Manual

Congratulations for buying your EASY-ROTOR-CONTROL Mini (shortly **ERC-Mini**). This document will guide you through the needed steps for installation, configuration and calibration of the **ERC-M Mini**. You will reach the best result by following these instructions step by step.

Table of contents

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 by taking care about the valid instructions and regulations.
- If the product must be repaired, only use original spare parts! Using different parts may cause property damage and personal injury! The repair has only to be done by an expert!
- The installation has to be done by a skilled expert.
- Connection-cables have to be chosen according to the needed diameter.
- Before working on the product all supply-voltages have to be securely cut of.
- The product is designed to work in clean and dry areas inside buildings.
- Prevent the product of humidity, water and heat.
- Don't use the product in areas where explosive gases, vapour or dust are or may occur.
- Don't let the product fall or apply mechanical stress as the product may be damaged.

1. Description

ERC-Mini is a computer-interface designed to connect various Rotators of the manufacturers Yaesu, Kenpro, Create and Emotator to a computer.
- Yaesu/Kenpro: models ending with DXA/DXC
- Yaesu/Kenpro: models ending with SDX
- Create: models ending with –P with a 6-pin DIN remote-connector
- Emotator: models with a 5-pin DIN remote connecting socket

On The computer-side it provides an USB-interface and a build-in COM/serial-interface with a FTDI-chip to provide a virtual-comport on any Windows,MacOS or Linux-machine.
On the rotor-control-box-side it can be easily connected to the control-box with the cable that came with your interface or, in case of Yaesu/Kenpro SDX, can be easily mounted inside the control-box and fixed with 2 screws.
All further technical information can be retrieved from the appendices in this manual.

2. ERC-Mini for Yaesu/Kenpro SDX

2.1 Bill of material (BOM)

QTY	Type	Value	Reference	Comments
ERC-Mini SDX V2.0 Bill Of Material				
1	PCB assembled	ERC-Mini SDX V2.0		
2	Distance-bolts	M3x6x8		
3	Screws	M3x6		
2	Spring-washers	3.2mm		
1	Strain-relief	4mm		for USB-cable
1	USB-cable	A to B 1.8m		

2.2 Mechanical Installation

For the mechanical integration of the ERC-Mini SDX please go ahead like this:

-   unplug the SDX-control-box from its main-supply and the rotor-cable

-   open the cabinet of the SDX-control-box by removing the 2 screws on the side of the cabinet and the 4 screws on the bottom of the cabinet that also hold the rubber-feet

