E R C

Instructions

Congratulations on purchasing your EASY-ROTOR-CONTROL (**ERC**). This document will guide you through the needed steps for assembly, configuration and installation of the **ERC**. You will obtain the best result by following these instructions step by step.

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Safety-Instructions

- Don't continue using the product if it is damaged.
- Keep electronic assemblies and components away from children.
- Products that carry electric voltages must be handled in accordance with instructions and regulations to avoid damage to equipment and personnel.
- If the product must be repaired, use only original replacement parts. Using different parts may cause equipment damage and personal injury. Repairs should be accomplished by a qualified individual.
- Before applying main-voltage the product must be securely build into a housing to provide protection against accidental contact.
- The installation should be performed by a qualified individual.
- Cables that carry dangerous voltages (e.g. main voltage) must be installed according to the valid instructions and regulations. The needed safety-distances must be maintained.
- Connection cables need to be chosen according to the needed diameter.
- Before working on the product all supply voltages must be disconnected.
- The product is designed to work in clean and dry areas inside buildings.
- Protect the product from humidity, water and heat.
- Don't use the product in areas where explosive gas, vapour or dust may occur.
- Don't let the product fall or apply mechanical stress as the product may be damaged.

1. Bill of Material (BOM)

The Bom is in the order how you should use the parts.

|	ERC USB V4.4 Bill Of Material				
QTY	Type	Value	Pitch	Reference	Comments
1	USB-Module	FTDI		IC3	
1	Pinheader	1x8 pol.	2.5		for USB-Module
1	PCB ERC	2-layer 80x61mm V4.4			
1	Capacitor ceramic	10n 50V 20%	2.5	C19	
2	Capacitor ceramic	22p 16V 5%	2.5	C1,C2	
1	Crystal	9.8304 MHz HC49U		Q1	
1	IC-Socket	28 pol. DIL28		IC1*	for IC1
1	IC-Socket	16 pol. DIL16		IC2*	for IC2
6	Capacitor ceramic	100n 50V 20%	2.5	C3-C5,C7-C9	
2	Capacitor Tantal	1u 35V 20%	2.5	C11,C13	
1	Pinheader	1x2 pol.	2.5	JP1	
3	Resistor	20K 5%	2.5	R1-R3	
1	Resistor	39K 5%	2.5	R4	
1	Resistor	220K 5%	2.5	R5	
3	Coil	10u 10% SMCC	2.5	L1-L3	
1	Diode	P6KE33CA	3.81	D2	
2	Terminal-block	2 pol. 5mm	5	X3,X4	
4	Terminal-block	3 pol. 5mm	5	X5-X8	
1	USB-Jack	Type B		X2	
1	Capacitor Al	100u 16V 20%	2.5	C18	
3	Relais	RM84-2012-35-1005		K1,K2,K3	alt.: RT424005
1	IC	ULN2003AN	DIL16	IC2	with socket
1	IC	MEGA328P-20PU	DIL28	IC1	with socket
1	USB-Cable	A to B 1.8m			
1	Jumper	2 pol.	2.5	JP1*	PWR/Reset
4	Distance-Bolt	M3x8x6mm			
8	Spring-Wascher	3.2mm			
4	Nuts	M3			
4	Screw	M3x6mm			
2	Mounting Angle	11x10x7mm			
1	Cable	blue 1m 0.75sqmm			for installation
1	Cable	black 1m 0.75sqmm			for installation
3	Cable-Ties	150mm			

