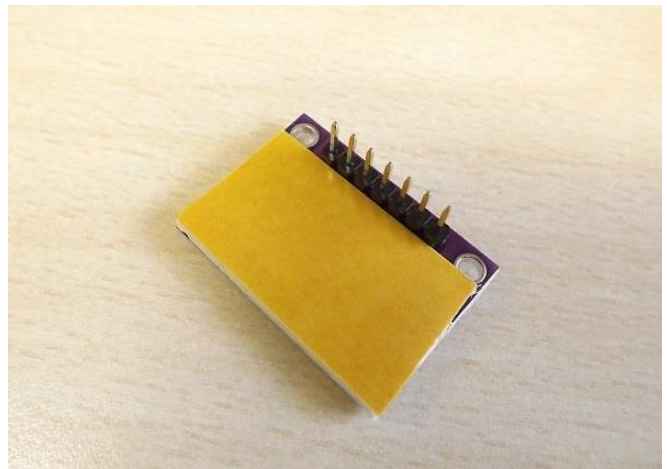
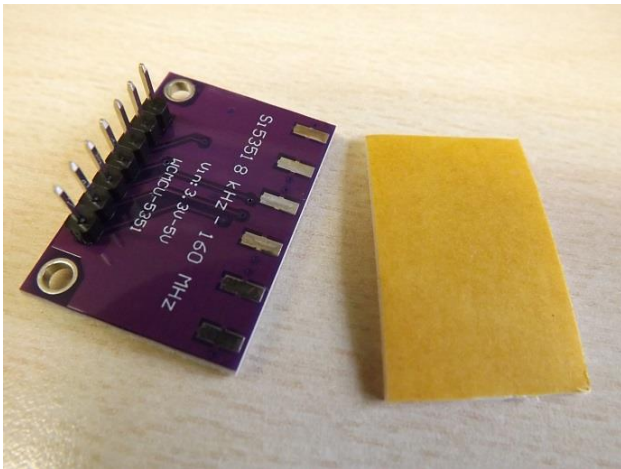
Look carefully at the images before starting to solder the parts



- ❶ Place and solder the two 15-pin female strips to the Arduino Nano board socket.
- ❷ Place and solder the 10uF C1 electrolytic capacitor and the 7805 IC1 regulator as indicated by the silhouettes printed on the board.
- ❸ Place and solder the rotary encoder.
- ❹ Place and solder a 6-pin male strip (P1). These are the outputs connections.
- ❺ Place and solder a 2-pin male strip for the +/- VCC input.
- ❻ Place and solder a 2-pin male strip for the TONE output.

⑦ Next, prepare the SI5351 module. Look closely at the images.

Solder the 7-pin strip to the board. Glue a piece of double-sided adhesive tape to insulate the surface of the board. Solder the SI5351 module to the *ARDU-5351 mini* motherboard as shown in the image.



Note: When solder the pin strips, make sure they are straight and flat on the board.

⑧ Insert the Arduino UNO module into the board socket. Pay special attention to your orientation.

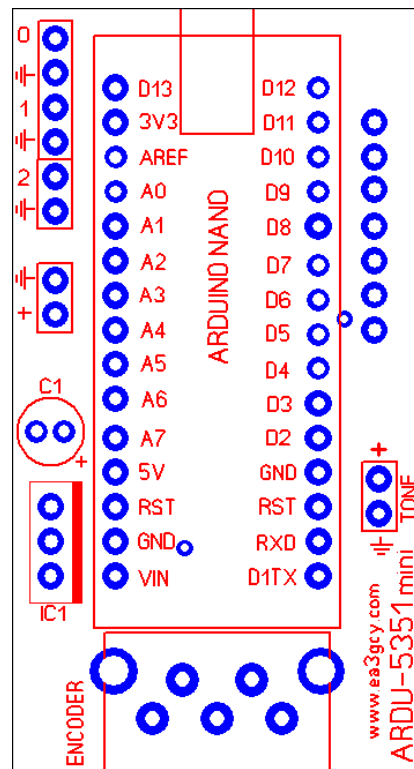
The assembly is already finished.

ARDU-5351 mini WIRING

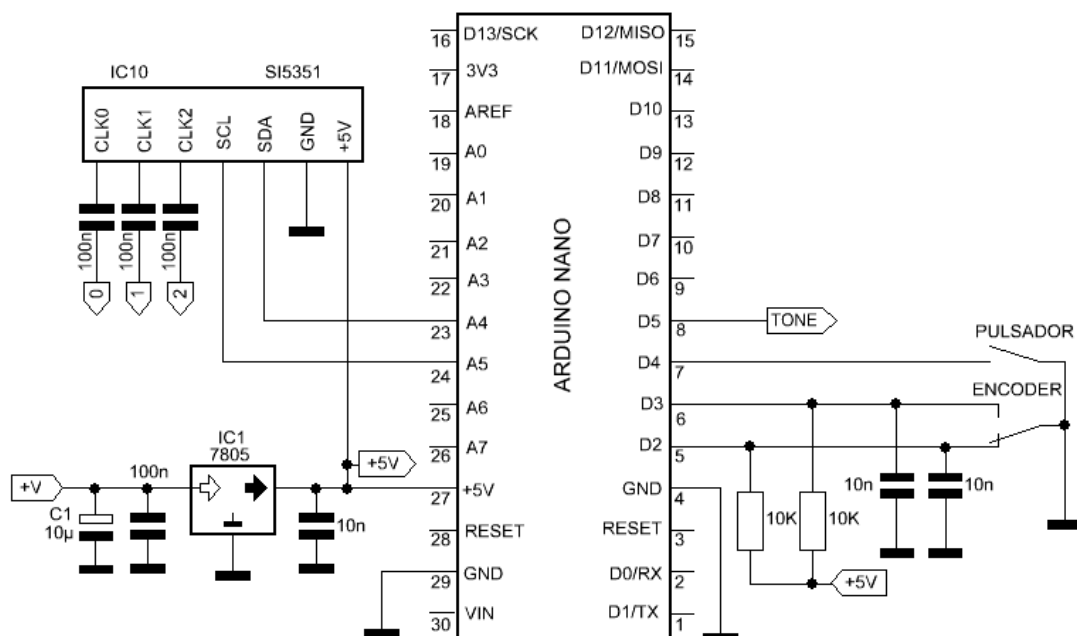
The wiring is very simple, but it is very important that you know how to do it.

