i-Switch 1.1

i-Switch is really a program created for the Arduino Uno or Arduino Pro Mini 16Mhz, together with a 16X2 LCD screen with I2C and an encoder that allows you to do all the necessary functions without using any additional pushbutton for the selection of up to six antennas and / or bandpass filters and up to two transceivers manually or automatically. In other words, a command for the control of self-built or commercial switches. You don't need a PC to set it up.

All the circuits necessary for its operation are simple and within the reach of any radio amateur and are described in this manual as well as its connection. It is an economic system for the selection of antennas. The software is upgradeable, so you can update the program yourself.

The software has been developed to be as simple as possible to use. It allows you to select up to 6 antennas and / or bandpass filters, to which you can assign the desired name for easy identification on the screen. You can use one or two transceivers, which you can name for easy identification on the screen. It is easily adaptable to the antenna switch relay boxes on the market. It has a menu to configure it according to the user's needs, in the functions it has. It has Manual control and automatic control.In the automatic mode, where it reads the frequency or band of the transceiver, it can communicate with the transceiver in BCD, C-IV and RS232 modes, allowing to define and choose the antenna and / or filter to select according to the band.

Characteristics

- Allows control of up to 6 antennas and / or filters.
- Allows one transceiver or two transceivers alternatively.
- Allows to assign name to the Antennas and / or filters. (10 Characters).
- Allows you to assign a name to the transceivers. (10 Characters).
- Allows changing the Antenna and / or filter manually or automatically.
- Allows the change from one transceiver to another.
- It allows the automatic control of antennas and / or filters, through BCD, CI-V and COM.
- Fully upgradeable.
- Configuration without PC.
- Very economical and easy to build.
- New free versions once the first license is obtained.
- Etc.

INDEX

SOFTWARE AND INSTALLATION PACKAGE:

The handling and installation has been tried to make it as simple as possible. The software package consists of 1 program and this manual:


   -i-Switch program. (i-Switch.Hex)

In order to record the software in Arduino, you must use additional software capable of recording the file in hexadecimal (.HEX) format called Xloader.

XLOADER, you can download it on my website www.ea7hg.com.

The operation is very simple and intuitive. First select the COM: port to which your Arduino is connected. Select the i-Switch.HEX file and press Upload.

STARTING i-Switch:

Once i-Switch is turned on, the screen will first show us the welcome with its callsign and version.
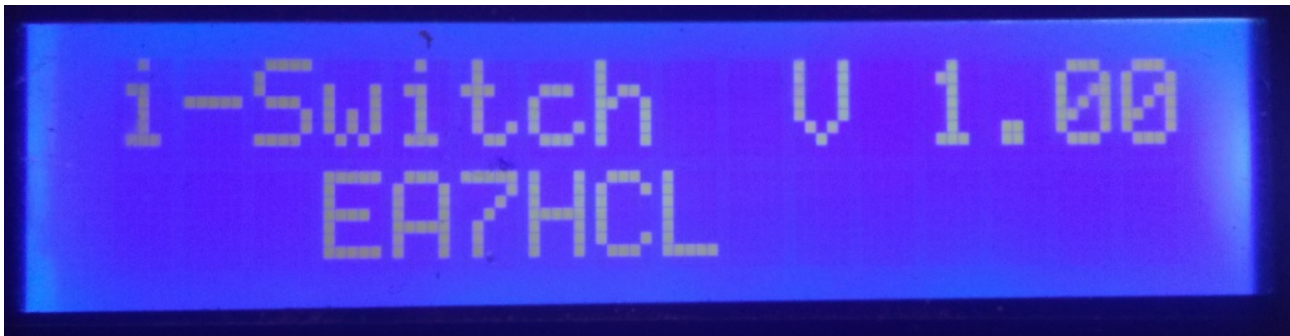
and a couple of seconds later the author of i-Switch.
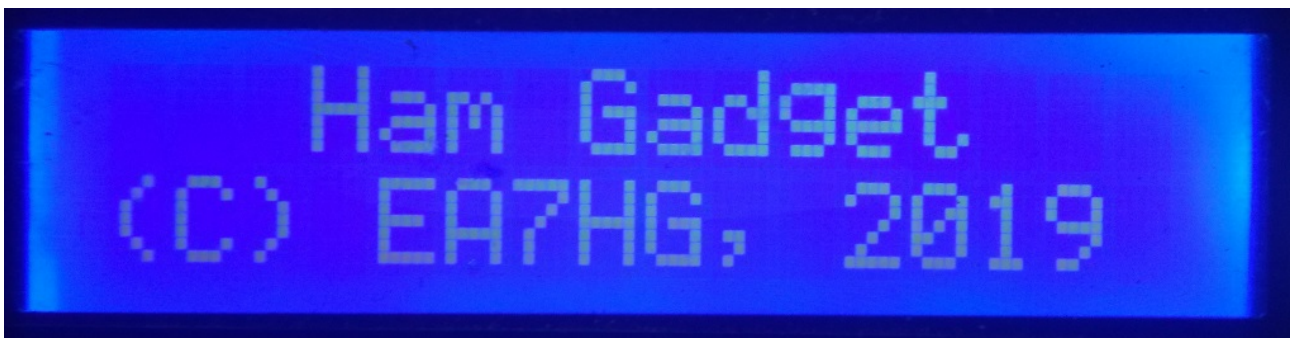
After the presentation is complete, the screen displays the following information at i-Switch startup.

The default i-Switch configuration allows manual control of a single transceiver and the selection of up to six antennas and / or filters. Once the configuration is changed, i-Switch will start as configured.
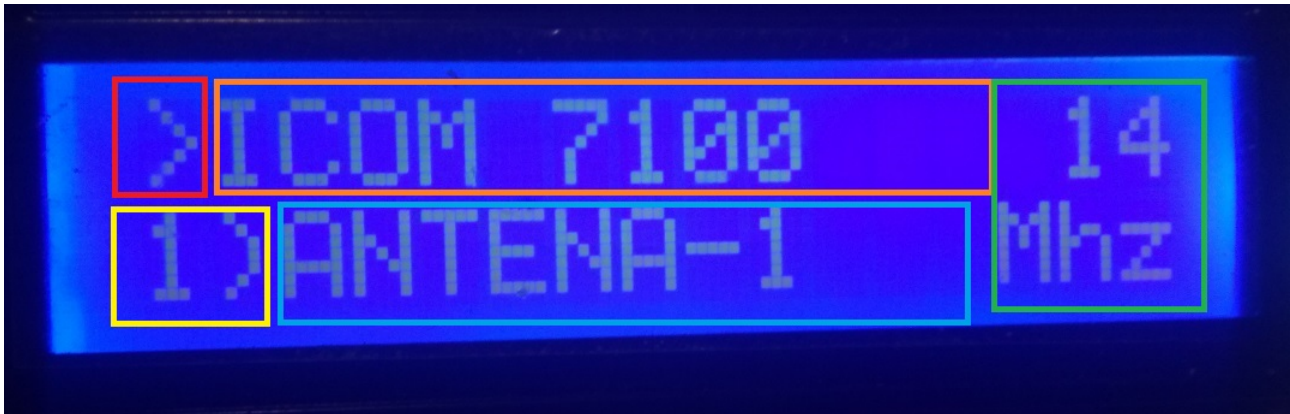
EXPLANATION OF THE i-Switch SCREEN IN MANUAL MODE:

In the upper line of the screen, the number of the active transceiver appears in the red box. Surrounding the orange box the name we have assigned to transceiver 1 will appear. (This name can be changed in the menu).

