

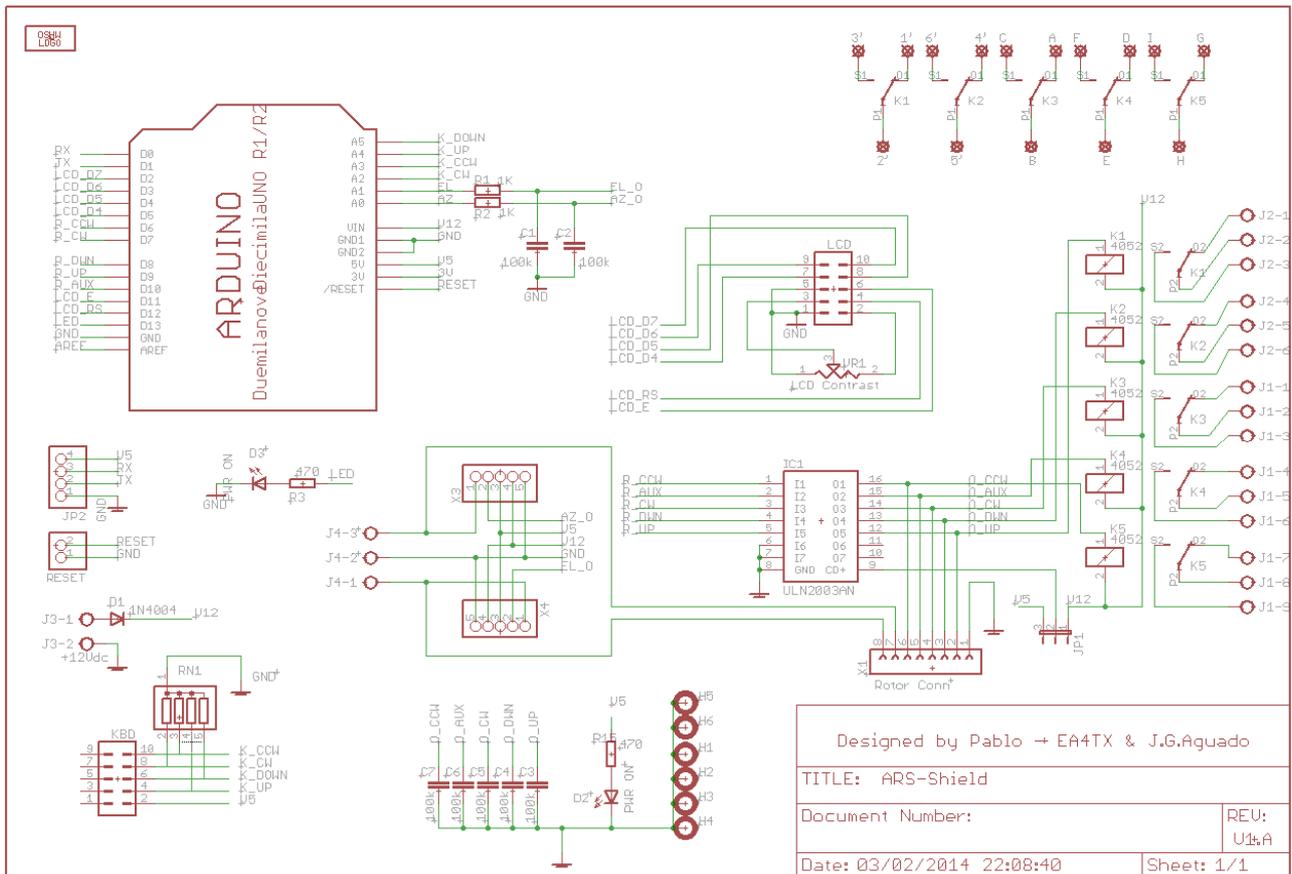
1.- INTRODUCTION

The ARS-Shield is a printed circuit in which a Arduino module (e.g. ONE) can be installed and which together with K3NG software serves as interface for controlling Antenna Motors (azimuth or azimuth + Elevation).