All elements are welded on the plate. You only have to connect the power cables, the “0” signal output and the “TONE” output.

Important: for the signal output use thin coaxial cable type RG174 or similar.



SCHEMATIC



ARDU-5351 mini

PART TWO

SETUP AND USE

FACTORY SETTINGS

There are 5 parameters to configure on *ARDU-5351 mini* kit.
The factory configuration parameters are as follows:

FREQ LOWER: 7.000.000MHz

FREQ UPPER: 7.200.000MHz

Output frequency 0 (CLK0): 7.000.000MHz + IF

IF: 4.913.500MHz

OFFSET FI: *Output = +IF*

Output frequency 1 (CLK1) (IF output): *enabled*

CAL FREQ: 500

When you start for the first time the frequencies will be:

- *Output 0 will be 11.913.500MHz*
- *Output 1 will be 4.913.500MHz*

SETTINGS

It is necessary that you have a basic knowledge about the Arduino platform.

Before starting the configuration, you should know about the needs of your project, what frequencies you need. Once you know what you want to do and how to do it, the setup will be very simple and fun!

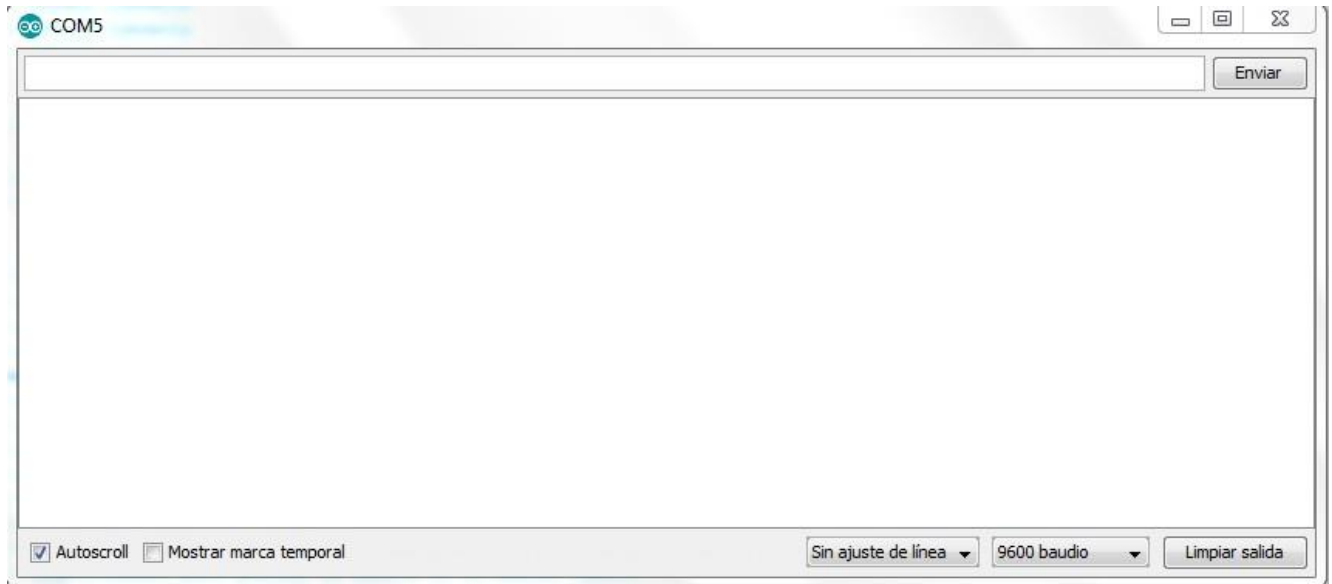
In order to configure the *ARDU-5351 mini*, you must have the Arduino IDE installed, which you can download from the official website: <https://www.arduino.cc/en/main/software>

The installation of the Arduino IDE is very easy. You must also install the CH340 driver to communicate with the generic Arduino Nano board that uses this kit.

On the internet you will find many tutorials to do both.

Plug the *ARDUINO-5351 mini* into the USB port of your computer, and in the "Tools" tab select the "Arduino Pro or Pro-mini" board and the "COM" port that has been assigned to the board.

Then on the Tools tab, select "Serial Monitor" and configure "No line adjustment" and speed "9600Baudio".