2. Preparation of USB-module

Solder the 8-pin pin-header 90° to the **top-side** of the USB-module as shown in the picture below.
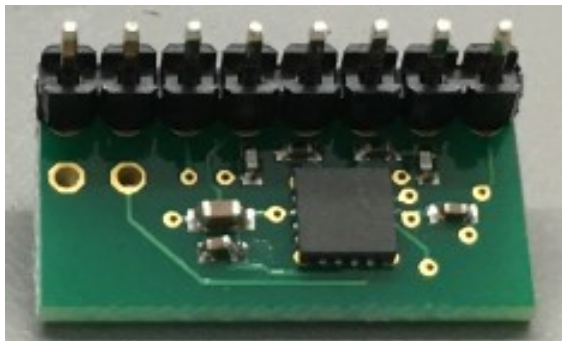
Top-side of USB-module
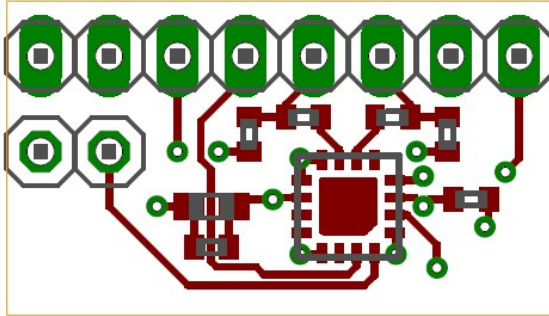
Bottom-side of USB-module
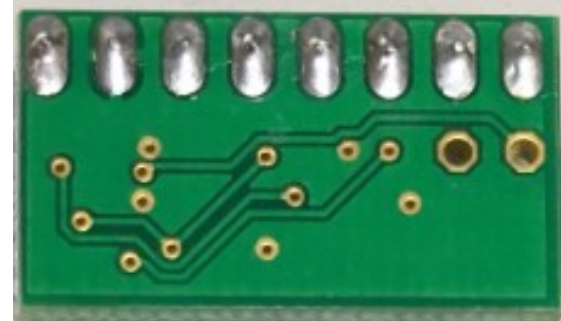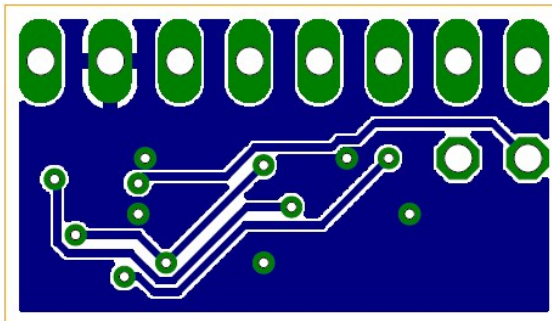
8-pin-header assembled and soldered to top-side of the USB-module

3. Assembly of PCB

Assemble and solder the components according to the following drawings. As the last step, assemble and solder the prepared USB-module on the PCB.

Please read the following instructions carefully before you start:

1. The vertical assembled Diodes should have a distance (1-2mm) away from the PCB while soldering. Otherwise there is the risk of overheating these components while soldering.

2. Carefully observe polarization of the following components (These components are shaded in red in the following drawing):
   - Aluminum Capacitor C18
   - Tantalum-Capacitors C11,C13
   - IC-Sockets IC1*,IC2*
   - Connectors X3,X4,X5,X6,X7,X8 (cable entry toward the perimeter of the board)

3. Carefully compare the position of the PCB with the drawings before you start to assemble it.

4. As the last component assemble the prepared USB-module in the assembly-place IC3.
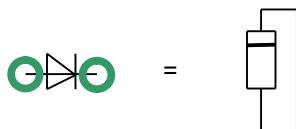

Components :

Color code of Resistors:
|	
20K 5%	red-black-orange-gold
alt.: 20K 1%	red-black-black-red- brown
39K 5%	orange-white-orange-gold
alt.: 39K 1%	orange-white-black-red-brown
220K 5%	red-red-yellow-gold
alt.: 220K 1%	red-red-black-orange-brown