On the bottom line of the screen, the symbol "greater than" appears in black, indicating that when you turn the encoder, the number of the antenna and / or active filter will change. The yellow box shows the number of the active antenna and / or active filter. Surrounding the green box the name that we have assigned to the antenna and / or active filter will appear, 1. (This name can be changed in the menu).

At this time, if we turn the i-Switch encoder, it would change the antenna number and / or active filter.

EXPLANATION OF THE i-Switch DISPLAY IN AUTOMATIC MODE:

In the upper line of the screen, the symbol ">" appears in the box in red, indicating that we can change the number of the active transceiver with the encoder, if in the configuration we have selected the use of 2 transceivers.

If in the configuration we indicate that we will only use a transceiver, the symbol ">" will not appear. Surrounding the orange box, the name that we have assigned to the transceiver will appear. (This name can be changed in the menu). To the right of this will show us the band read by i-Switch. In the event that you do not read any band or it is outside its limit, the symbol "?" Will appear.

In the bottom line surrounded by yellow color it will indicate the selected antenna and / or filter number. Surrounded by a blue box, it will show us the name of the antenna and / or active filter. (This name can be changed in the menu).

I-Switch MENU:

To access the I-Swicth Menu, you only need to press the encoder for more than a second and a half. Once this time has passed, the screen will show Menu on the first line: and "<<" will appear on the second line.

By indicating the second line "<<" if we press the encoder we will exit the Menu returning to the i-Switch screen again.

If we turn the encoder, the different configuration options of i-Switch will appear, which are the following:

- TRX
- ANT
- Auto?
- BCD/C-IV/COM
- TRX?
- ANTxQRG
- <<

To access any of the options, simply press the encoder on the desired option.

MENU : TRX:

Allows you to assign a name to the transceiver for easy identification on the screen. By turning the encoder, it will allow us to select between the number one or number two transceiver to change the name according to this configured i-Switch.

Once the transceiver number is selected, the letter A will appear on the bottom line of the screen. If we turn the encoder, the different letters and symbols that are allowed to be used to assign a name will appear. Once the desired letter or symbol has been chosen, if we press the encoder it will be selected and then the next letter or symbol will appear on the right side of it. To change it, simply turn the encoder to the desired letter or symbol and once chosen, press the encoder to select it and so on until the desired text is entered.
The maximum text allowed is 10 letters or symbols.

To record the desired text there are two ways:
If the length of the text is more than 10 letters or symbols, the text is recorded automatically.
If it is not more than 10 letters or symbols, you must select the "@" symbol and press the encoder when it is displayed on the screen.

MENU : ANT:

Allows you to assign a name to the antenna and / or filter for easy identification on the screen. By turning the encoder, it will allow us to select the antenna number and / or active filter to change the name.

Once the antenna and / or filter number has been selected, the letter A will appear on the bottom line of the screen. If we turn the encoder, the different letters and symbols that are allowed to be used to assign a name will appear. Once the desired letter or symbol has been chosen, if we press the encoder it will be selected and then the next letter or symbol will appear on the right side of it. To change it, simply turn the encoder to the desired letter or symbol and once chosen, press the encoder to select it and so on until the desired text is entered.
The maximum text allowed is 10 letters or symbols.

To record the desired text there are two ways:
If the length of the text is more than 10 letters or symbols, the text is recorded automatically.
If it is not more than 10 letters or symbols, you must select the "@" symbol and press the encoder when it is displayed on the screen.

Example of text change:

Let's suppose that when we select transceiver one on i-Switch, ICOM-7300 will display:

We will select transceiver number one to rename it.
In the lower line the letter A will appear. We will turn the encoder until we reach the letter I. Once the I is displayed, we will press the encoder once and II will appear. We will rotate the encoder until the second letter appears the letter C. The screen will show IC. Press the encoder once and ICC will appear on the screen. We will rotate the encoder until the letter O appears. The screen would show ICO. We will press the encoder once and ICOO will appear on the screen. We turn the encoder until the last letter is an M, so ICOM would remain on the screen. We will press the encoder once and ICOMM will appear. We rotate the encoder until the - sign appears, remaining on the ICOM screen. Press the encoder once and it will remain on the ICOM screen. We will turn the encoder until we reach 7 and so on until we reach the last 0. Finally we will have the screen with ICOM-730000. We will rotate the encoder until the last zero is the at sign "@". The text would be as follows: ICOM-7300 @. By pressing the encoder, the text is recorded as ICOM-7300, leaving the menu directly and returning to i-Switch.
The operation is the same for renaming the antenna and / or filter.

MENU : AUTO?:

It will allow i-Switch to work manually, that is, the user through the encoder can select the antenna and / or filter to use, as well as the transceiver or automatically, in which i-Switch reads the information from the transceiver active and selects the antenna and / or filter assigned to the band.

We will turn the encoder to select Man. (Manual) or Auto (Automatic). The selected mode will be stored in the memory of i-Switch to always use it by default until the user changes it again.

MENU : BCD/CIV/COM:

It only affects Automatic mode and allows communication between i-Switch and the transceiver or transceivers.

It allows choosing between three modes of communication with the transceiver or transceivers.

BCD:

i-Switch due to the limitations of the arduino only allows BCD communication on a single transceiver. You can select between transceiver one or transceiver two, but not both. Suppose that the transceiver one wants its communication in BCD, in the second transceiver it does not allow BCD, but on the contrary if you can use the CIV or COM combination.

Once BCD is selected, we must indicate if we want to use the Yaesu or Elecraft BCD format.

CIV:

i-Switch enables C-IV communication (ICOM) on a single transceiver or on two transceivers.
First, you must select the number of the transceiver that you want to communicate with i-Switch in this protocol. Once selected, you must select the Hexadecimal address of the transceiver by turning the encoder until you reach the correct value. Once the Hexadecimal address of the transceiver has been selected, you must select the communication speed in Baud by turning the encoder again to the correct value.

COM:
i-Switch allows RS232 communication in a single transceiver or in two transceivers using the Kenwood protocol that is also implemented in transceivers of other brands, such as Yaesu, Elecraft, etc. **In the old Yaesu they use a protocol in hexadecimal, so they are not compatible with i-Switch, so you should use them with the BCD protocol.** The Yaesu protocol is divided into two options, Yaesu-8 and Yaesu-9. Yaesu-8 is for transceivers that use 8 digits for the frequency and Yaesu-9 is for transceivers that use 9 digits.

First, you must select the number of the transceiver that you want to communicate with i-Switch in this protocol. Once selected, you must select the communication speed in Baud by turning the encoder again to the correct value.

TABLE OF VALID COMBINATIONS FOR i-Switch IN AUTOMATIC MODE WITH TWO TRANSCEIVERS:

TRANSCEIVER 1	TRANSCEIVER 2
BCD	C-IV
BCD	COM
C-IV	BCD
COM	BCD
C-IV	C-IV
C-IV	COM
COM	COM
COM	C-IV

MENU : TRX?:

Allows i-Switch to work with one or two transceivers.
You must select by turning the encoder between value 1 (one transceiver) or value 2 (two transceivers).

MENU : ANTxQRG:

It only affects the Automatic mode and allows assigning to each band the antenna and / or filter to be used.