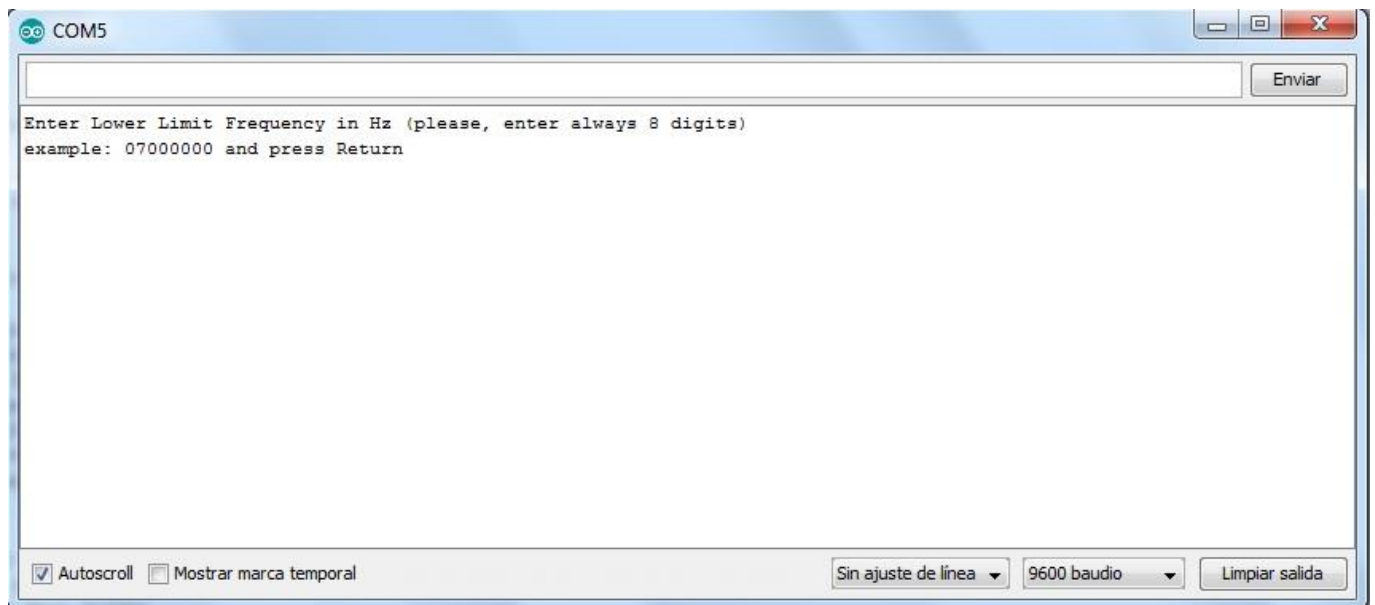


Close the “Serial Monitor” again (do not close the Arduino IDE).

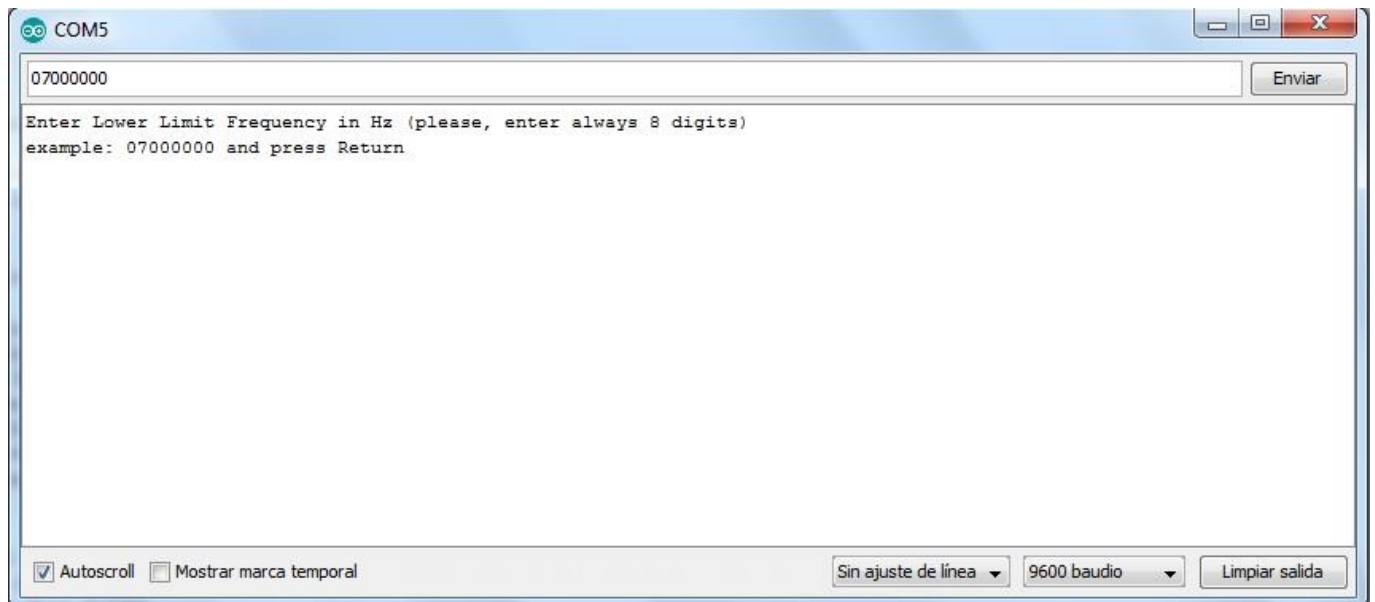
➡ To configure the *ARDU-5351 mini* you must press and hold the encoder button and then start the “Series Monitor”, press and hold the encoder button until the display shows:

Enter Lower Limit Frequency in Hz (please, enter always 8 digits)