Color code of Coils:
10uH 10%   brown-black-black-silver (they also resemble resistors)
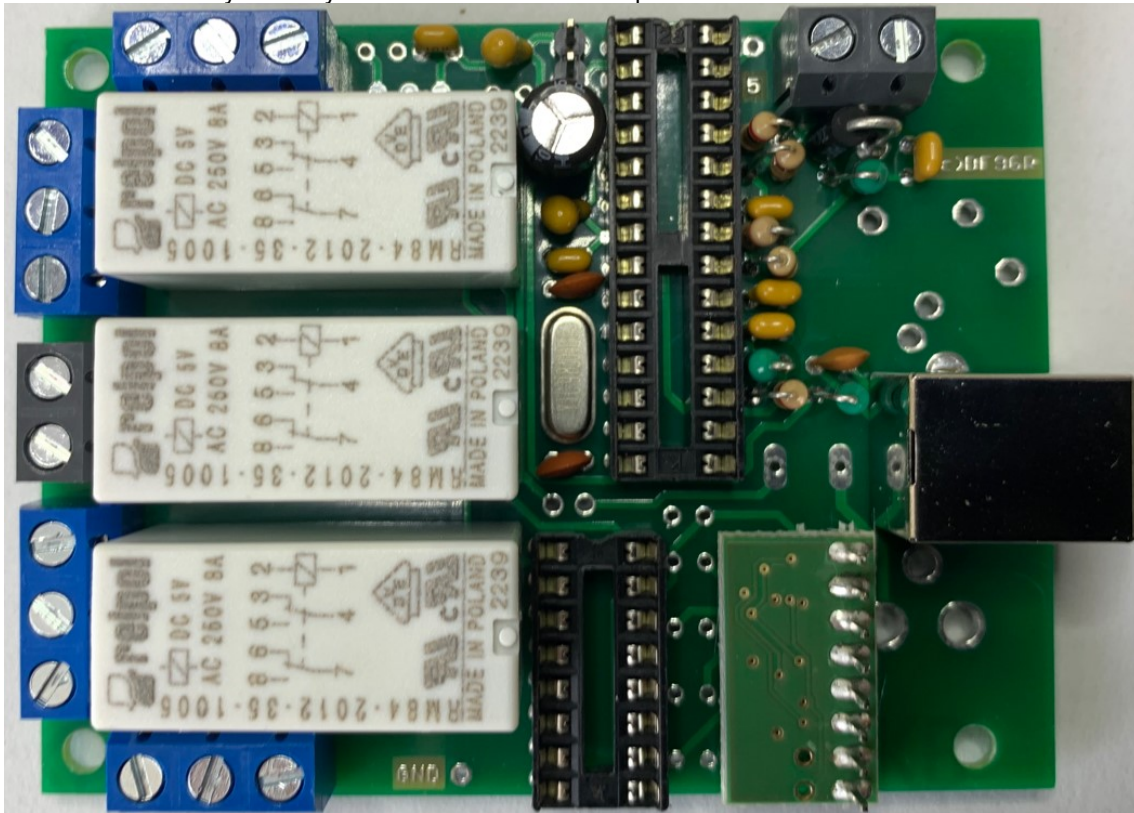
Diodes :

The following components are not assembled in the USB-version:
C6,C10,C12,C14,C15,C16,C17,D1,F1,J1,IC3,IC4,X1
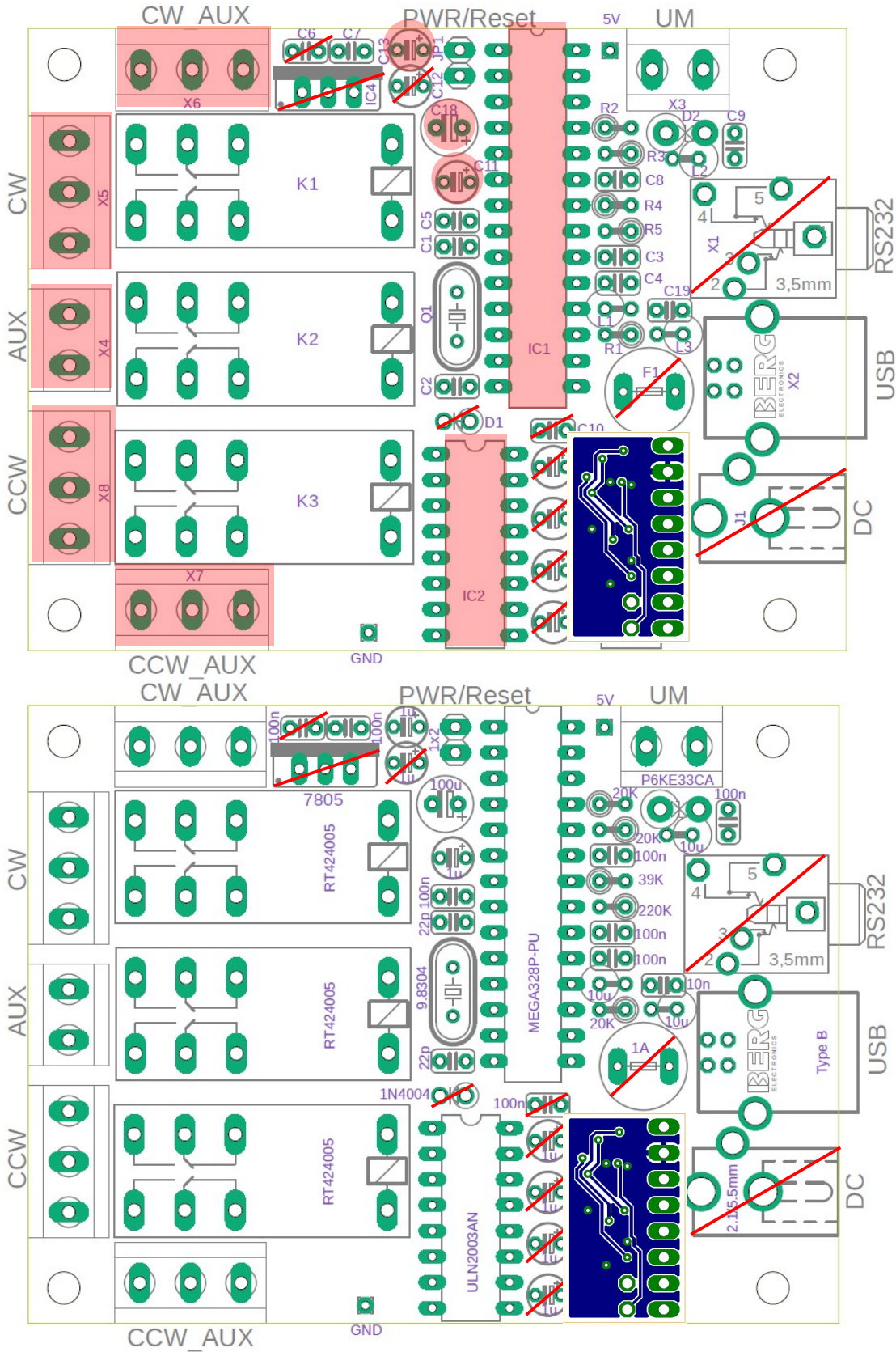
Check the assembly carefully to insure it resembles this photo.