On the top line of the screen, the band to which we want to assign the antenna number will appear. It will start by asking what antenna we assign in case we are out of band (No Band.) The values are between 0 (in which it does not assign any antenna and / or filter, that is, it leaves the transceiver without any antenna and / or filter) and 6, which is the number of antennas and / or filter to select between one and six.
We will turn the encoder to the antenna and / or filter number that we want to use for this band. To select it, just press the encoder. The first band is the 1.8 Mhz band. Then the next band (3.5 Mhz) will appear and we will proceed in the same way as the one indicated above.

Bands that appear to configure the antenna and frequency range:

BAND	Lower limit	Upper limit
1,8 Mhz	1,810,0	2,000,0
3,5 Mhz	3,500,0	4,000,0
5 Mhz	5,350,0	5,370,0
7 Mhz	7,000,0	7,300,0
10 Mhz	10,100,0	10,150,0
14 Mhz	14,000,0	14,350,0
18 Mhz	18,000,0	18,068,0
21 Mhz	21,000,0	21,450,0
24 Mhz	24,890,0	24,990,0
28 Mhz	28,000,0	29,700,0
50 Mhz	50,000,0	54,000,0
70 Mhz	69,900,0	71,000,0
144 Mhz	144,000,0	148,000,0
220 Mhz	220,000,0	225,000,0
430 Mhz	420,000,0	450,000,0
1296 Mhz	1,240,000,0	1,300,000,0

I-Switch OPERATION IN MANUAL MODE:

The number and name of the active transceiver will always appear on the first line of the display. On the second line of the screen, the antenna and / or filter number and the name of the antenna and / or active filter will always appear.

If you have configured i-Switch for a single transceiver:

On the second line, the sign ">" will appear, indicating that you can change the antenna and / or filter using the encoder rotation. The transceiver number cannot be changed. To access the Menu, you must keep the encoder pressed for more than 1.5 seconds.

If you have configured i-Switch to work with two transceivers,

The sign ">" may appear on the first or second line of the screen. If it is in the first line of the display, it indicates that you can change by turning the encoder the transceiver to be used. If it is in the second line of the screen, it indicates that you can change the antenna and / or filter to be used by turning the encoder.

To be able to switch between transceiver selection and antenna selection, simply press the encoder for at least a quarter of a second and less than 1.5 seconds. To access the Menu, you must keep the encoder pressed for more than 1.5 seconds.

I-Switch OPERATION IN AUTOMATIC MODE:

The name of the active transceiver as well as the band read will always appear on the first line of the display. If the symbol "?" Appears , indicates that you are not reading the band or are outside the band limit. On the second line of the screen, the antenna and / or filter number and the name of the antenna and / or active filter will always appear.

If you have configured i-Switch for a single transceiver:

It is not possible to select between one transceiver and another.
To access the Menu, you must keep the encoder pressed for more than 1.5 seconds.

If you have configured i-Switch to work with two transceivers:

The ">" sign appears on the first line of the display and indicates that you can change the transceiver to be used by pressing the encoder for at least a quarter of a second and less than 1.5 seconds.

To access the Menu, you must keep the encoder pressed for more than 1.5 seconds.

If at the bottom of the screen it indicates intermittently <0- NO ANT> or any other antenna between the signs "<" and ">" and the symbol "?" Appears on the top line , indicates that there is still no communication between the transceiver and i-Switch or it is outside the band limits, disabling the encoder function until it stops blinking (Approximately 3 seconds of blinking). Once the text is fixed on the screen, the encoder is again enabled to change the transceiver or access the Menu. Yes for NO Band. you selected the antenna and / or filter 0 (No Ant), the transceiver will be without antenna and / or filter, if you chose another antenna and / or filter number between one and six, in case you do not have communication with the transceiver or it is outside the band limits, the antenna and / or filter that was selected for NO Band will be connected.

I-Switch RESET:

In the event of a malfunction or to configure the default parameters of i-Switch, you can perform a memory reset.

To perform the RESET, you must turn off i-Switch. Once off press the encoder and without releasing it turn on i-Switch. Once RESET appears, stop pressing the encoder and i-Switch will restart with the default parameters.

I-Switch default parameter table:

Parameter	Value
Number of transceivers	1
Transceiver Name 1	TRX 1
Transceiver Name 2	TRX 2
Name Antenna / Filter 1	ANT 1
Name Antenna / Filter 2	ANT 2
Name Antenna / Filter 3	ANT 3
Name Antenna / Filter 4	ANT 4
Name Antenna / Filter 5	ANT 5
Name Antenna / Filter 6	ANT 6
Auto?	Manual
Transceiver Communication 1	BCD
Transceiver Communication 2	BCD
Bauds Transceiver 1	4800
Bauds Transceiver 2	4800
Hex Transceiver 1	0
Hex Transceiver 2	0
BCD mode Trasnceiver 1	Yaesu
BCD mode Trasnceiver 2	Yaesu
Antennas/Filters for band	Antenna/Filter 2 for all bands.

COMPONENTES Y CONEXIONADO :

To use i-Switch we need the following components:

- – Arduino Uno, Arduino Nano or Arduino Pro-mini. (The Arduino Pro.mini, since it does not have a USB port, will need a TTL-RS232 or TTL-USB adapter to be able to record the program).
- – 2X16 LCD with I2C (with PCF8574).
- – Rotary encoder.
- – Integrated circuit ULN2003 or UNL2803 or small circuit with transistor.
- – TTL-USB or TTL-RS232 adapter or circuit with MAX232 for communication between i-Switch and your transceiver in COM mode. A small circuit for C-IV. For BCD communication no circuit is necessary. These components are only necessary in case of using i-Switch in automatic mode.

ARDUINO CONNECTION TABLE:

PIN ARDUINO	FUNCTION
0	Relay Output Antenna / Filter 5
1	Relay Output Antenna / Filter 6
2	Relay Output Antenna / Filter 1
3	Relay Output Antenna / Filter 2
4	Relay Output Antenna / Filter 3
5	Relay Output Antenna / Filter 4
6	RX TTL Transceiver 1
7	TX TTL Transceiver 1
8	BCD A
9	BCD B
10	RX TTL Transceiver 2
11	TX TTL Transceiver 2
12	BCD C
13	BCD D
A0	SW Encoder
A1	DT Encoder
A2	CLK Encoder
A3	Relay Output 1/2
A4	SDA LCD
A5	SCL LCD

ARDUINO CONNECTION WITH LCD:

The image refers to the Arduino UNO. The connection pins are the same for the Arduino ProMini and Arduino Nano. On some boards the digital pins are marked with the letter D and the Pin number. Example: D10 pin on Arduino Uno is marked as 10.
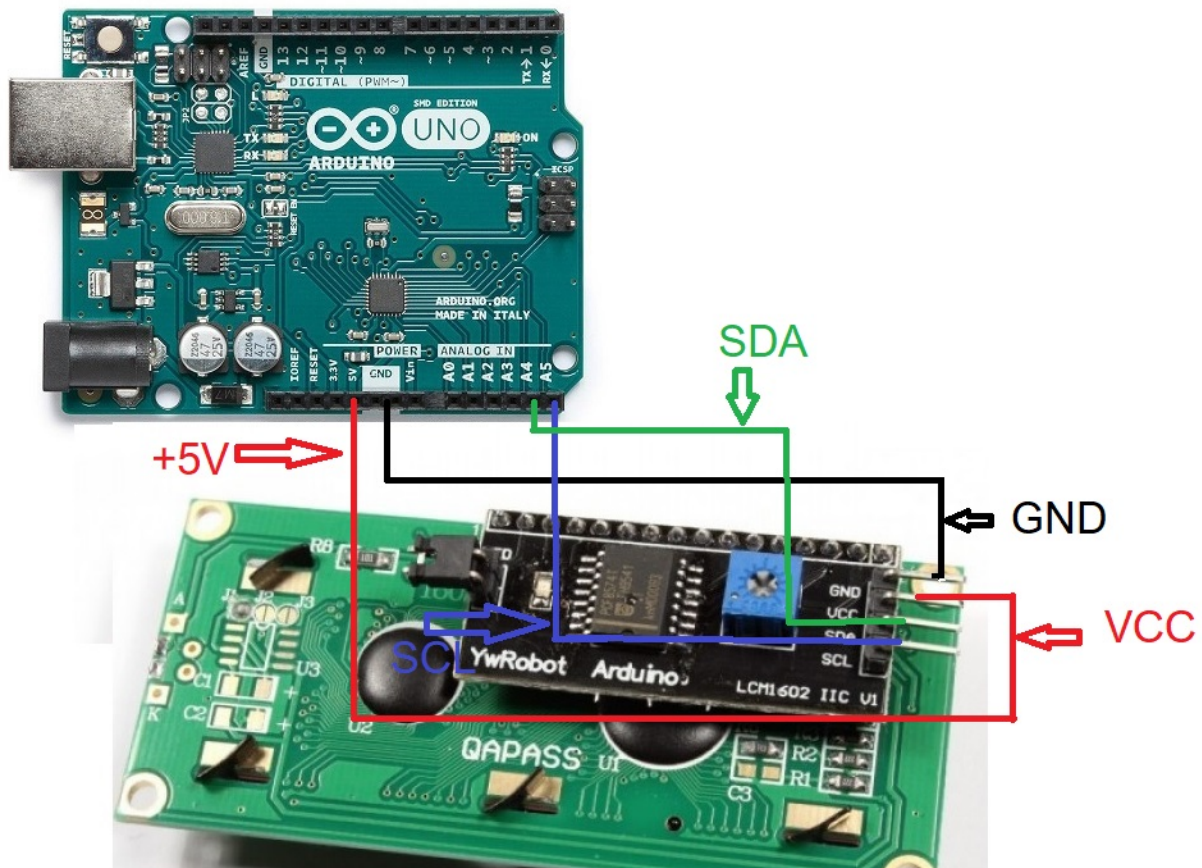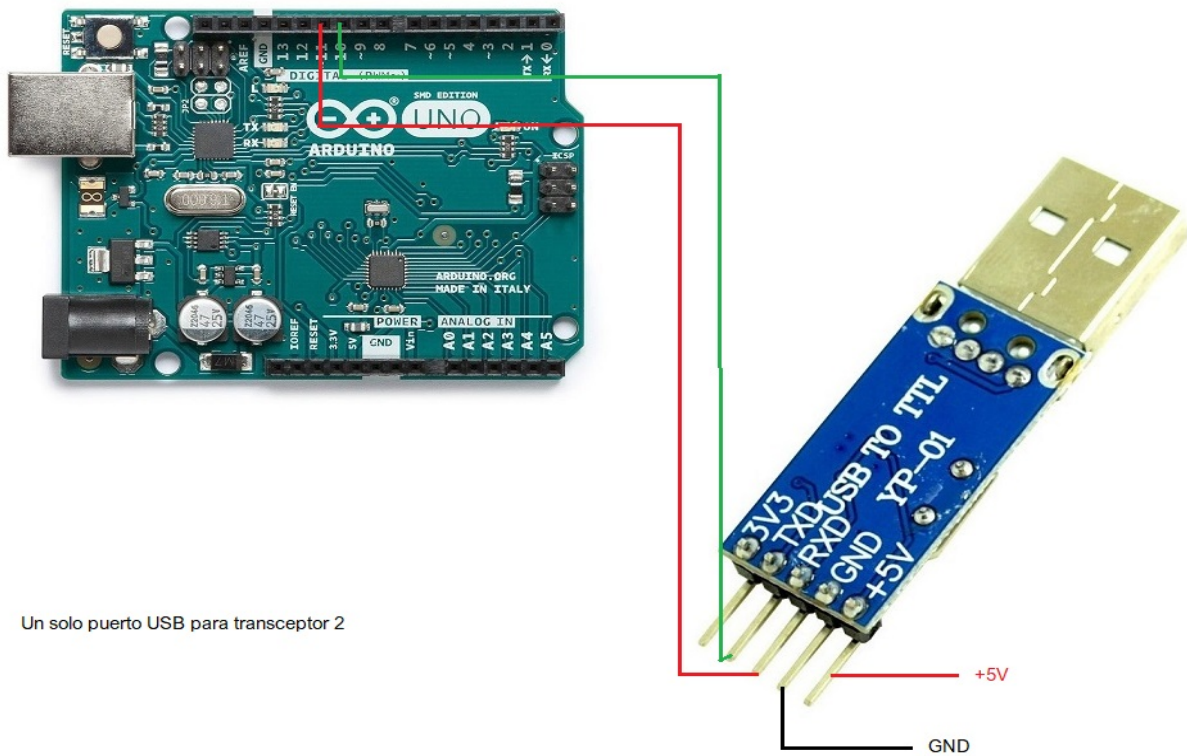
ARDUINO CONNECTION WITH ENCODER:

The image refers to the Arduino UNO. The connection pins are the same for the Arduino ProMini and Arduino Nano.
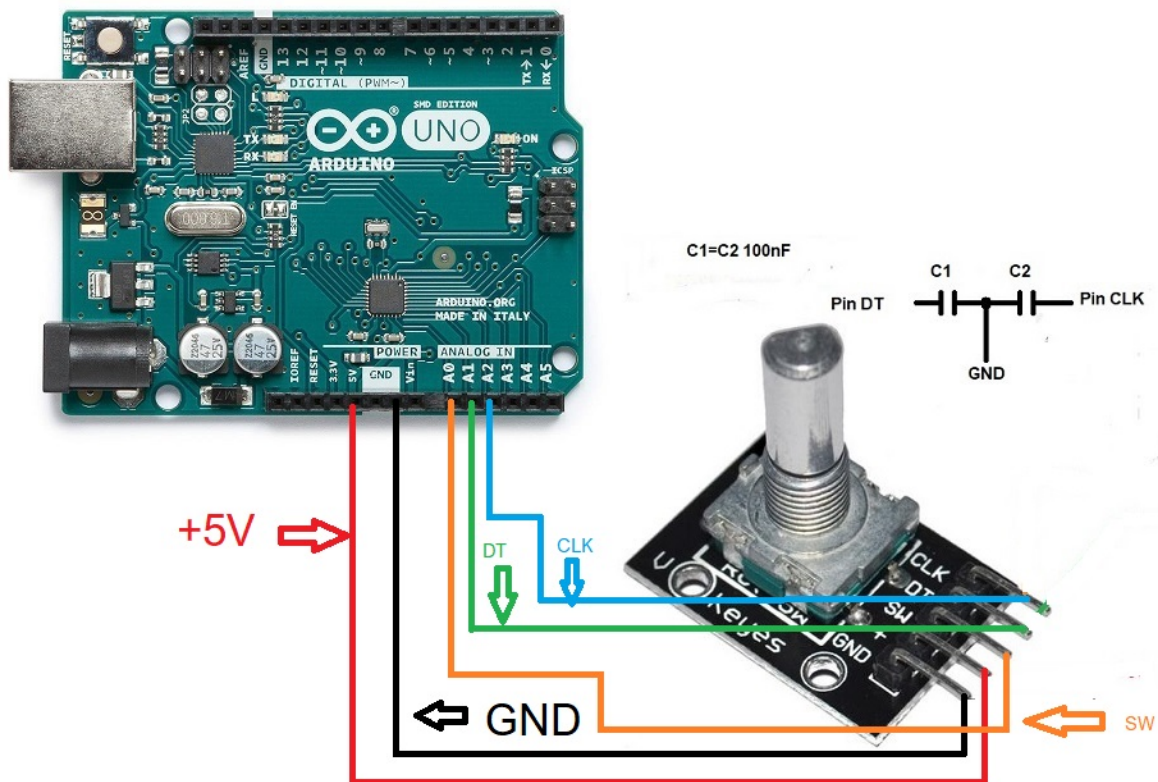
To eliminate bounces in the encoder solder a 100nF capacitor between the encoder DT pin and GND and another 100nF capacitor between the encoder CLK pin and GND.