In this ARS-Shield you must assemble the components necessary for the rotor version that is required; the basic version of the ARS-Shield does not include components which should be purchased at electronics stores or can be supplied on request.

The ARS-Shield follows the philosophy of DIY (do it yourself), then it is not delivered assembled. For users who want a finished product, they have the option of the ARS-USB, full and ready to operate.

ARS-Shield plate scheme is as follows:



At the end of the manual, the BOM is included in Annex I.

NOTE:

The PCB can be used with an Azimuth rotor and a second Elevation rotor. If only to be used with an azimuth rotor, **is NOT necessary to mount** the components associated with Elevation.

2.- DESCRIPTION OF THE CIRCUIT

J1 and J2 - output relays:

The PCB includes 2 relays outputs for both Azimuth: J1 and Elevation: J2

Each relay has a double circuit and presents a configuration of switch. 9 (3 by relay) terminal of a first circuit, are available on the J1 connector, and seen from left to right, are tagged as:

J1-1, J1-2, J1-3, J1-4, J1-5, J1-6, J1-7, J1-8 and J1-9

The switching of each relay is as follows:

	Relay OFF	Relay ON
Right/CW	J1-2-J1-1	J1-2-J1-3
AUX	J1-5-J1-4	J1-5-J1-6
Left/CCW	J1-8-J1-4	J1-5-J1-6

This first circuit of each relay will be which is used in the majority of cases, to connect with the rotor and apply the spin to the right or left. If necessary, the second circuit of each relay, is available in the marked points as: A B C D E F G H I

These 9 points of the second circuit, are printed in the printed and next to each relay circuit.

Switching is similar to work done in J1:

	Relay OFF	Relay ON
Right/CW	(B) A	B C
AUX	E D	E F
Left/CCW	H G	H I

In cases where it will be to use a lifting engine, we have also other 2 relays, and whose main circuit is available at the socket J2.

	Relay OFF	Relay ON
UP	J2-2-J2-1	J2-2-J2-3
DOWN	J2-5-J1-4	J2-5-J2-6

The second circuit is present as shown below:

	Relay OFF	Relay ON
UP	2' -1'	2' -3'
DOWN	5' - 4'	5' - 6'

J3 - power supply:

The power of 12-14Vcc input is available at J3. Respect the polarity and pay attention.



J4 – feedback and position input:

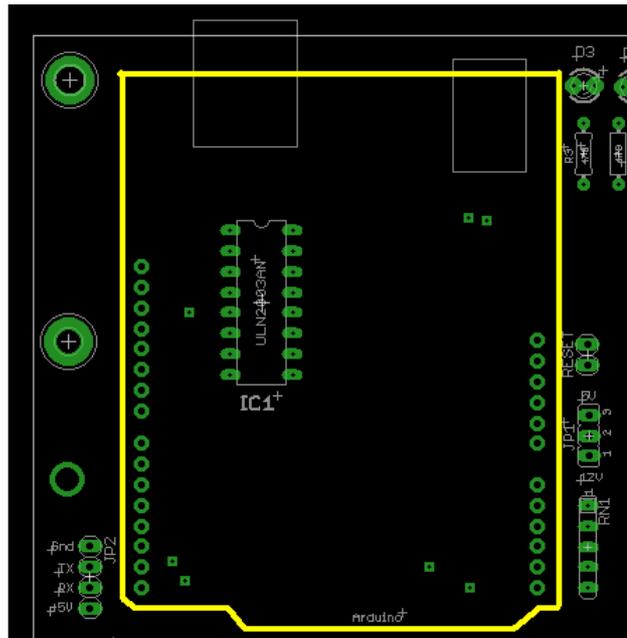
Most rotators use a potentiometer (POT) and the feedback voltage from it, is used to calculate the antenna position.