-   mount the 2 distance-bolts M3x6x8 as shown in the next picture and slightly bend the components that may conflict with the ERC-Mini SDX-PCB
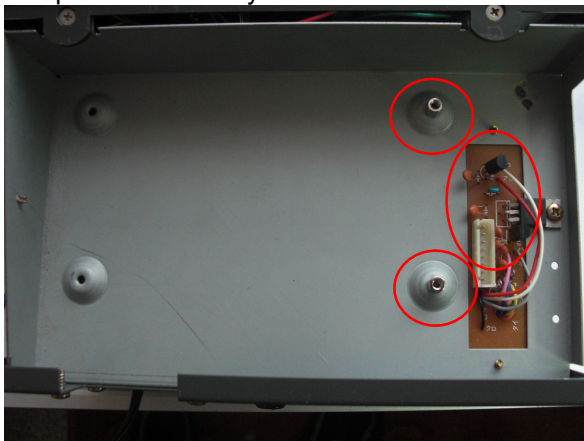
- plug the ERC-Mini SDX into the 8-pin-pinheader as shown in the next picture
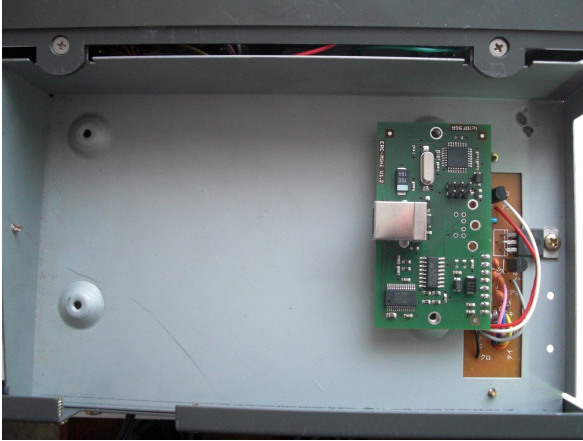
- fix the ERC-Mini SDX with 2 screws M3x6 and 2 spring-washers 3.2mm as shown in the next picture
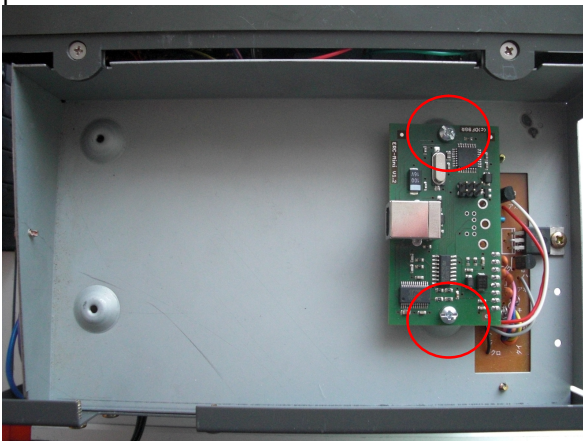
- connect the USB-B-connector to the ERC Mini SDX and let the USB-cable exit on the back-side of the cabinet
- fix the USB-cable with the strain-relief as shown in the next picture
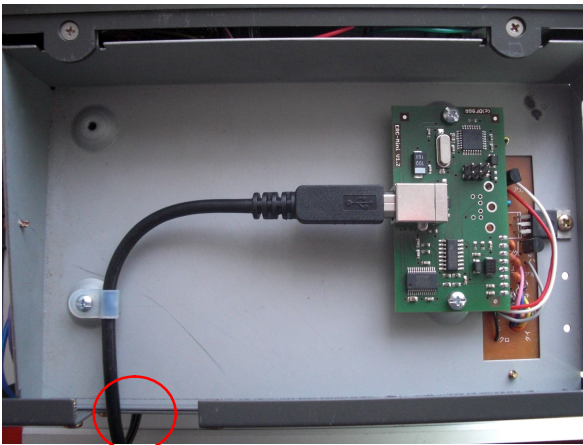
- close again the cabinet with the 6 screws and the 4 rubber-feet you removed before
- connect the rotor-cable and the main-supply

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3. ERC-Mini for Yaesu/Kenpro DXA/DXC

3.1 Bill of material (BOM) for Yaesu/Kenpro DXA/DXC

ERC-Mini V2.0 DX Bill Of Material				
QTY	Type	Value	Reference	Comments
1	Interface	ERC-Mini V2.0		In enclosure
1	Cable to control-box	Mini-DIN6 – Mini-DIN6 2m		
1	USB-cable	A to B 1.8m		

3.2 Bill of material (BOM) for Create -P

ERC-Mini V1.3 -P				
QTY	Type	Value	Reference	Comments
1	Interface	ERC-Mini V2.0		In enclosure
1	Cable to control-box	Mini-DIN6 – DIN6 1m		
1	USB-cable	A to B 1.8m		

3.3 Bill of material (BOM) for Emotator

ERC-Mini V1.3 EMO Bill Of Material				
QTY	Type	Value	Reference	Comments
1	Interface	ERC-Mini V2.0		In enclosure
1	Cable to control-box	Mini-DIN6 – DIN5 1m		
1	USB-cable	A to B 1.8m		

3.4 Connection of ERC-Mini to the control-box

Plug the cable with the Mini-DIN6 into the ERC-Mini and the other side into the control-box.

Plug the USB-cable with the USB-B-connector into the ERC-Mini.

4. Establishing the USB-connection

Plug the USB-A-connector to a free USB-connector on your computer.

Depending on your operating-system, you will be asked to install an USB-driver. This driver is available in the Drivers-folder on the CD delivered with your ERC-Mini.

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 computer. In case you have a conflict with another COM-port (e.g. virtual COM-port), change the COM-port-number in the properties.

5. The Service-Tool for Windows

If you use another OS than Windows (e.g. MacOS or Linux), please read the appendix 5 for calibration and configuration of the ERC-Mini.

The Service Tool is on the CD supplied with the kit.

