

# HOME-LINBUS Arduino Shield



## User Manual & Technical Reference

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Version 1.0

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## **Introduction**

### **Welcome**

Congratulations with buying the HOME-LINBUS Arduino Shield, we hope you will enjoy building it and that the Shield will work up to your expectations. There are two type of Shields, the standard 5V version for the Arduino Uno and alike and the 3V3 version for the Arduino Due and alike. This KIT is complete and comes with a pre-programmed PIC16(L)F1503 high performance 5 MIPS @ 20 MHz 8 bits RISC microcontroller which is running the embedded HOME-LINBUS protocol. We would like to thank you for buying the product from us, we also would like to ask you to have a look at all our other products. We have put the most care in putting this document and KIT together, if you have a problem or complains regardless of our efforts you can always contact us direct for assistance and help. If you send us an e-mail you should tell in a few clear lines the kind of problem or complain you have.

## 1. KIT Overview

The MrX<sup>®</sup> HOME-LINBUS Shield has been designed with the greatest care. There are two type of Shields, the standard 5V version for the Arduino Uno and alike and the 3V3 version for the Arduino Due and alike. This KIT is complete and comes with a pre-programmed PIC16(L)F1503 high performance 8 MIPS @ 32 MHz 8 bits RISC microcontroller which is running the embedded HOME-LINBUS protocol designed by MrX<sup>®</sup>. Since the microcontroller is pre-programmed it takes a lot of complex work out of your hands, making the construction of the HOME-LINBUS Translator KIT easy and fail proof. For the technical people here some technical features about the microcontroller and firmware.

- Firmware written in: Assembler / C code.
- Firmware binary code size: 2436 Bytes.
- Microcontroller speed: 2 MIPS @ 8 MHz.
- PIC16(L)F1503 High performance 8 bits RISC.

### HOME LINBUS Devices

This product will allow the control of the Axa Remote 2.0 window winder, it may also control other HOME-LINBUS devices from other manufacturers which use the HOME-LINBUS standard.

### Shield Features

- Can control upto 4 HOME-LINBUS devices.\*
- Can control all versions of the Axa Remote 2.0
  - Standard Version
  - Synchronous Version (Wide windows, 2 Units)
  - Solar Version
- Control Mode (Open/Close and Stop)
- Request Current Window state (Open/Closed)
- Makes use of a standard 9Volt DC 1 Amp 230V Adapter\*\*

\* count 0.5A for each window winder, meaning a 2A Adapter is needed.

\*\* not included

## 1.0 Operation

This shield's functionality can be best appreciated from a description of its operation. The shield, see Figure 1, does have 4 I/O inputs that can accept commands from any external source and one I/O output that is reporting the current window status. Default the command inputs should be held high or left floating.

### **OPEN**

Making the OPEN command input J1 pin 5 low for 30ms will execute the window OPEN command on the window winder.

### **CLOSE**

Making the CLOSE command input J1 pin 6 low for 30ms will execute the window CLOSE command on the window winder.

### **STOP**

Making the STOP command input J1 pin 7 low for 30ms will execute the window STOP command on the window winder.

### **STATUS**

Making the STATUS command input J1 pin 4 low for 30ms will execute the window STATUS request command of the window winder. The current window winder status will be available on J1 output pin 3, the status update will be available about 500ms after the command has been given.