ARDUINO CONNECTION WITH RS232 SERIAL PORT (COM):

The image refers to the Arduino UNO. The connection pins are the same for the Arduino ProMini and Arduino Nano. On some boards the digital pins are marked with the letter D and the Pin number. Example: D10 pin on Arduino Uno is marked as 10.

In order to use an RS232 serial port, you must include the circuit with the integrated MAX232 as shown in the image.

Connected to use only one RS232 Serial port for transceiver 1:

Connected to use only one RS232 Serial port for transceiver 2:
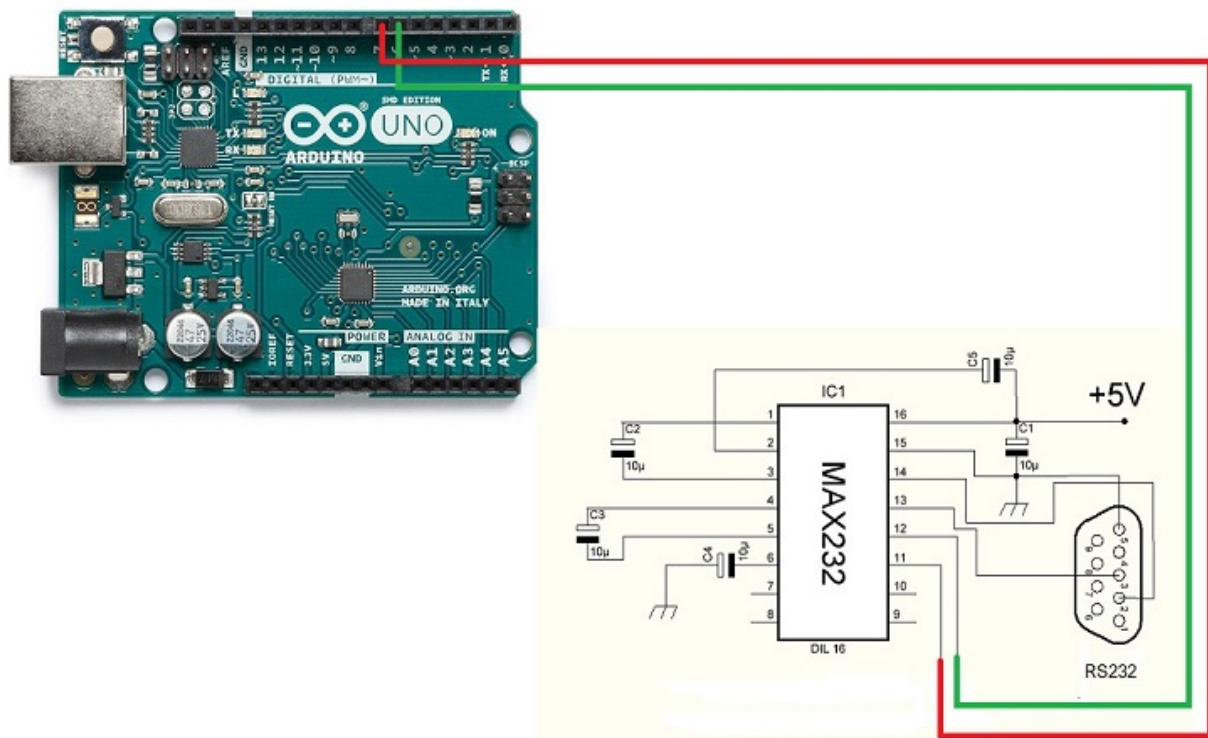
Un solo puerto RS232 para uso del transceptor 2
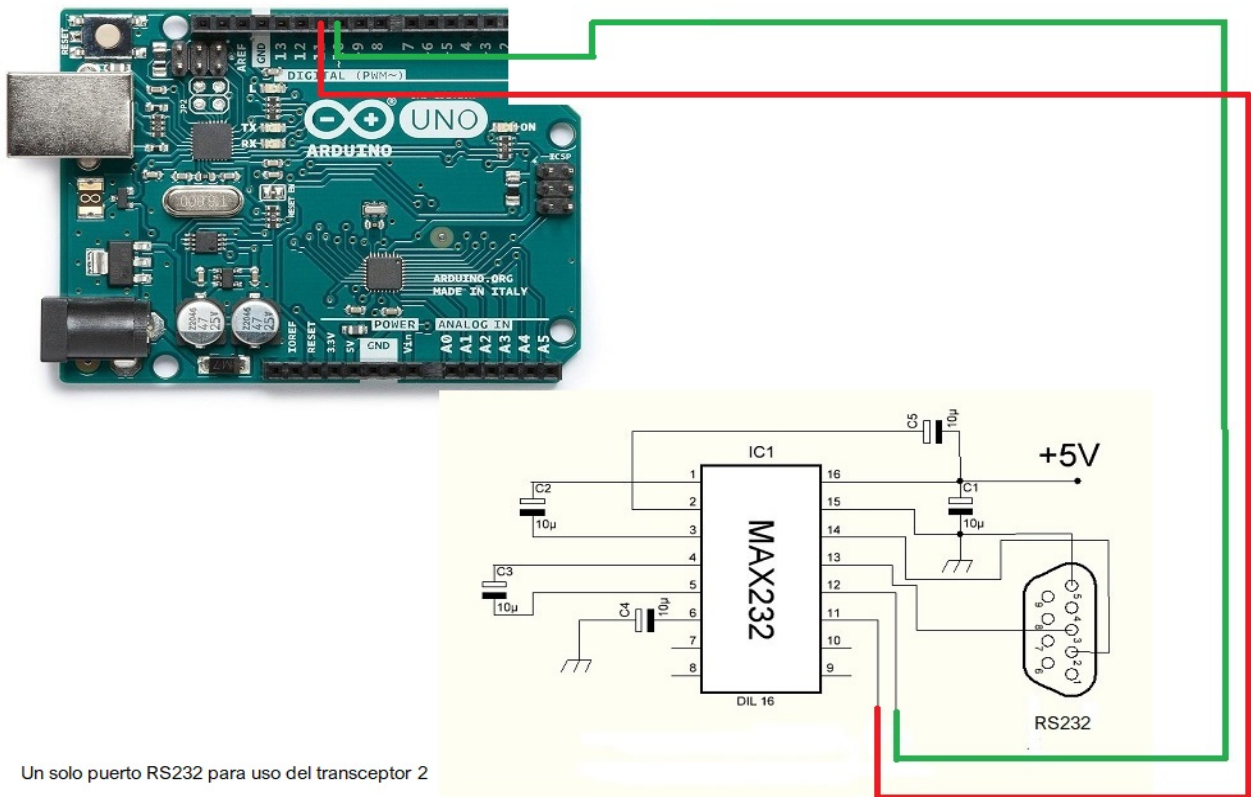
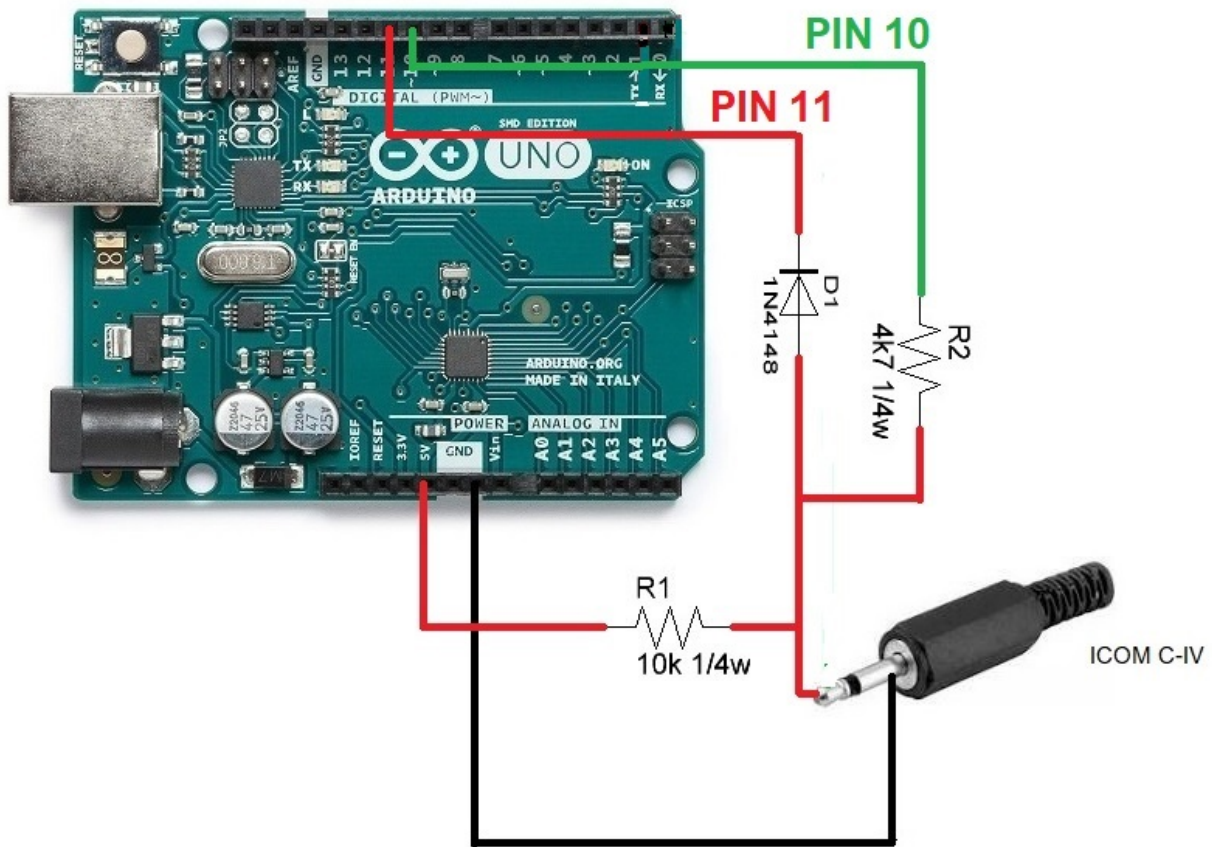Connected to use the two transceivers with two RS232 Serial ports:
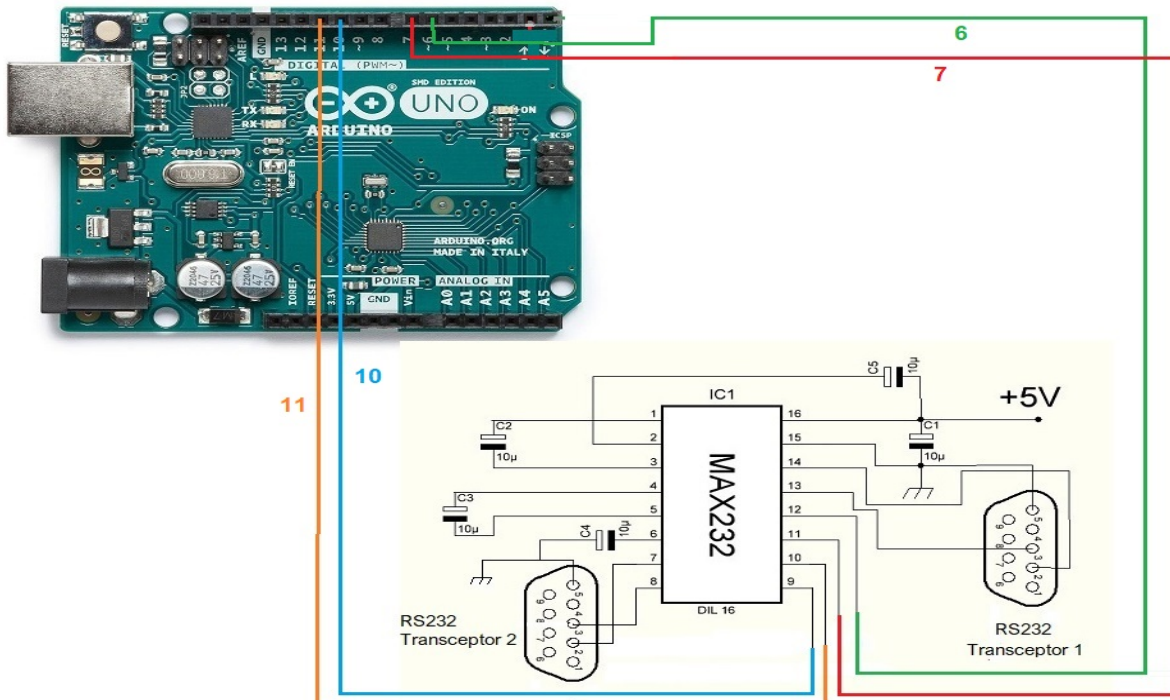
ARDUINO CONNECTION WITH USB PORT (COM):