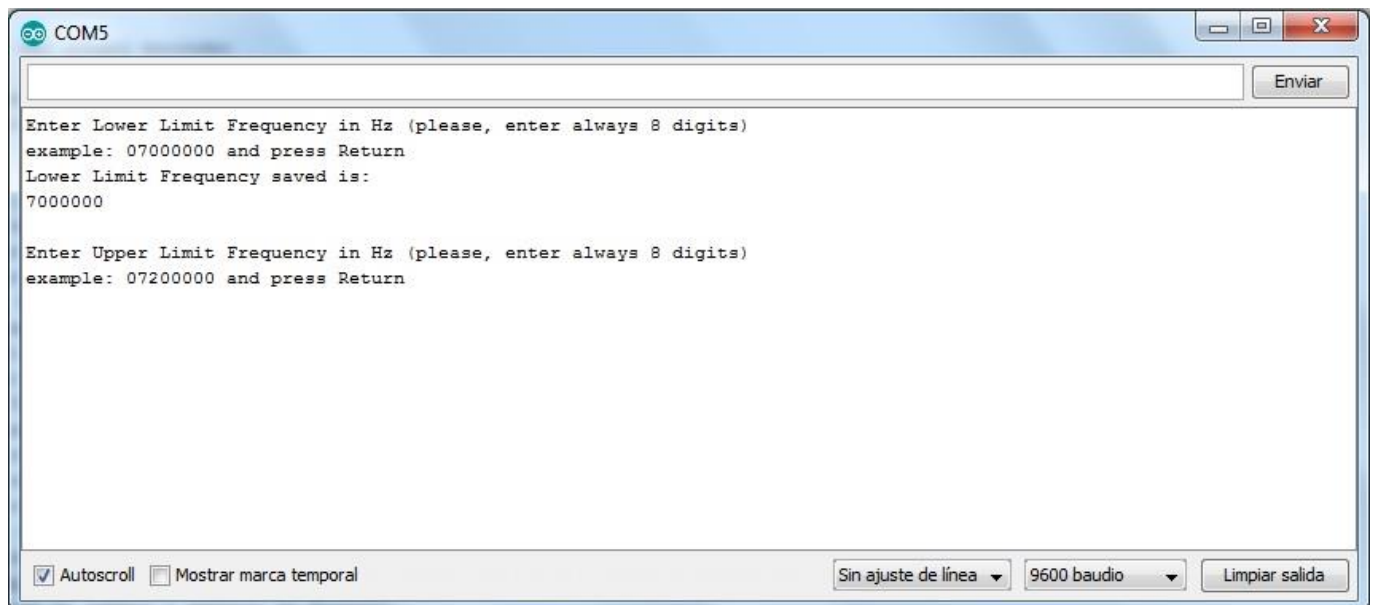
Example: 07000000 and press Return



Then, in the top box write the Low Frequency Limit you want to generate with the *ARDU-5351 mini* in Hz. You must always enter 8 digits.



For example, for 7.0Mhz you must type 07000000 and then press "Enter" key and the Monitor screen will show:



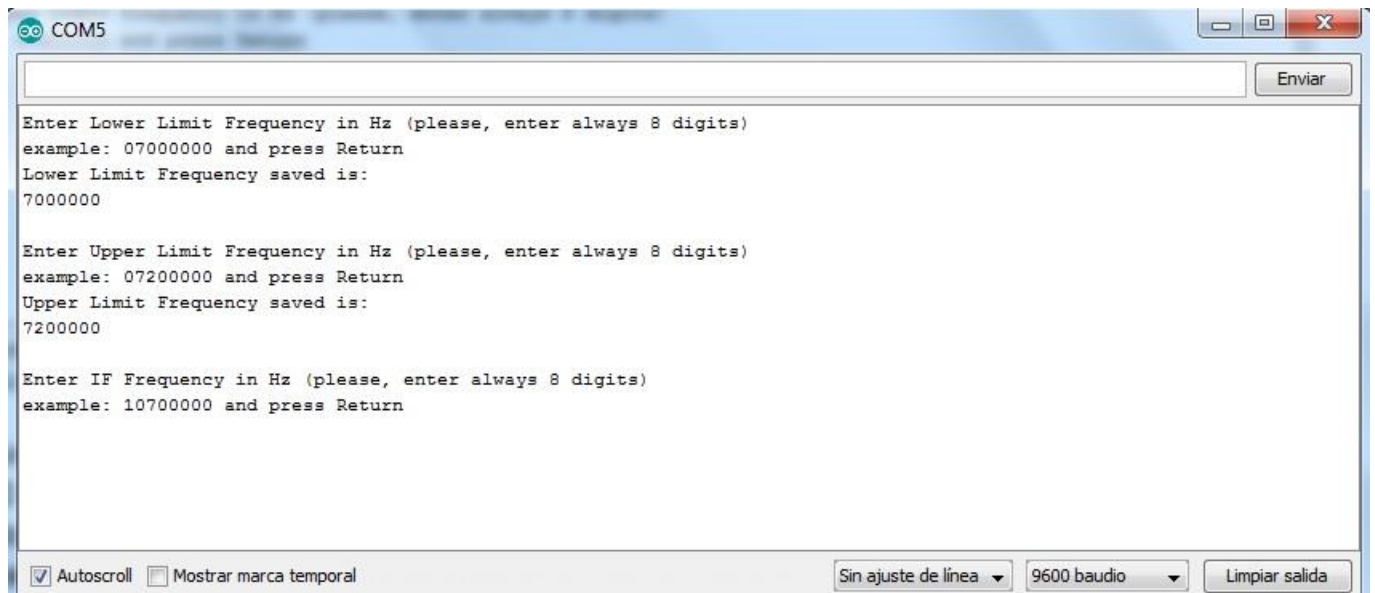
Lower Limit Frequency saved is:
7000000

Indicating this frequency has been saved.

➡ Next you are asked for the following parameter to configure:

Enter Upper Limit Frequency in Hz

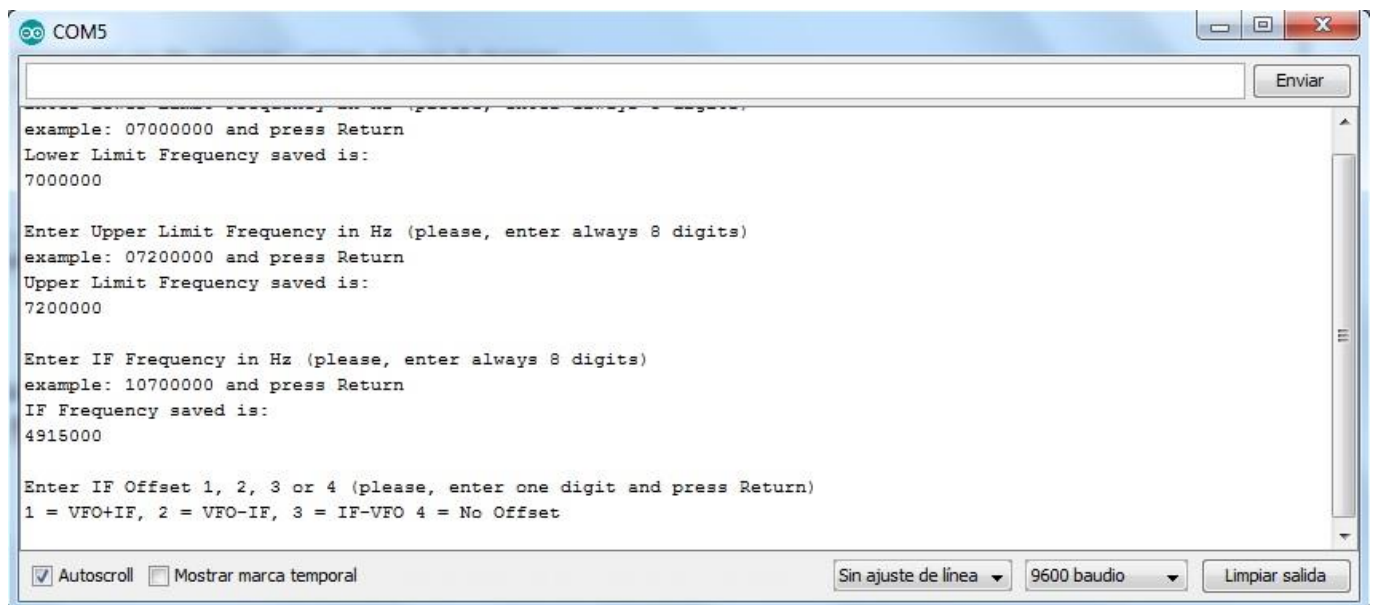
The procedure is the same as before. In the box enter the 8 digits of the desired upper limit frequency. For example 07200000



➡ You will then be asked for the input of the IF frequency.

Enter IF Frequency in Hz

For example, we enter 04915000 (the intermediate frequency of the ILER-40 4.915MHz kits).



You will then be asked to enter the offset type of the IF frequency.

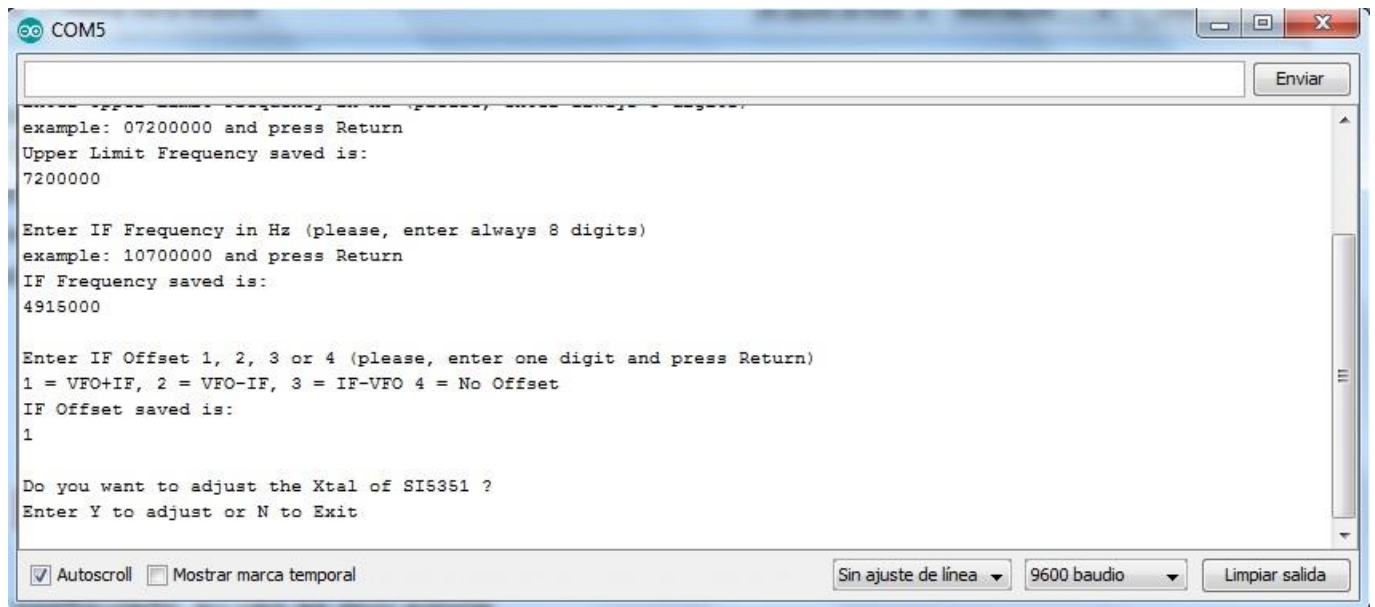
Enter IF Offset.

There are four possibilities:

1 = VFO + IF, 2 = VFO-IF, 3 = IF-VFO and 4 = NO Offset.

You must type a single number, for example 1 (offset used in ILER-40 kits)