After assembly, attach the 4 bolts and the 2 mounting angles with nuts for mounting. Use spring-washers below the nuts.

5. Insert ICs and Jumper for Power/Reset

The pins of the ICs have to bend before you can put them into their sockets. Use a hard base (e.g. your working desk) and bend the row of pins slightly, that they get an angle of 90°. Now insert the ICs and take care about direction of the components and not to bend any pins while inserting the components into the sockets.
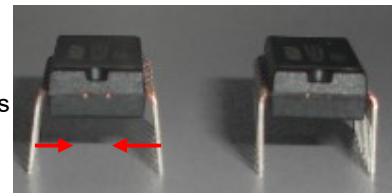
Now put the Jumper on connector JP1 (the Jumper must remain on JP1 for normal operation).
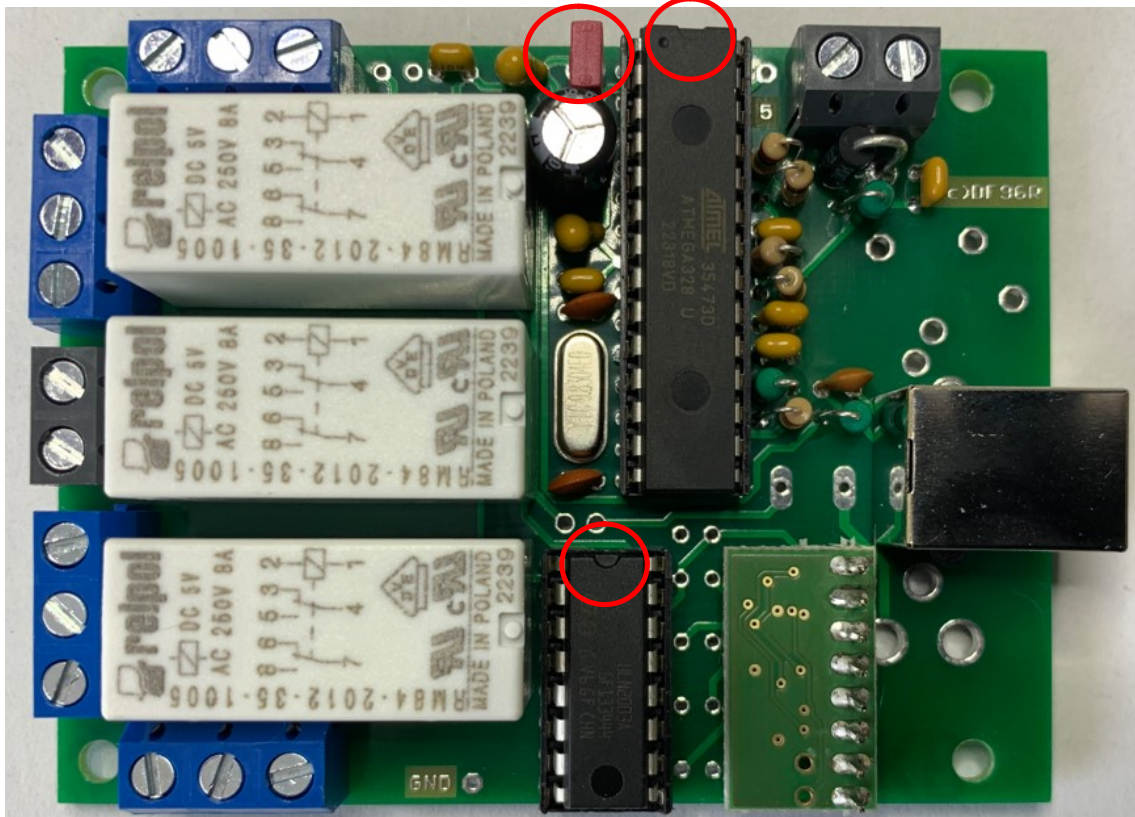
6. Establishing the USB-connection