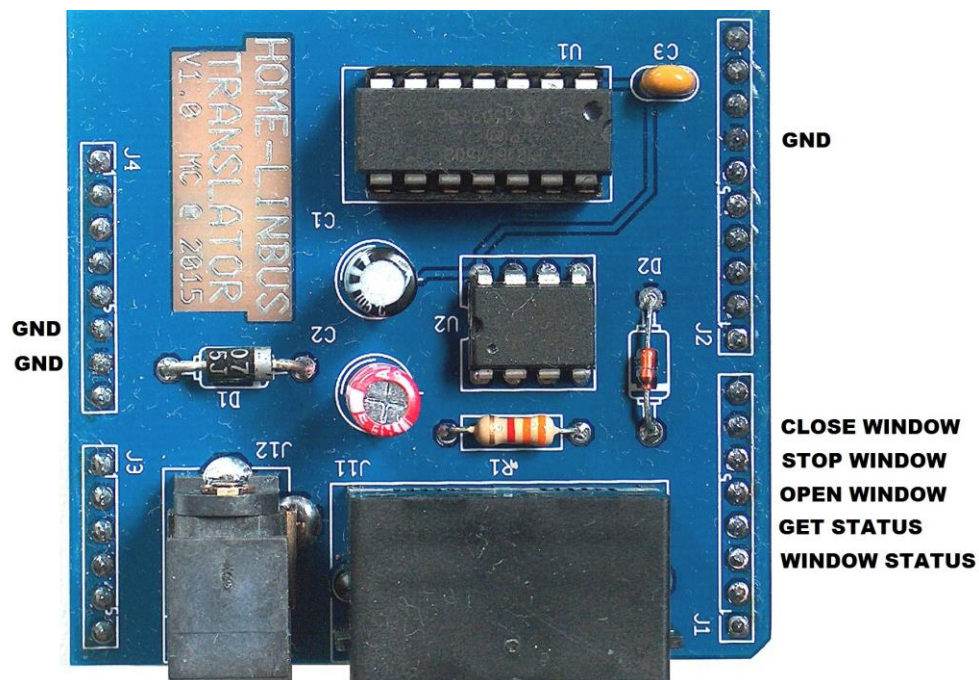


Figure 1: Command input and output I/O pins

## 1.1 Firmware

The firmware has been designed especially for the HOME-LINBUS KIT and can be used for all HOME-LINBUS devices including the Axa Remote 2.0 Window winder. The user can upgrade the firmware of the KIT in the future by replacing U1 for this reason the chip is residing into an IC socket for easy removal.

## 1.2 PCB

The high quality 60 mil flame retardant FR4 based PCB has been produced and designed with the latest technology. The PCB is protected with an UV protecting anti-solder layer while the solder pad's are covered with a so called HAL layer for better soldering capabilities. The PCB has been electrically tested during production by a nail table that is testing the PCB traces for shorts and interruptions, all PCB's passed this test successfully. Figure 2 is giving an overview of the Top and Bottom layer of the PCB, the user can see that all components have to be mounted on top layer, the bottom layer is only for the connection headers. The PCB has been printed with markings and numbers for the components to make your life as easy as possible.

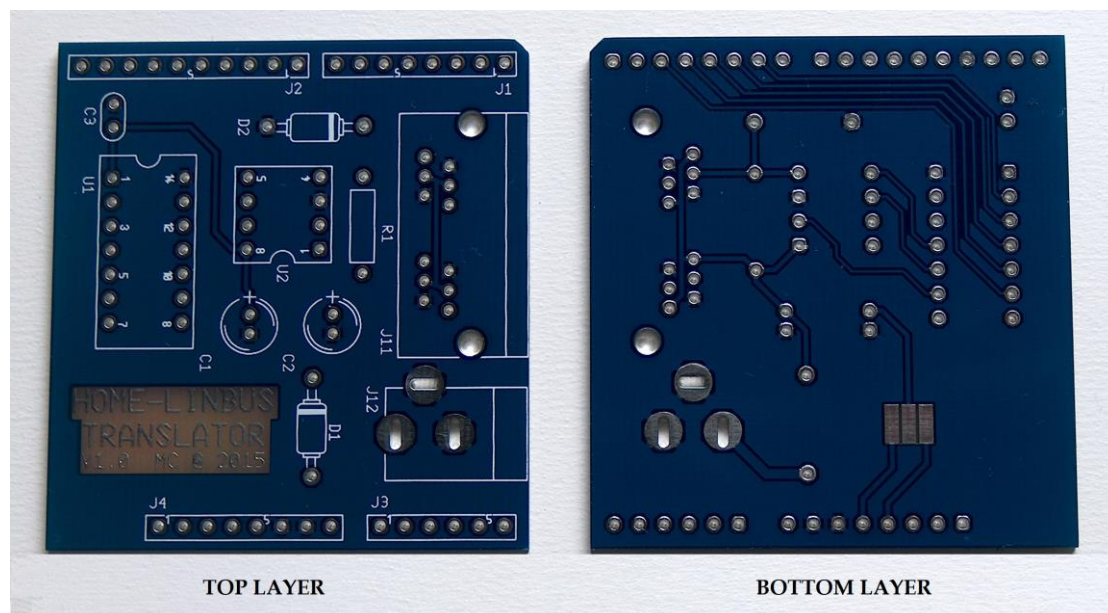


Figure 2: Top and Bottom Layer of PCB

## 1.3 Components

The KIT is delivered with all components including the RJ25 6P6C dual jack, a pre-programmed PIC16(L)F1503 high performance RISC microcontroller which is running the HOME-LINBUS protocol firmware developed by Axa® and high quality components including a PCB board. Figure 3 is giving an overview of all components that are included in the KIT, before you continue we advice you to check if you can identify all components by using the component list and Figure 3.