Start the Setup-File **SETUP ERC-Mini_Vnn.EXE** (nn=version) directly on the CD 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.
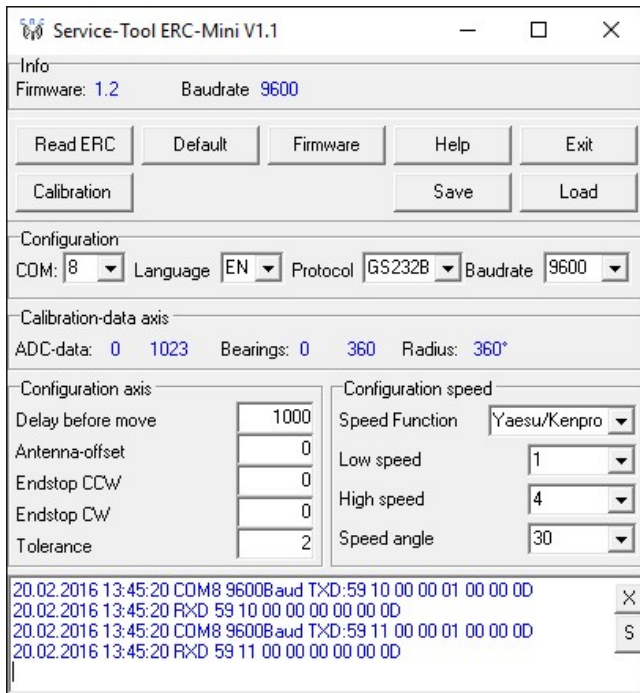
5.1 Configuration of the COM-Port

On shipment, the Service Tool is configured to COM1, which is most properly not the com-port, which was assigned to the ERC-Mini by the hardware-manager of your computer, hence after Start-Up the program may bring up an error-message because of the wrong COM-Port.

Choose the right COM-Port. COM: 4

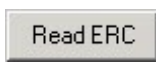The Service Tool will check the availability of the ERC-Mini at the chosen COM-Port. If successful, the Service Tool will read the configuration-parameters of the ERC-Mini and populates the configuration- and the calibration-panels.

5.2 Read the ERC-MINI-configuration-parameters

The parameters of the ERC-MINI can be read by clicking the [Read ERC] button.

5.3 Language

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

5.4 Speed-control

ERC-Mini provides an automatic speed-control like this (example for a speed angle of 30°):
- rotator starts moving with low-speed
- after 30° the rotator speeds up to high-speed
- 30° prior to reaching the target-position, rotator will again slow down to low speed.

This takes away stress from the whole structure, especially with large antenna-arrays or heavy antennas.

The rotators from Create Yaesu-Kenpro allow the speed-control in 4 stages:1 - 2 - 3 – 4, where 1 is the lowest speed and 4 is the highest speed

Speed-Function
Possible values: none – Yaesu/Kenpro - Create
  - choose Yaesu/Kenpro for their rotator-series DXA/DXC and SDX
  - choose Create for their rotator-models ending with –P
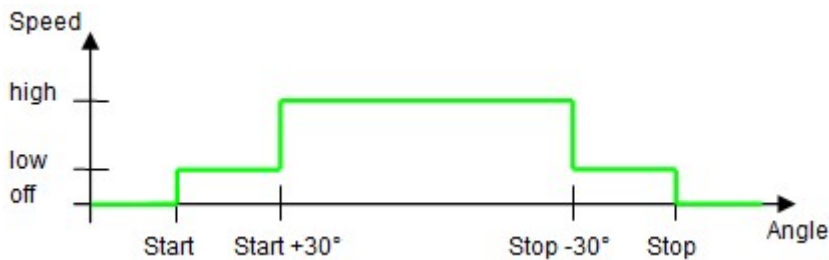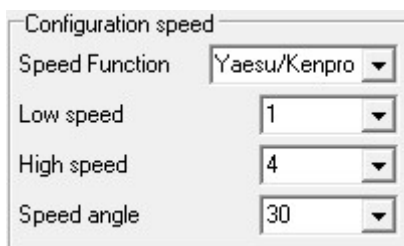 - choose none for Emotator (no Speed-Control)

Low speed (only available if Yaesu/Kenpro has been choosen)
possible values: 1 / 2 / 3 / 4
  - configured to 1: low speed will be performed with speed 1
  - configured to 2: low speed will be performed with speed 2
  - configured to 3: low speed will be performed with speed 3
  - configured to 4: low speed will be performed with speed 4

High speed (only available if Yaesu/Kenpro has been choosen)
possible values: 1 / 2 / 3 / 4
  - configured to 1: high speed will be performed with speed 1
  - configured to 2: high speed will be performed with speed 2
  - configured to 3: high speed will be performed with speed 3
  - configured to 4: high speed will be performed with speed 4