Plug the USB-B-connector to the ERC and the USB-A-connector to a free USB-connector on your PC.

Depending on your operating-system, you will be asked to install an USB-driver. This driver is available on the Website from FTDI:
https://ftdichip.com/Drivers/vcp-drivers/

After successful installation of the driver, a new COM-Port (COMn) is available. You can identify the COM-port-number by inspecting the hardware-settings of your PC. In case you have a conflict with another COM-port (e.g. virtual COM-port), change the COM-port-number in the properties.
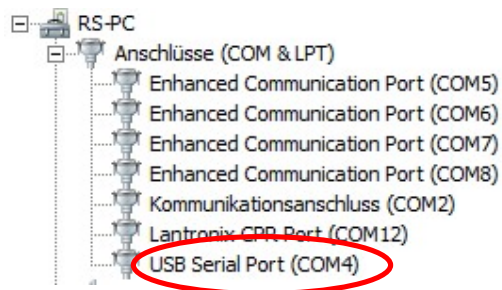
7. The Service-Tool

The Service Tool is in the data-package of your ERC.

Start the Setup-File **SETUP ERC-M_Vnn.EXE** (nn=version) and follow the instructions.

The installation wizard will automatically install the Service Tool in the program directory (or any other if you choose a different one) and put an icon on your desktop.

Start the Service Tool by double-clicking the Icon on the desktop.

7.1 Configuration of the COM-Port

On shipment, the Service Tool is configured to COM1, which is most properly not the com-port, where you connected the ERC, hence after Start-Up the program may bring up an error-message because of the wrong COM-Port.

Choose the right COM-Port. `COM: 12`

The Service Tool will check the availability of the ERC at the chosen COM-Port. If successful, the Service Tool will read the configuration-parameters of the ERC and populates the configuration- and the calibration-windows.

You can now perform a little hardware-test before the installation. Click the `Test`-button and all relays will be switched on sequentially.

7.2 Read the ERC-configuration-parameters

The parameters of the ERC can be read by clicking the `Read ERC` button.

7.3 Language

The Service-Tool and the help-files are available in different languages. Choose the language with the `Language EN`-box.

7.4 Configuration of the AUX-relay

Depending on the rotator used, you need to configure the function of the 3rd relay. Otherwise the rotator may not move.
Please check in the installation-guide which setting is needed for your type of rotator.

Choose the desired function in `Function of AUX brake`.

7.5 Other functions of the Service Tool

The other functions of the Service Tool are well described in the help-function of the Service Tool.

Click the `Help` button.

8. Installation of the ERC

Easy-Rotor-Control can either be installed in the rotor-controllers housing or in certain cases it can be installed on the outside of the housing. The installation is unique to every type of rotor/controller. Therefore an installation-guide is available in the data-package of the ERC.

9. Theory of operation

A Microcontroller receives commands via the USB-interface in the Yaesu GS-232B (or GS-232A) or Hygain DCU-1 protocol from the programs that support controlling rotators.
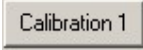
The ERC takes the task to move the rotator to the desired position or to stop the rotator while it is moving. Also changes of the direction are possible while the rotator is moving. The current position of the rotators is calculated from the measured rotor-feedback-voltage. To achieve accurate function, the ERC has to be calibrated to the specific value of the rotor-feedback-voltages (ref. to the next chapter).

Depending on the direction to move, the CW- and CCW-relays are activated. With a programmable delay the AUX-relay will be activated to control the speed or the brake of the rotator.

The ERC is fully powered by USB.