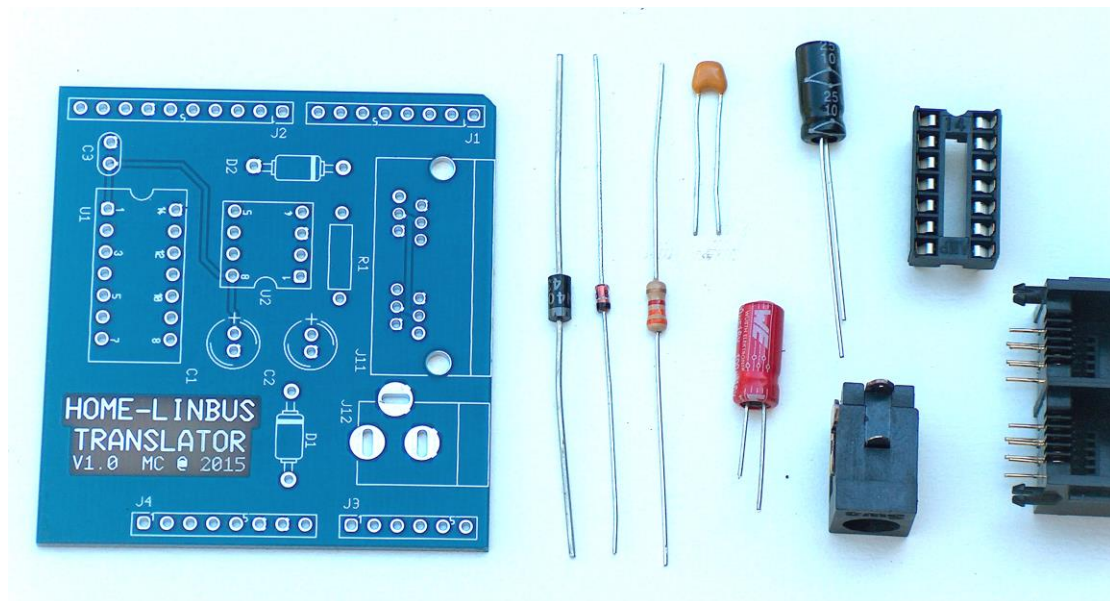


Figure 3: All components excluding the headers

#### Component List 5V version 2015:

- U1 : PIC16F1503 + 14pin socket. (Pre-programmed with Firmware)
- U2 : MCP2025-500
- R1 : 3K3
- C1 : 10uF/16V.
- C2 : 100uF/25V.
- C3 : 100nF.
- J1 : 8pin header.
- J2 : 10pin header.
- J3 : 6pin header.
- J4 : 8pin header.
- J11 : Dual RJ25 6P6C Jack.
- J12 : DC Power Jack 2.5mm.
- D1 : 1N4007.
- D2 : 18V 300mW Zener Diode.
- PCB : Arduino Uno R3 Shield

#### Component List 3V3 version 2015:

- U1 : PIC16LF1503 + 14pin socket. (Pre-programmed with Firmware)
- U2 : MCP2025-330
- R1 : 3K3
- C1 : 10uF/16V.
- C2 : 100uF/25V.
- C3 : 100nF.
- J1 : 8pin header.
- J2 : 10pin header.
- J3 : 6pin header.
- J4 : 8pin header.
- J11 : Dual RJ25 6P6C Jack.
- J12 : DC Power Jack 2.5mm.
- D1 : 1N4007.
- D2 : 18V 300mW Zener Diode.
- PCB : Arduino Uno R3 Shield



## 2 Construction

You should start by placing all components in front of you and make sure you can identify them from the above list and Figure 3. You need the following tools to complete the construction of the HOME-LINBUS KIT in a proper and fast manner.

- Soldering iron (15 – 40 Watts).
- Wire stripper.
- Wire cutter.
- Solder wire.

### 2.1 Headers

We will start by putting the Shield PCB and the 4 pin headers together; the short pins should be connected to the bottom PCB side as can be seen in Figure 4. The KIT is delivered with a special headers that fit in the standard Arduino Uno Shield sockets.