The image refers to the Arduino UNO. The connection pins are the same for the Arduino ProMini and Arduino Nano. On some boards the digital pins are marked with the letter D and the Pin number. Example: D10 pin on Arduino Uno is marked as 10.
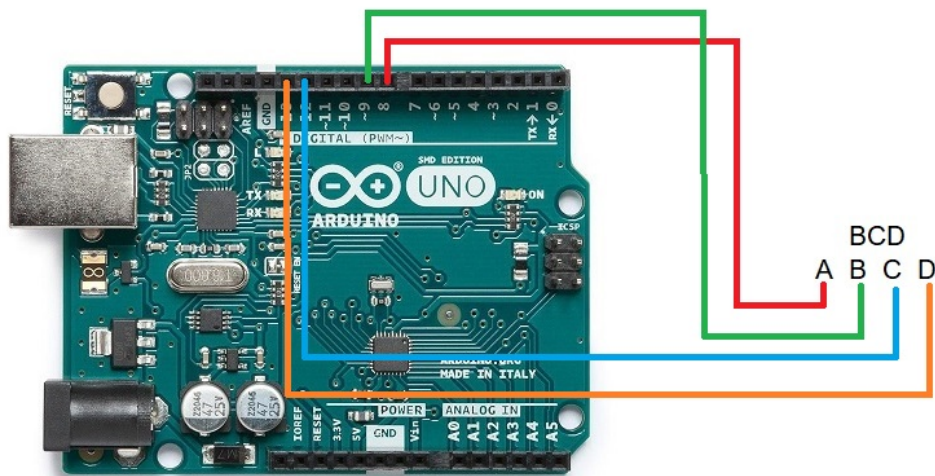
Connected to use only one USB port for transceiver 1:
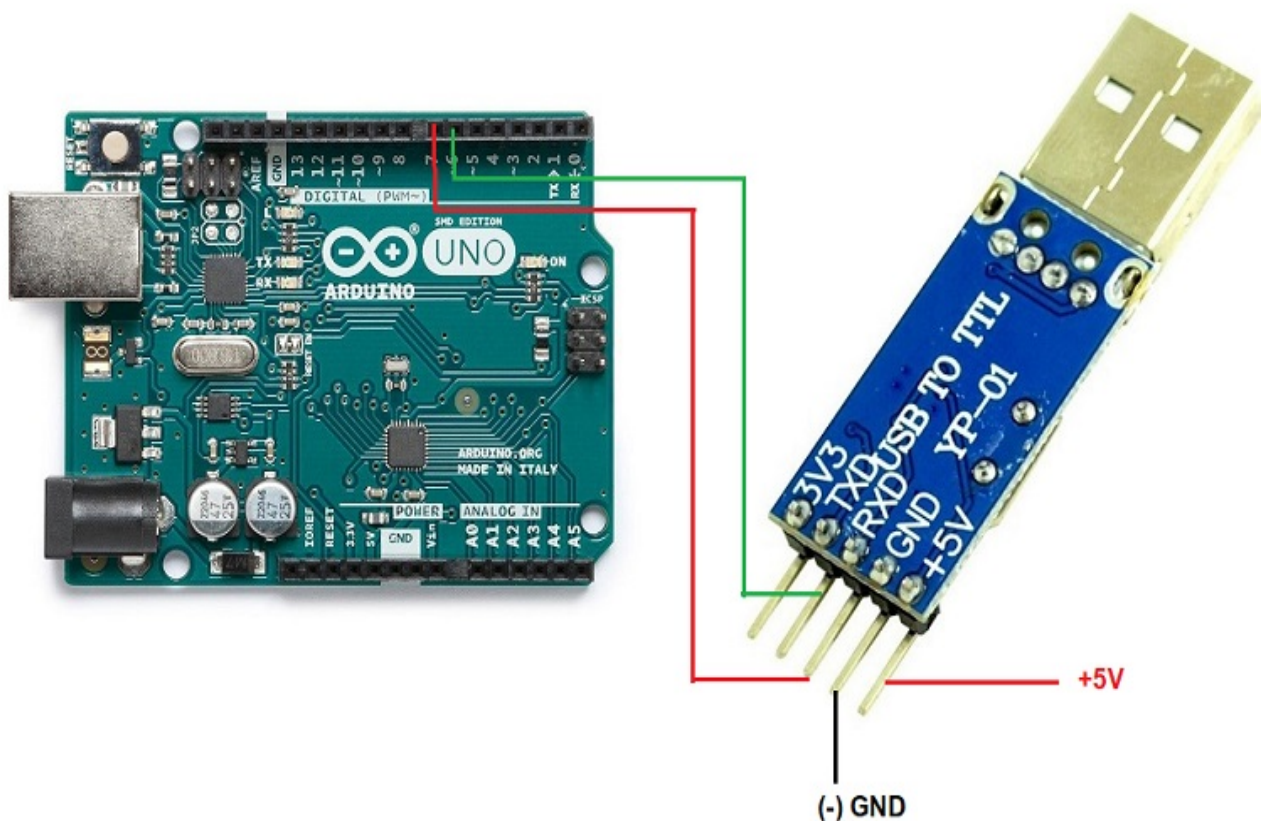
Connected to use only one USB port for transceiver 2:

Un solo puerto USB para transceptor 2

+5V

GND

ARDUINO CONNECTION WITH PORT C-IV (TTL):

The image refers to the Arduino UNO. The connection pins are the same for the Arduino ProMini and Arduino Nano. On some boards the digital pins are marked with the letter D and the Pin number. Example: D10 pin on Arduino Uno is marked as 10.

Connected to use only one TTL port for transceiver 1:
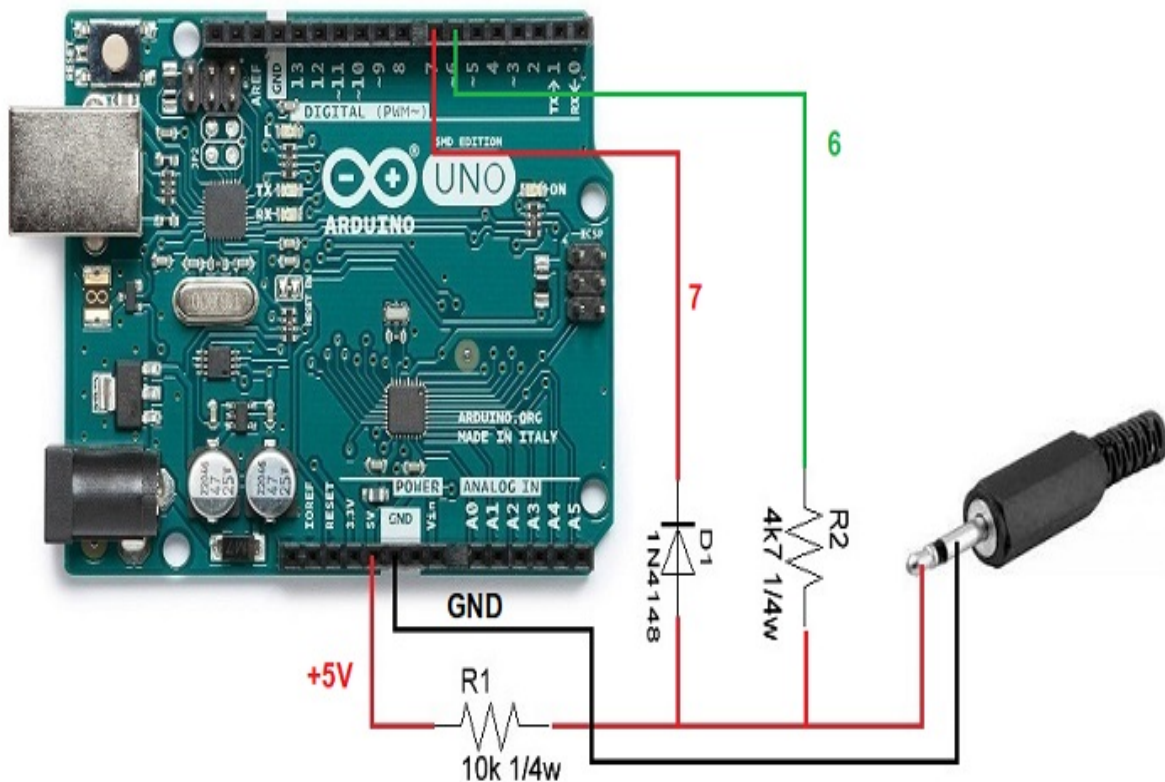
Connected to use only one TTL port for transceiver 2:

# ARDUINO CONNECTION WITH ANTENNA RELAYS AND / OR FILTERS AND TRANSCEIVER:

The image refers to the Arduino UNO. The connection pins are the same for the Arduino ProMini and Arduino Nano. On some boards the digital pins are marked with the letter D and the Pin number. Example: D10 pin on Arduino Uno is marked as 10.