Speed angle (only available if Yaesu/Kenpro or Create has been choosen)
possible values: 0 / 10 / 20 / 30
  - defines the angle for low-speed at the beginning and end of a turn

5.5 Calibration
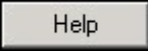
After the ERC-Mini is connected to the computer, it has to be calibrated. This calibration is a one-time-task and the result of calibration will be stored inside the ERC-Mini.
To calibrate the ERC-Mini, it has to measure the rotor-feedback-voltages at both ends including a possible overlap (turning radius > 360°). The calibration is a software-guided procedure, which will be

started by pressing the [Calibration] button of the service tool.

Just follow the instructions given by the calibration assistant and for questions, read the Calibration-section of the help-file available through the Help-button of the Service-Tool.

5.6 Other functions of the Service Tool

The other functions of the Service Tool and the other configuration-items are well described in the help-function of the Service Tool. Click the [Help] button.

6. First check of calibration with Rotor-Control G

The rotor-control-program Rotor-Control G is on the CD supplied with your interface.

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

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

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

The green pointer and number show the current position of the rotator.
A target can be put at the red number and rotation starts by clicking the the GO-button.You can stop the rotation any time by clicking the STOP-button.
You can also move the rotator to a target-position by clicking on any point of the graphic.
By clicking the button PARK, the rotator moves to the configured parking position.

7. Connection of ERC-Mini to other programs

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

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

Appendices

Appendix 1: Specification

ERC-Mini specification

Mechanical Dimensions
- PCB: 67mm x 37,5mm
- Enclosure: 78mm x 40mm x 24mm

DC Supply
- USB-powered 5VDC
- current consumption: max 10mA

Temperature-range
- 0°C to 70°C

Measurement input circuits (rotor feedback voltage)
- range : 0 to 6V against ground
- input-impedance : > 25KOhm
- protected against high voltage bursts coming through the cable
- measurement-resolution: 10 Bit

Outputs
- CW, CCW: Open collector-outputs against ground
- max. current per open-collector-output with 2 outputs simultaneously at 100% duty-cycle and 70° C: 380mA
- Speed: 4 stage DAC with high-Impedance output-voltages of 0,6V to 4,7V

Communication-interface
- USB through type B connector
- USB/serial converter with FTDI-chip

Controller
- 8-bit RISC-architecture
- bootloader to update firmware through USB
- supported protocols for rotor-control
    o subset of Yaesu GS232A / GS232B
    o subset of Hygain DCU-1 and extensions for position feedback

Firmware supported features
- delay before rotator starts moving
- programmable end stops
- antenna offset
- support of overlap up to 180°
- speed-function
- tolerance of position
- software-calibration
- security stop if rotor doesn´t move
- configurable communication-speed: 4800 -9600 Baud
- save and load of all calibration- and configuration-data

Service-Tool and Rotor-Control G
- Supported operating systems
    o Windows 2000 and XP
    o Windows Vista, 7, 8, 10 (32 bit and 64 bit)