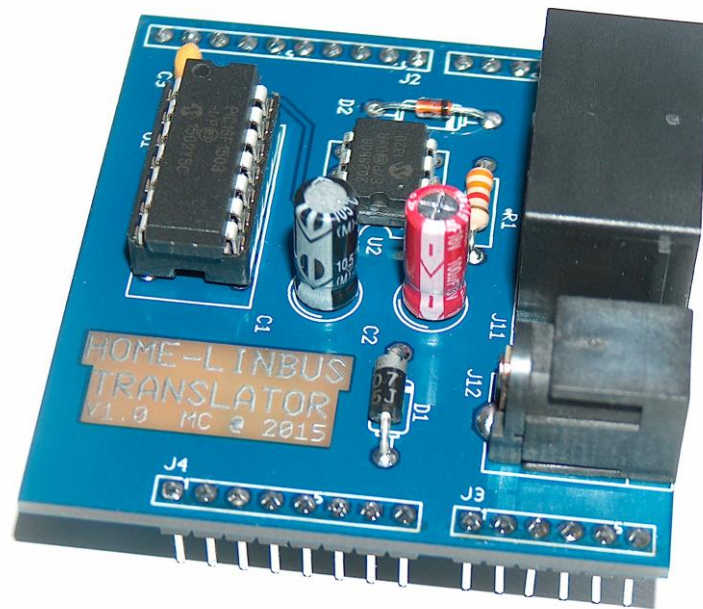


Figure 4: Shield assembled with headers.

## 2.2 Putting the PCB together.

Best is to place first the normal resistor R1, diodes D1 and D2 and capacitor C3 on the PCB board, R1, D1, D2, C3 can clearly be identified in Figure 5. Use the component list from Page 9 to check which components should be put on the PCB. After the resistor, capacitor and diodes have been placed on the PCB you should solder them and remove the long wires using the wire cutter tool. Be careful when you place the diodes D1 and D2 onto the PCB to check the location of the white or black band since this component can only be placed in one direction. The resistor R1 and capacitor C3 can be mounted in both directions.