In example, the integrated ULN2003 C. has been used for 7 relays. Likewise, the integrated C. UNL2803A can be used for 8 relays, using seven inputs / outputs of the eight available, being the same pinout, except that the GND pin is 9 and the VCC pin is the 10. See Datasheet from the manufacturer.
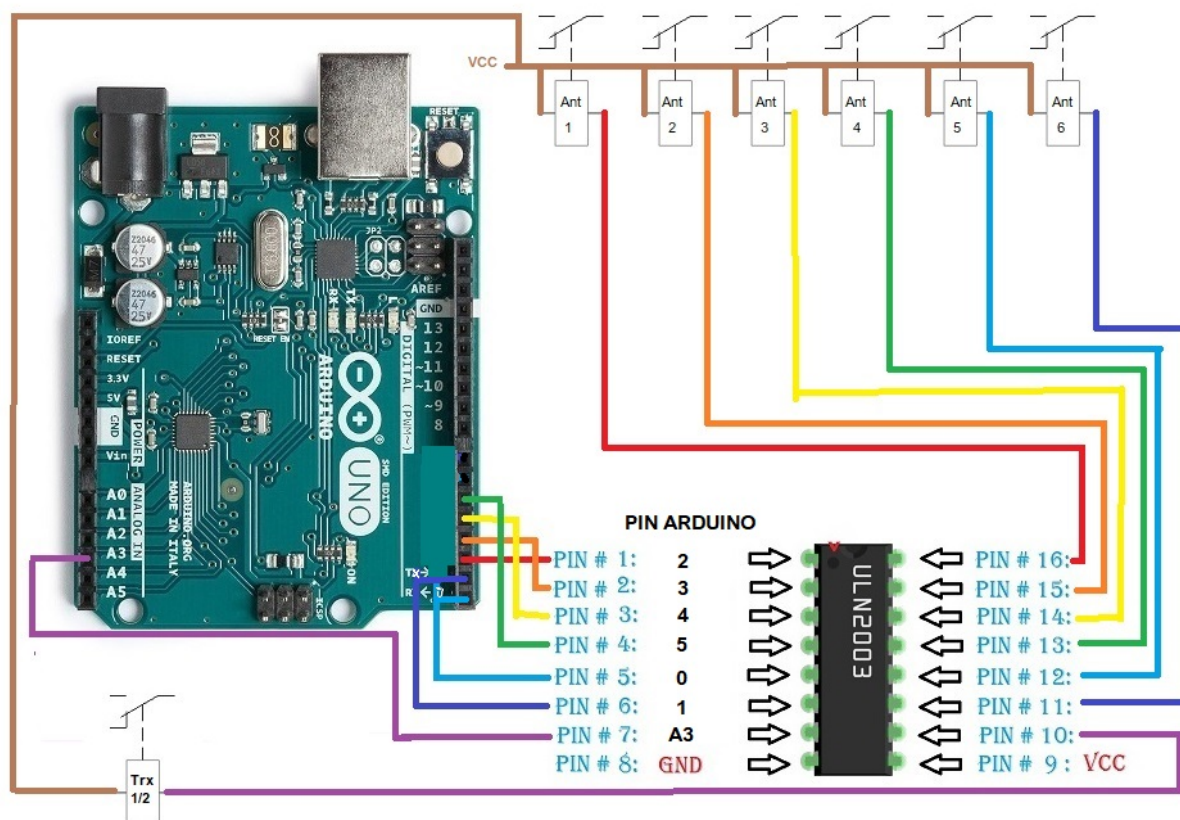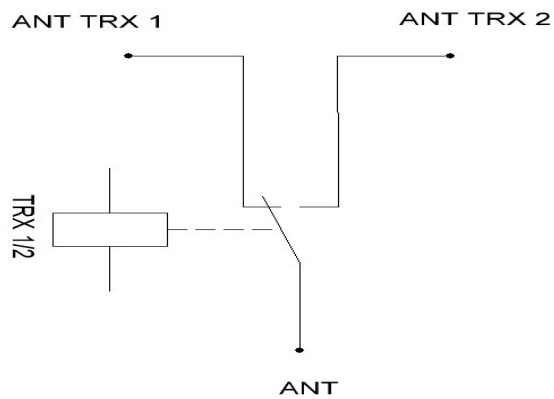
Instead of using a ULN2003 / ULN2803 integrated circuit to activate the relays, this can be replaced by a simple resistance and a BC337 transistor or similar for each relay.
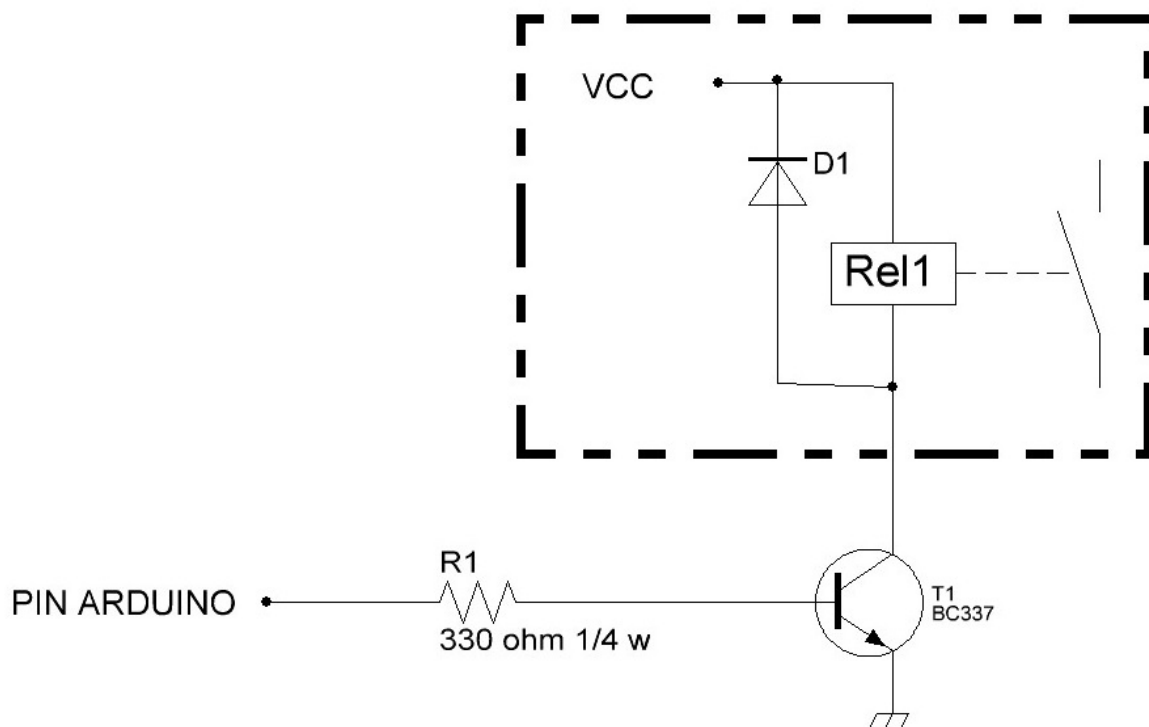
Arduino, Yaesu, Elecraft, ICOM, etc. are registered trademarks of their owners.

EA7HG
Eugenio F.Medina Morales

23001 Jaén
España
Email : EA7HG@hotmail.com