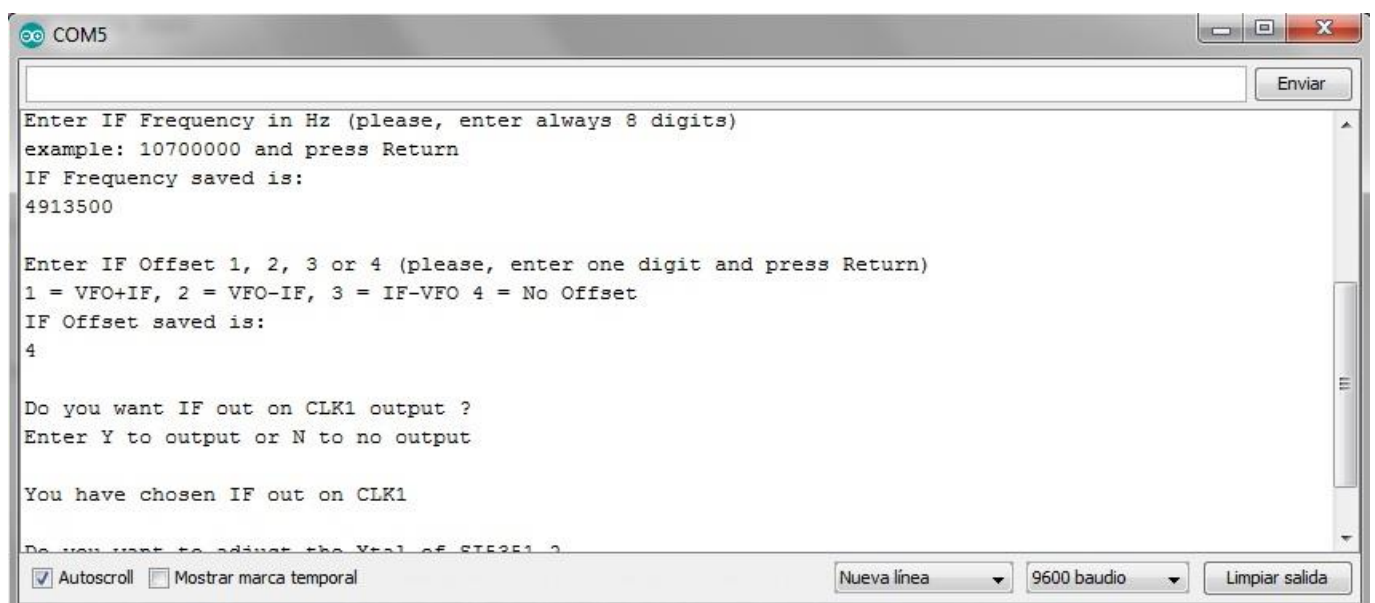
Then it will show:



➡ Next you will be asked if you want the FI signal exit by *ARDU-5351 mini 1* (CLK1) output.

Do you want IF out on CLK1 output ?

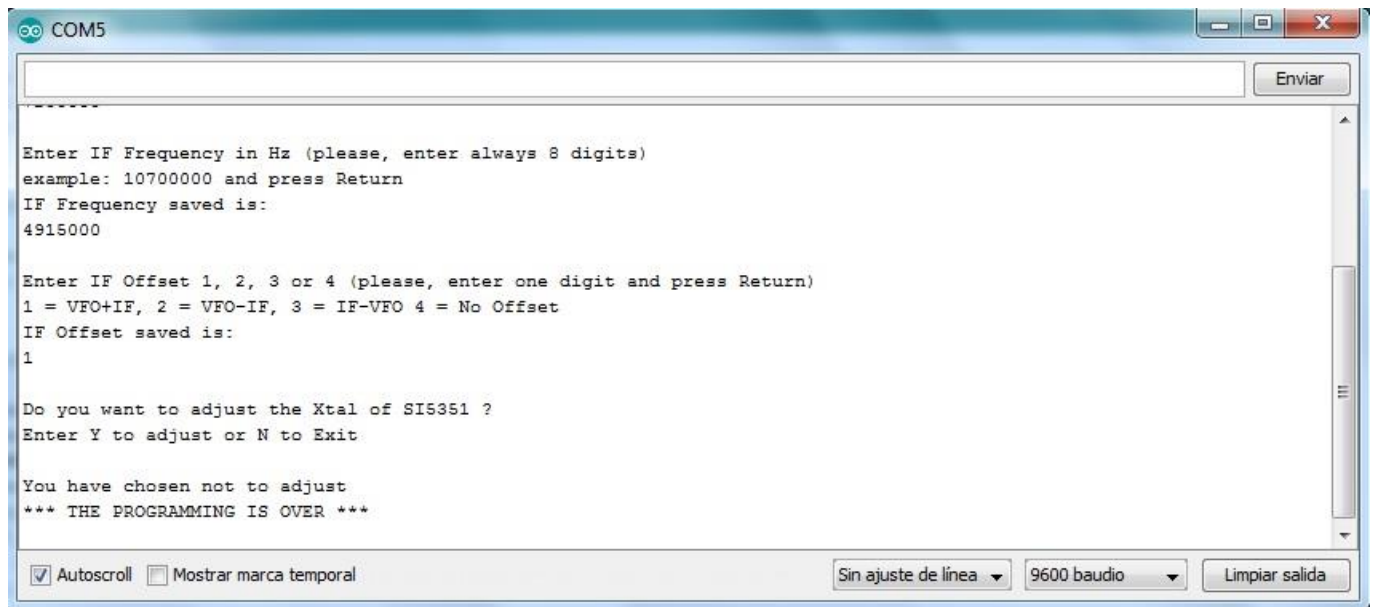
You can enter Y or N (in uppercase)



➡ Finally he wonders if he wants to adjust the calibration frequency of the SI5351 crystal.

Do you want to adjust the Xtal of SI5351 ?

You can enter Y or N (in uppercase). If you type N, the configuration will finish, the following screen will appear and the ARDU-5351 mini will restart.



SI5351 Xtal adjust

If in the previous step you select Y (yes) you can now adjust the Xtal frequency of SI5351.

To make this adjustment you must have a good precision instrument to monitor the output frequency (frequency meter, quality receiver etc.)