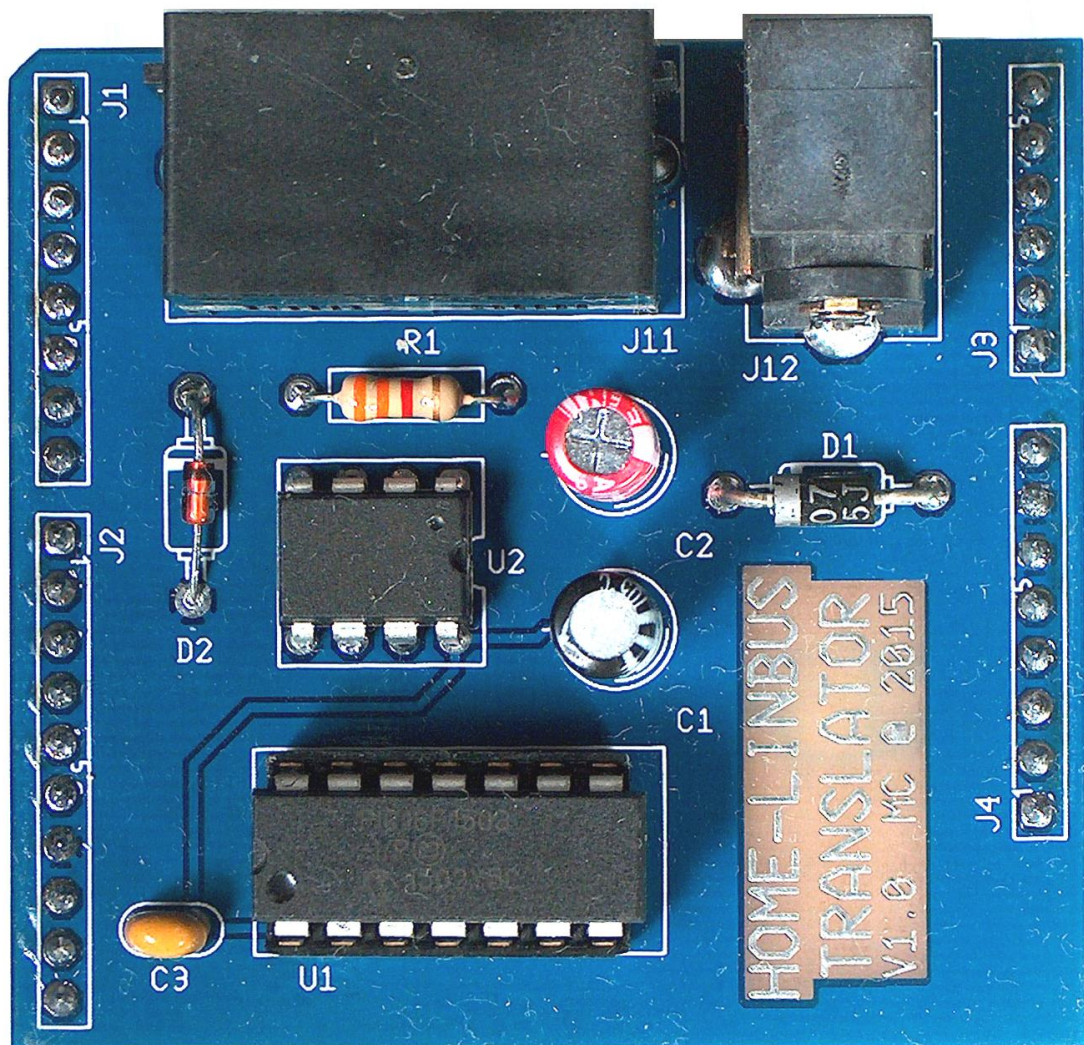


Figure 5: Completely assembled PCB.

### 2.2.1 Microchips

The next step is placing the two microchips U1 and U2, be careful when you do this since you don't want destroy the chips. Best is to place microchip U2 first and watch carefully that the notch on the chip is matching the notch on the PCB marking in Figure 5. After the microchip U2 has been placed and soldered you can place the 14 pin IC socket for U1, look carefully for the position of U1 and the notch on the IC socket and the place of the notch on the PCB board. Keep in mind that the chip is sensitive to static electricity and that a good working bench is required to do things properly.

### 2.2.2 Capacitors

Now its time for placing the Electrolytic capacitors, C1 and C2, the capacitors should be placed at the printed side of the PCB. The Electrolytic capacitor C1 the 10uF /16 V, Figure 6 should be placed now; check the negative marking on the capacitor and the long wire is positive. This should match the (+) plus sign marking on the PCB. The Electrolytic capacitor C2 the 100uF /25 V, Figure 6 should be placed now; check the negative marking on the capacitor and the long wire is positive. This should match the (+) plus sign marking on the PCB.



Figure 6: Electrolytic capacitor.

### 2.2.3 DC Power Jack

The DC Power Jack J12 connector should be place next to header J3; it does not need an explanation how this should be placed since it can only be placed in one way.

### 2.2.4 RJ25 Jack

The last component we need to place is J11 the dual RJ25 6p6c Jack. It should be place next to DC Power Jack J12; it does not need an explanation how this should be placed since it can only be placed in one way.

## 2.2.5 PIC16(L)F1503

We now need to place the brains, in our case the pre-programmed PIC16(L)F1503, in the IC socket that you have placed before. Look carefully for the notch in the PIC16(L)F1503 enclosure and bend the pins if needed to put it gently in the 14 pin IC socket. The notch in the enclosure should match with the notch in the IC socket. Do this with care and don't rush things. Keep in mind that the chip is sensitive to static electricity and that a good working bench is required to do things properly.

To complete the construction process you need to check for shorts made during the soldering process. Check the bottom of the PCB for excess solder, pay extra attention to the pins of the microchips U1 and U2 but also not to forget the pins of the RJ25 J11 jack.

You're now done and the PCB should now look like the picture in Figure 7. If you have a different result you should re-check all the steps and correct the error.