Appendix 2: Schematics ERC-Mini
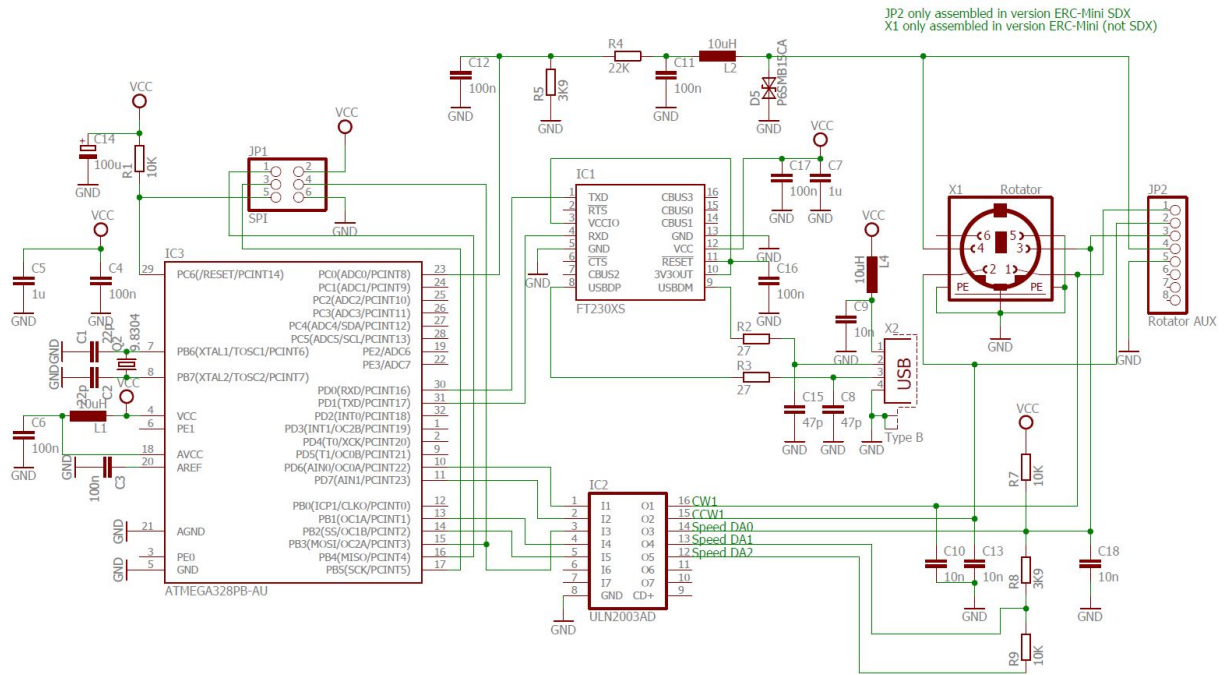
Appendix 3: Assembly-plan ERC-Mini
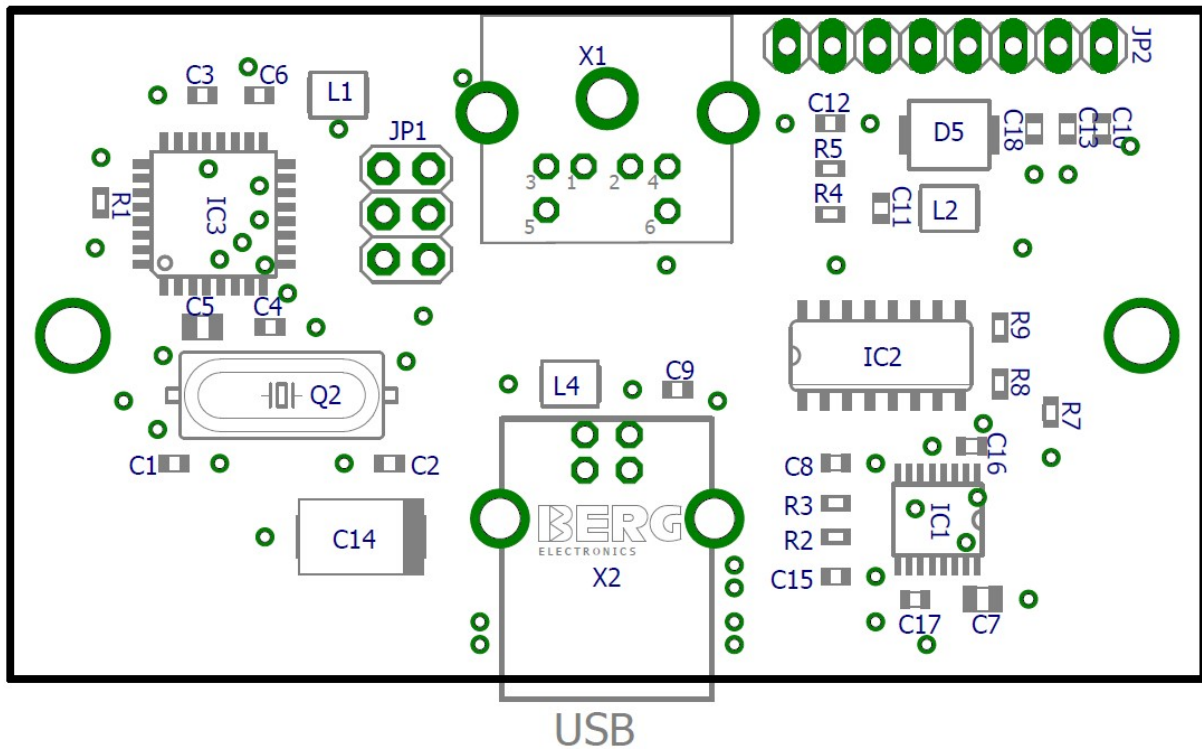
Appendix 4: Rotor-protocol command-set

Remarks for the annotation in this document:

<cr> = carriage return and represent the decimal-value 13 = Hex-value 0Dh
<lf> = line feed and represents the decimal-value 10 = Hex-value 0Ah
aaa = a 3-digit azimuth-position with leading 0
eee = a 3-digit elevation-position with leading 0
<s> = space and represents the decimal-value 32 = Hex-value 20h

Whenever this document refers to elevation, setting a position will be ignored and if a position is requested for elevation it always returns 000.