J4 is the entry to read the antenna position of the rotator (s). It has 3 terminals:

- J4-1: Input for Elevation motor
- J4-2: Gnd for both inputs
- J4-3: Input for Azimuth motor

Arduino module:

The Arduino is positioned with its components down and align the pins as shown in the following image.



Conditioning card:

The conditioning card is available as an option to the ARS-Shield. The Arduino only accepts signals between 0-5V. This option should be used if the rotator at its right top POT supplies a signal exceeding that level, otherwise it may damage the ADC input of the Arduino.

It can also be used when rotor on its right edge, delivers a voltage well below the 5V, with which lost significantly the resolution of the system. In this case, conditioning card is able to amplify the signal to the 5V at the top on the right.

In addition to these two features reduce / amplify, the card includes a Sallen-Key filter to avoid to the extent of the possible than any AC (e.g. RF) signal can generate interference in reading.

A conditioning card is installed by motor, i.e. in the socket X3 and X4 in the case of elevation and azimuth motor.

If the conditioning card is not used, it is **necessary to put the Jumper between pins 1-2** (first pin of the socket) as described in the section of the Assembly which is described below.

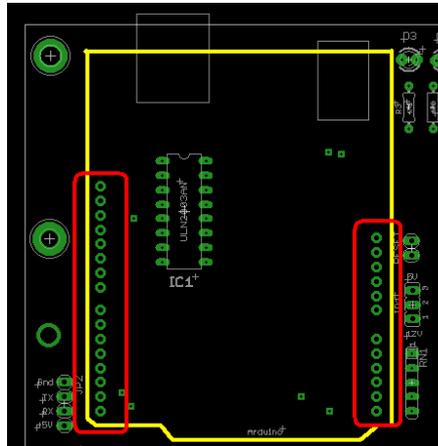
Input KBD and LCD

The IDC10 connector labeled KBD (keyboard) and LCD (Display) are used when you want to use a keyboard and a display with the ARS-Shield. It is an option that can be used and are not indispensable.

3. MOUNTING COMPONENTS

1.- First IC1 (ULN2003) solder to the PCB.

2.- Now go to put the strips of pins that are used to fix the Arduino to the PCB (remember that the Arduino is mounted upside down, i.e. with the components down). For groups of pins are perfectly aligned, it's best to first click pins on the female connector that presents the Arduino and then giving it back to the Arduino do that they enter through the holes on the PCB. With this you will get that they are perfectly in line and once presented the Arduino at the place, soldering the pins to the PCB. Once done you can already remove the Arduino until you are have soldered everything.

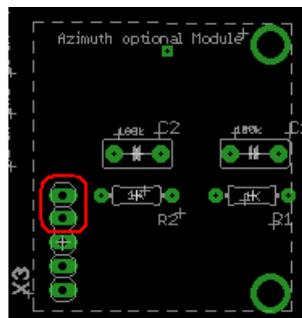


PIN strips are shown in red

3.- Solder 3 pin Strip: JMP1. If 12V relays are used, set 1-2. If you use 5V relays, must connect: 2-3

4.- Weld the PIN strips: 3X (azimuth) and 4X (elevation). Remember that if don't use elevation rotor this connector X4 is not necessary to install.

At this point you can connect conditioning card (in those cases that may be necessary). If the conditioning card is not used, should be a **Jumper** between **pins 1 and 2** for the signal coming in (from the motor potentiometer) J4 connector go to the ADC of the Arduino.



Jumper between pin 1-2 required

Note: Newer ARS-Shields PCBs have moved R1, R2, C1 and C2 components to different PCB location. See Annex II.

In the attached picture, shown in red, the 2 jumper that should be between pin 1-2. This is not necessary when using the conditioning card.

5.- Install and soldering the terminals J1 (Azimuth relay Output), J2 (Elevation relay Output), J3 (Power supply Input) 12-14Vcc and J4 (POT input).

6.- Install and soldering RN1. Keep in mind in their polarized marked by a point. It is a 4 + 1 K 1 SIL.