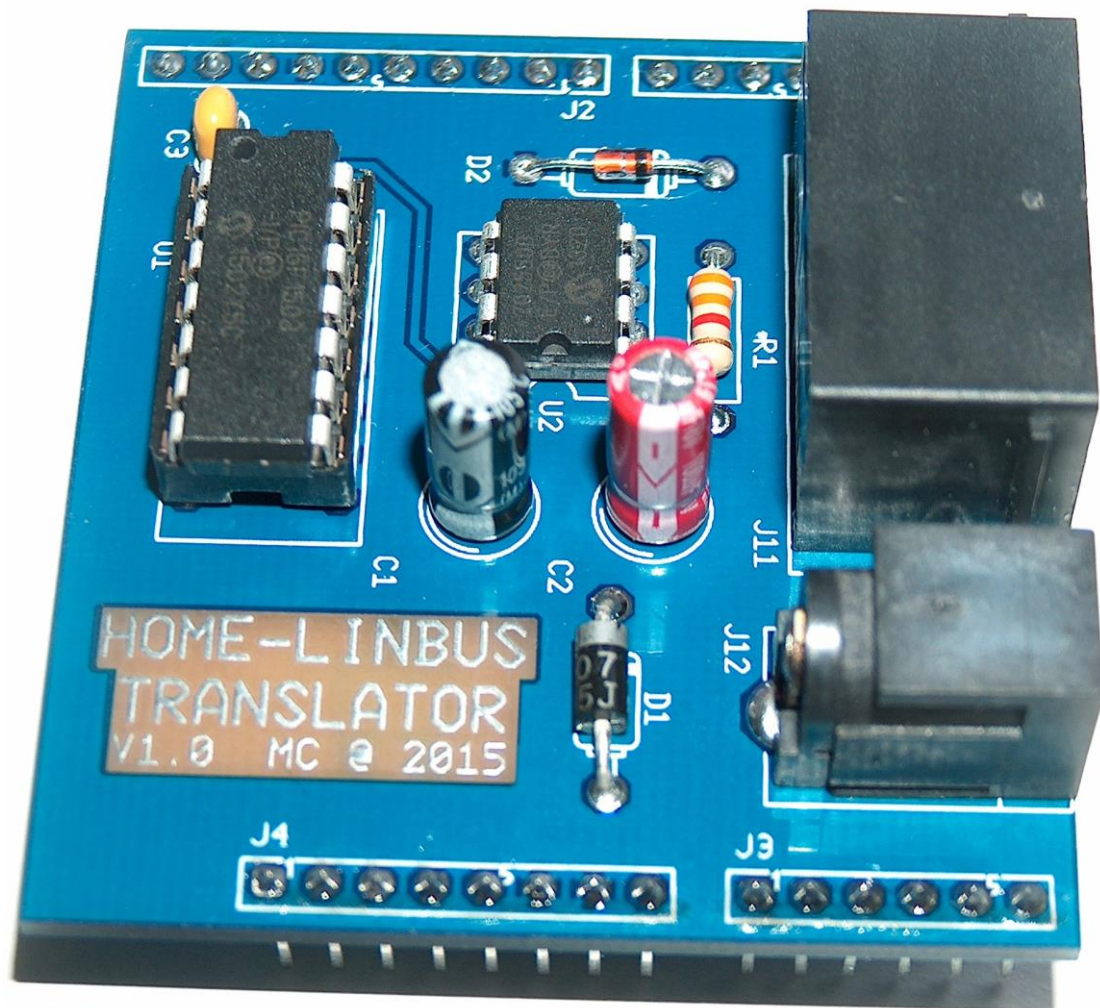


Figure 7: The completed PCB Board.

## 3 Connecting

### 3.1 Installing the shield

The Axa Remote 2.0 Arduino Shield is available in two versions, the standard 5V version for the Arduino Uno and alike and the 3V3 version for the Arduino Due and alike. Please make sure you install the correct shield on the correct Arduino otherwise you will possibly destroy all your work and the Arduino.

### 3.2 Arduino Sketch

To make things as easy as possible there is an Arduino Sketch available for the Arduino Uno that is able to show the user how to work with the Arduino Shield. The Arduino Sketch is called “RV2902\_CONTROL.ino” and needs to be opened in the Arduino IDE. When you have attached the Arduino Uno to the USB port and compiled the Sketch you can upload the code into the Arduino Uno. Disconnect the Arduino Uno from the USB port and install the Arduino Shield.

### 3.3 Making it all work

Now we are about to test the working of your setup, we do need to make sure we do have an Axa Remote 2.0 at hand with the batteries removed. Now first make the connection between the Remote 2.0 and the RJ25 on the Shield. Connect the 9V power supply to the DC Power Jack J12 and switch the power supply on.

When you have applied power for the first time the window winder will always try to open even if it is already completely open. It needs to get insync with the window winder state.

The window winder demonstration Sketch will open the window completely and wait for a few seconds before closing completely again.