Hygain DCU-1 with extensions for position-request

Some commands are redundant with slight differences to keep compatibility to the different implementations of the DCU-1-protocol in different programs

| Command to ERC-Mini	Description	Returned from ERC-Mini
AS1;	Stop rotation	
AI1;<cr>	Request position azimuth	;aaa
AI1;	Request position azimuth	;aaa
AM1;<cr>	Execute rotation	
AM1;	Execute rotation	
AP1aaa;<cr>	Set azimuth-position to aaa	
AP1aaa;	Set azimuth-position to aaa	
D	Rotate CCW	
MGaaa	Rotate azimuth to aaa	
U	Rotate CW	
;	Stop rotation	

Yaesu GS232 A and B

The only difference in A and B is the format how a position is returned from the ERC

Command to ERC	Description	Returned from ERC
A<cr>	Stop rotation azimuth	<cr>
C<cr> (in GS232A-mode)	Request position azimuth	+0aaa<cr><lf>
C<cr> (in GS232B-mode)	Request position azimuth	AZ=aaa<cr><lf>
C2<cr> (in GS232A-mode)	Request position azimuth + elevation	+0aaa+0eee<cr><lf>
C2<cr> (in GS232B-mode)	Request position azimuth + elevation	AZ=aaa<s><s>EL=eee<cr><lf>
L<cr>	Rotate CCW 1st axis	<cr>
Maaa<cr>	Rotate azimuth to aaa	<cr>
R<cr>	Rotate CW 1st axis	<cr>
S<cr>	Stops rotation	<cr>
Waaa<s>eee<cr>	Rotate azimuth to aaa and Rotate elevation to eee	<cr>

Appendix 5: API (application programming interface)

If another OS than Windows is used (e.g. MacOS or Linux), the Service-Tool that came with your ERC-Mini is of no use.
In order to perform configuration- and calibration-tasks, ERC-Mini provides a programming-interface, which can be easily used with a terminal-program.

Remarks for the annotation in this document:
<cr> = carriage return and represent the Ascii-code 13 = Hex-code 0D

Start the terminal-program, set the right COM-port and the communication-speed (default speed is 9600 Baud)

These are the commands provided by the API:

Commands to read the settings of the ERC-Mini:

API ERC-Mini V12	to ERC-Mini					from ERC-Mini								Example	Range	Explanation
Command	ASCII					ASCII										
Read Firmware-version	r	F	M	W	(cr)	a	F	M	W	0	1	0	0	(cr)	V1.00	1.00...9.99	
Read Baudrate	r	B	A	U	(cr)	a	B	A	U	9	6	0	0	(cr)	9600	4800/9600	
Read Protocol	r	P	R	O	(cr)	a	P	R	O	0	0	0	1	(cr)	1=GS232B	0/1/2	0=GS232A, 1=GS232B, 3=DCU1
Read Angle Right	r	A	N	R	(cr)	a	A	N	R	0	3	6	0	(cr)	360°	0...360	
Read Angle Left	r	A	N	L	(cr)	a	A	N	L	0	0	0	0	(cr)	0°	0...360	
Read Calibration Right	r	C	A	R	(cr)	a	C	A	R	1	0	1	0	(cr)	ADC=1010	0...1023	
Read Calibration Left	r	C	A	L	(cr)	a	C	A	L	0	0	0	5	(cr)	ADC=5	0...1023	
Read Delay before Move	r	D	B	M	(cr)	a	D	B	M	1	0	0	0	(cr)	1000	0...5000	
Read Programmable Stop Right	r	P	S	R	(cr)	a	P	S	R	0	0	0	5	(cr)	5	0...179	
Read Programmable Stop Left	r	P	S	L	(cr)	a	P	S	L	0	0	1	0	(cr)	10	0...179	
Read Tolerance	r	T	O	L	(cr)	a	T	O	L	0	0	0	2	(cr)	2	0…10	
Read Antenna-Offset	r	A	O	F	(cr)	a	A	O	F	-		0	9	0	(cr)	-90°	-180...+180	
Read Speedfunction	r	S	P	F	(cr)	a	S	P	F	0	0	0	1	(cr)	1	0/1/2	0=no speed function, 1=Yaesu/Kenpro, 2=Create
Read Speed angle	r	S	P	A	(cr)	a	S	P	A	0	0	0	3	(cr)	3	0/1/2/3	0=0°, 1=10°, 2=20°, 3=30°
Read Speed at Low-speed	r	S	P	L	(cr)	a	S	P	L	0	0	0	1	(cr)	1	0/1	0=speed1, 1=speed2, 2=speed3, 3=speed4
Read Speed at High-speed	r	S	P	H	(cr)	a	S	P	H	0	0	0	0	(cr)	0	0/1	0=speed1, 1=speed2, 2=speed3, 3=speed4