7.- Solder the diode: D1; well check its polarity. It is a 1N4004 or similar.

8.- Soldering Leds: D2 and D3; Please note the polarity.

9.- Solder R3 and R15, resistors which are right next to the Led diodes. They are 470 Ohms.

10.- Solder R1 and R2, 1 K resistors.

11.- Soldering C1 and C2 100nF capacitors.

12.- If you are using a Display, VR1 is 1k trimmer that allows the contrast of the display. Also put the IDC10 connector, marked as LCD.

13.- If you are using a keyboard, it connects in KBD - IDC10 connector.

14.- Put the relays that you'll need. Remember to place the JMP1 Ridge to the voltage of the relay you want to use: 5 or 12V. The relays are type double circuit Mod 40.52 Finder

15.- The capacitors C3, C4, C5, C6 and C7 only mounted when using the socket X 1 outlet compatible with some controls Yaesu. They are 100nF capacitors.

ANNEX I - Bill of Material - BOM

Part	Value	Device	Package	Description
C1	100nF	C5/3	C5B3	CAPACITOR
C2	100nF	C5/3	C5B3	CAPACITOR
C3	100nF	C5/3	C5B3	CAPACITOR
C4	100nF	C5/3	C5B3	CAPACITOR
C5	100nF	C5/3	C5B3	CAPACITOR
C6	100nF	C5/3	C5B3	CAPACITOR
C7	100nF	C5/3	C5B3	CAPACITOR
R1	1K	R-EU_0204/7	0204/7	RESISTOR
R2	1K	R-EU_0204/7	0204/7	RESISTOR
R3	470	R-EU_0204/7	0204/7	RESISTOR
R15	470	R-EU_0204/7	0204/7	RESISTOR
RN1	1K	G04R	SIL5	SIL RESISTOR (4+1)
VR1	1K	LCD Contrast	PT-10S	LCD CONTRAST TRIMMER
D1	1N4004	1N4004	DO41-10	DIODE
D2	LED3MM	LED3MM	LED	POWER ON LED
D3	LED3MM	LED3MM	LED	ACTIVITY LED
IC1	ULN2003	ULN2003	DIL16	DRIVER ARRAY
J1	TERMINAL-9	AK500/9	AK500/9	SCREW TERMINAL BLOCK
J2	TERMINAL-6	AK500/6	AK500/6	SCREW TERMINAL BLOCK
J3	12Vdc POWER	AK500/2	AK500/2	SCREW TERMINAL BLOCK
J4	Analog Inputs	AK500/3	AK500/3	SCREW TERMINAL BLOCK - POT INPUT
JP1		JP2E	JP2	JUMPER - RELAY VOLTAGE SELECTOR
JP2		PINHD-1X4	1X04	PIN HEADER - SERIAL
K1	RELAY 4052	4052	F4052	FINDER 40.52 12V RELAY-UP
K2	RELAY 4052	4052	F4052	FINDER 40.52 12V RELAY-DWN
K3	RELAY 4052	4052	F4052	FINDER 40.52 12V RELAY-CW
K4	RELAY 4052	4052	F4052	FINDER 40.52 12V RELAY-AUX
K5	RELAY 4052	4052	F4052	FINDER 40.52 12V RELAY-CCW
KBD	IDC10	ML10	ML10	KEYBOARD CONNECTOR
LCD	IDC10	ML10	ML10	LCD CONNECTOR
RESET		PINHD-1X2	1X02	RESET PIN HEADER
X1	Rotor Conn	FE08-1	FE08	FEMALE HEADER
X2	*** NOTE 1 ***			
X3		PINHD-1X5	1X05	AZ OPTIONAL CONNECTOR
X4		PINHD-1X5	1X05	EL OPTIONAL CONNECTOR

Note 1 : Corresponds with strips of pins where the Arduino is subject to the PCB

ANNEX II B - ARS-Shield PCB V1.1