10. Calibration

After the ERC is connected to the rotor-controller, it has to be calibrated. This calibration is needed, because different kinds of rotators deliver different kinds of feedback-voltages. Also variations between rotators of the same model would lead to inaccuracy. To calibrate the ERC, it has to measure the rotor-feedback-voltages at both ends including overlaps (turning radius > 360°). The calibration is a software-guided procedure, which will be started by pressing the [Calibration 1] button of the service tool. Just follow the instructions given by the calibration assistant.

After pressing the calibrate-button, the calibration is always done in 3 steps:
1. Decide if you want to calibrate an elevation- or an azimuth-rotator and confirm with the OK-button.
2. Move the rotator to the most clockwise (right) position (to the most upwards position if it is an elevation-rotator), fill in the value, that the dial of your rotator shows and confirm with the OK-button.
3. Move the rotator to the most counter-clockwise (left) position (to the most downwards position, if it is an elevation-rotator), fill in the value, that the dial of your rotator shows and confirm with the OK-button

Please note, that the value to be filled in during the calibration-steps 2 and 3 is always the true value that the dial of your rotator shows. Don't put values like 450 (if you have a rotator with overhead) or -180° (if your rotator has the stop in south) or anything else that is not shown on the dial of your rotator.

Here are some examples:
- Azimuth-rotator with 360° turning-range and start at 0°: Step 1 = 360, Step 2 = 0
- Azimuth rotator with 360° turning-range and start at 180°: Step 1 = 180, Step 2 = 180
- Azimuth-rotator with 450° turning-range and start at 0°: Step 1 = 90, Step 2 = 0
- Azimuth rotator with 450° turning-range and start at 180°: Step 1 = 270, Step 2 = 180
- Elevation-rotator with 90° turning-range: Step 1 = 90, Step 2 = 0

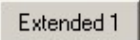Don't worry, the ERC will understand and make a correct calibration out of this.

EVERY position for the calibration of an azimuth-rotator is possible, if it is calibrated within a range of > 180° and < 540°.

After calibration, the Service-Tool will show the results of the calibration in the Calibration-data panel:

- Antenna-type
    - 0 AZ if you have calibrated an azimuth-rotator
    - 1 EL if you have calibrated an elevation-rotator
- ADC-data
    - First value is the range of voltage that has been chosen by the ERC in order to optimize the resolution (auto-range measurement).
        - 0/1/2 for axis 1 = range 16V/8V/4V
        - 3/4/5 for axis 2 = range 16V/8V/4V
    - Second value is the ADC-value of the feedback-voltage measured at the most counter-clockwise (most downward) position.
    - Third value is the ADC-value of the feedback-voltage measured at the most clockwise (most upwards) position.
    - The third value must always be greater than the second value as the feedback-voltage must increase while the rotator is moving clockwise or upwards.

If the feedback-voltage of the rotator has un-linearities, an extended calibration can be performed

every 30° by pressing the [Extended 1] button. The installation-guide will tell you, if your specific rotator needs an extended calibration.

11. First check of calibration with Rotor-Control M

The rotor-control-program Rotor-Control M is in the data-package of your ERC.

Start the Setup-File **SETUP RC-M_Vnn.EXE** and follow the instructions.
The installation wizard will automatically install the Service Tool in the program directory (or any other if you choose a different one) and puts an icon on your desktop.

Set the ERC with the Service-Tool to Baudrate 9600 and Protocol GS232B and close the Service-Tool.

It is important to close the Service-Tool before you start the Rotor Control M because Windows does not allow that more than 1 application is accessing a comport at the same time.

Start Rotor-Control M by double-clicking the Icon on the desktop.

Configure the Axis to <axis1=AZ | axis2=none>.

The green pointer and number show the current position of the rotator.
Targets can be put at the red numbers and the rotator moves after pressing the GO-button.
The STOP-button will terminate rotation.

You can also move the rotator to a target-position by clicking on any point of the graphics.
By clicking the button PARK, the rotator move to the configured parking position.

12. Connect the ERC to other programs

Please take care about the following issues, if you want to control your ERC with other programs:

- Choose the right COM-port
- COM-port-speed in the program must be same as in ERC
- Adjust the comport in the program to : N-8-1 (No Parity, 8 databits,1 stopbit)
- Use the same protocol in program and ERC (Yaesu GS232B, GS232A or Hygain DCU-1)

More detailed information about specific program-setups can be found on our web-page in the Software-Guide.

Appendix A: Schematics

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