Commands to configure and calibrate the ERC-Mini:

API ERC-Mini V12	to ERC-Mini								
Command	ASCII								
Set Baudrate	s	B	A	U	9	6	0	0	(cr)
Set Protocol	s	P	R	O	0	0	0	1	(cr)
Set Delay before Move	s	D	B	M	1	0	0	0	(cr)
Set Programmable Stop Right	s	P	S	R	0	0	0	0	(cr)
Set Programmable Stop Left	s	P	S	L	0	0	0	0	(cr)
Set Tolerance	s	T	O	L	0	0	0	2	(cr)
Set Antenna-Offset	s	A	O	F	0	0	0	0	(cr)
Set Speedfunction	s	S	P	F	0	0	0	1	(cr)
Set Speed angle	s	S	P	A	0	0	0	3	(cr)
Set Speed at Low-speed	s	S	P	L	0	0	0	1	(cr)
Set Speed at High-speed	s	S	P	H	0	0	0	0	(cr)
Set Calibration Left	s	C	A	L	0	0	0	0	(cr)
Set Calibration Right	s	C	A	R	0	3	6	0	(cr)
Set Factory Default Values	s	F	D	V	0	0	0	0	(cr)

Programming examples
(Keep in mind, that every command must be terminated with a carriage-return which is hex 0Dh or decimal 13)

- Example for calibration:
    o Situation: your rotator has an overlap of 90° and is moving clockwise
      180° – 270° – 360° – 90° – 180° - 270°
    o Move your rotator manually to the most counter-clockwise position at 180°
      ▪ Send to ERC-Mini: sCAL0180
    o Move your rotator manually to the most clockwise position at 270°
      ▪ Send to ERC-Mini: sCAR0270
    o The result of calibration can be read back from the ERC-Mini like this:
      ▪ Send to ERC-Mini: rANR
      ▪ ERC-Mini answers: aANR0270
      ▪ Send to ERC-Mini: rANL
      ▪ ERC-Mini answers: aANL0180
      ▪ Send to ERC-Mini: rCAR
      ▪ ERC-Mini answers: aCAR0711 (0711 is the ADC-value at 270° CW)
      ▪ Send to ERC-Mini: rCAL
      ▪ ERC-Mini answers: aCAR0004 (0004 is the ADC-value at 180° CCW)
- Example for setting the delay before move to 2000 milliseconds = 2 seconds:
      ▪ Send to ERC-Mini: sDBM2000
    o The result of setting can be read back from the ERC-Mini like this:
      ▪ Send to ERC-Mini: rDBM
      ▪ ERC-Mini answers: aDBM2000

If a command to ERC-Mini is wrong or a value is out of range an error is reported from ERC-Mini
- If an incorrect read-command was received, ERC-Mini sends: r-ERROR
- If an incorrect set-command was received, ERC-Mini sends: s-ERROR

Appendix 6: Rotor-connections

ERC-Mini	Function	Yaesu/Kenpro SDX 8-pole pinheader	Yaesu/Kenpro DXA/DXC 6-pole Mini-DIN	Create RC5x-3-P 6-pole DIN	Emotator 5-pole DIN
1	CW	1	1	2	2
2	CCW	2	2	5	5
3	Speed	3	3	6	-
4	Position	4	4	1	1
5	GND	5	5	Shield	Shield
6	-	-	-	-	-