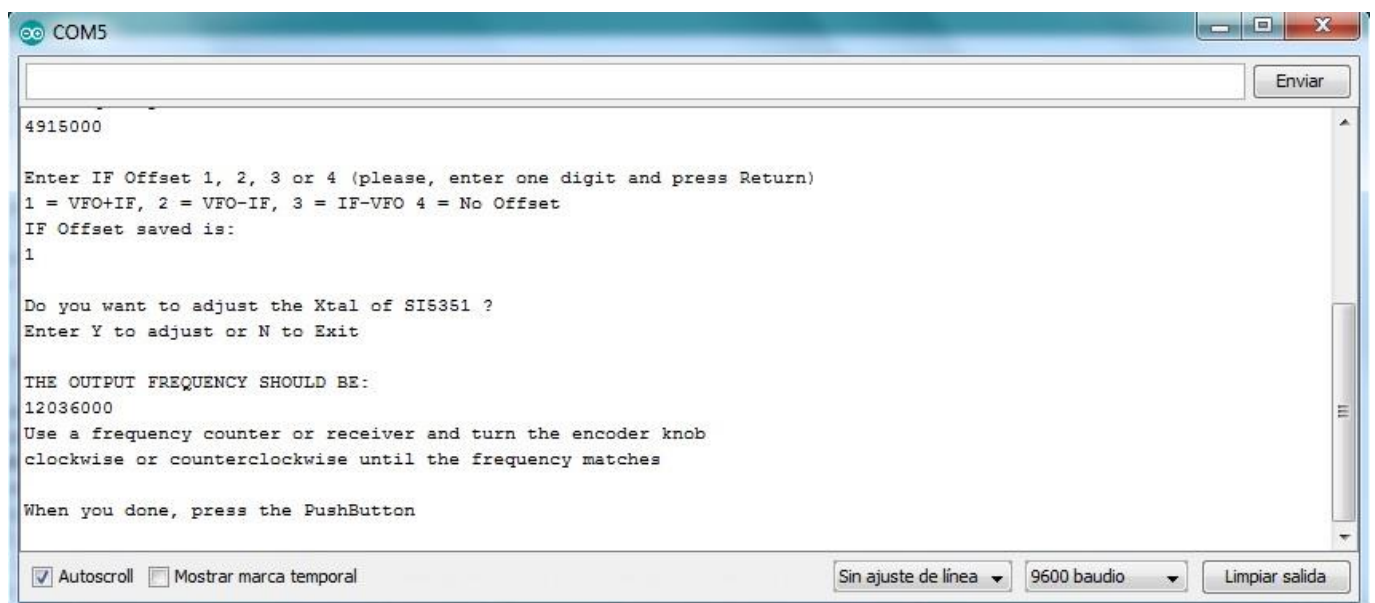
The screen will show you the theoretical frequency that the SI5351 is generating on output 0. Now you must turn the rotary encoder to one side or the other until the reading on the instrument is the same. When finished, press the encoder button.

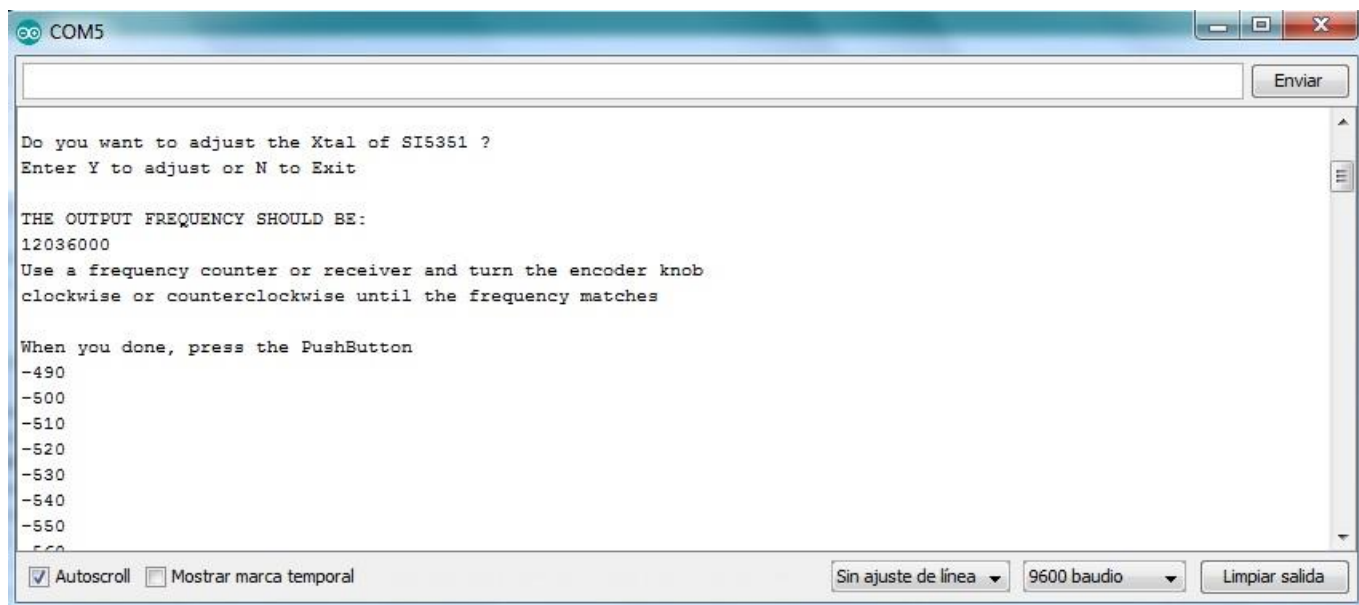
THE OUTPUT FREQUENCY SHOULD BE:

120036000

Use a frequency counter or receiver and turn the encoder knob

Clockwise or counterclockwise until the frequency matches

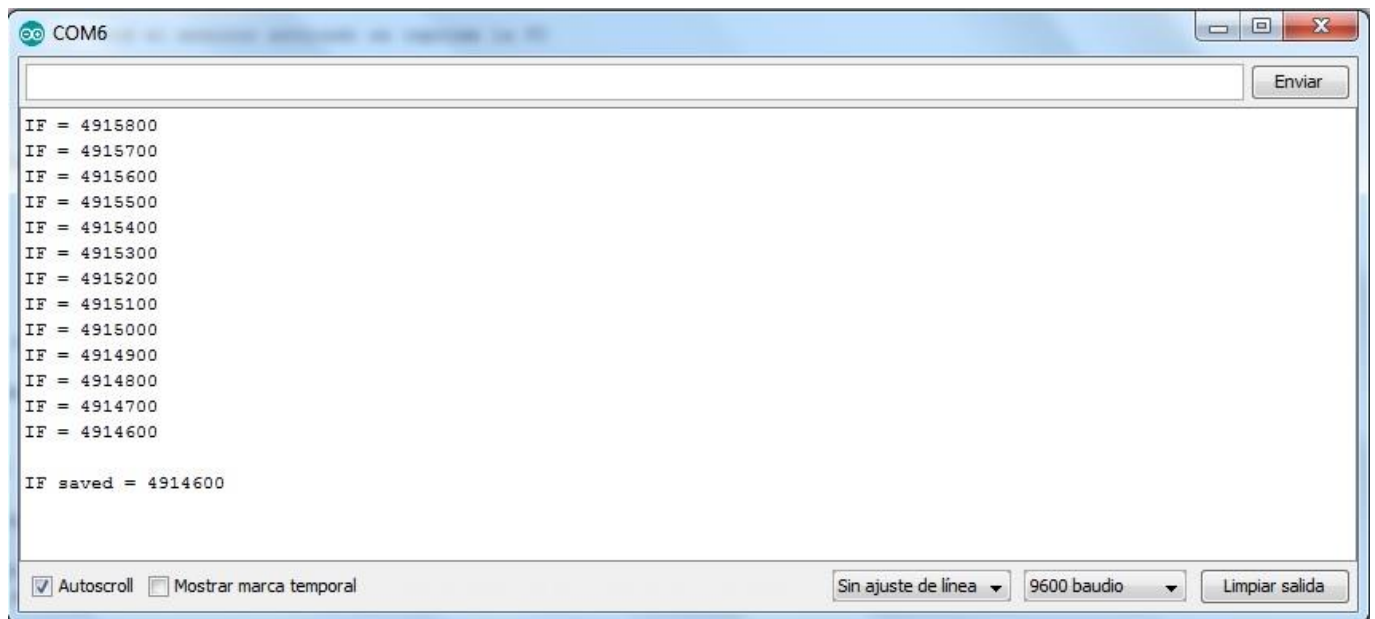




The adjustment range is from -2000 to +2000 in 10 units steps.

IF RE-ADJUSTMENT "ON LIVE"

You will have programmed an IF value during the initial *ARDU-5351 mini* programming. However, you may have to IF re-adjustment once you have the *ARDU-5351mini* working on your radio. This is especially important if you have programmed the IF through the 1 (CLK1) output (this happens when output 1 (CLK1) is used as a BFO signal for the radio (for example in the *ILER-40* kit). In that case it will be very useful to be able to perform a reset of the IF in "running" operation to adjust the BFO exactly USB or LSB.



Connect the *ARDU-5351 mini* to the Arduino IDE and run the monitor (Tools> Serial Monitor).

The *ARDU-5351 mini* will restart.

Press and hold the encoder button for more than 1 second for the CW monitor to generate the VFO frequency and keep it pressed until two "R" are heard in a row, release the button at that time (release the button before it is finished to hear "R" "R")

The current IF frequency will appear on the screen.

FI = xxxxxxxx

Turn the encoder to increase or decrease the IF. The steps are 100Hz

Note: during the setting, the IF signal will appear on output 1 (CLK1), even if you have not activated this output in general programming.

Once the adjustment is complete, press shortly to exit. The screen will show:

FI saved = xxxxxxxx

Settings for ILER-40v3 and ILER-20v3

These are the settings to use as VFOs for the ILER-40v3 and ILER-20v3:

	F	IF FREQUENCY	IF OFFSET	SI5351 OUT
ILER-40v3	7.000.000	4.913.500	VFO+IF	11.815.000
ILER-20v3	14.000.000	4.000.000	VFO+IF	18.000.000
ILER-20v3	14.000.000	4.000.000	VFO-IF	10.000.000

ARDU-5351 mini USE

Once configured, its use is very simple.

Tuning and step change.

By turning the rotary encoder knob to the left or right, the frequency decreases or increases according to the “step” step selected at that time. Each time the step starts it is 1kHz. A quick press of the encoder button will change the step cyclically between 1kHz - 100Hz - 10Hz.

CW Frequency Announcer

To announce the frequency in CW, press and hold the encoder button for more than 1 second until the numbers in CW begin to sound.

The *ARDU-5351 mini* will announce the frequency in three numbers corresponding to hundreds of kHz, tens of kHz and units of kHz.

This announcement system is intended for radios in which you know the band where it is located (for example monoband transceivers).

LIMITED WARRANTY

Please read carefully PRIOR to do any work with your kit.

All parts provided with this kit are guaranteed against any fabrication defect for one year after the sale. The buyer has the option to examine the kit and the instruction manual for 10 days. If during this period he or she decided not to build the kit, it will be possible to send the kit back, with all shipping charges payed by the customer. The seller shipping charges and all other costs involved (Ebay or Paypal charges) will not be reimbursed.

If you plan to ship it back, PLEASE CONSULT how to do it to ea3gcy@gmail.com

Javier Solans, ea3gcy, guarantees that when the kit is built and adjusted following the information enclosed in this manual, and it is used according to the advices mentioned, it will work according to its specifications.

It is your duty to follow the advices and recommendations of this manual, correctly identify the parts, use good working procedures and have access and correctly use the tools and instruments requirede for the assembly and adjustment of the kit.

In case you think any part for the kit is missing, please make an inventory of all parts with the parts list included on the manual. Please revise all bags, envelopes or boxes carefully. If something is missing, please send me an email and I will mail you the part right away. Even if you don't want to bother with a common part you may have on your junk-box or a local store, please let me know so I can help other customers with a similar problem.

I can also provide a part that you have broken, dammaged or lost by accident.

In case you find any errata or mistake on this manual, or you like to make a comment, please get in touch with me at ea3gcy@gmail.com

Enjoy building QRP!

73 Javier Solans, ea3gcy