



Instructions

Congratulations for buying your EASY-ROTOR-CONTROL M (shortly **ERC-M**). This document will guide you through the needed steps for assembly and configuration of the **ERC-M**. You will reach 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 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. Bill of material (BOM)

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

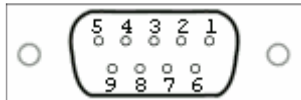
ERC-M RS232 V2.2 Bill Of Material				
QTY	Type	Value	Reference	Comments
1	DSUB-connector	9 pole female solder		for RS232-cable
1	DSUB-case	for 9 pole		for RS232-cable
1	Cable with Phone-Jack	3.5mm Stereo 1.25m		for RS232-cable
1	PCB	ERC-M 2-layer 80x65mm V2.2		
1	Crystal	9.8304 MHz HC49U	Q1	
2	IC-socket	16 pole DIL16	for IC2, IC3	
1	IC-socket	28 pole DIL28	for IC1	
2	Capacitor ceramic	22p 16V 5%	C1,C2	
10	Capacitor ceramic	100n 50V 20%	C3,C4,C6,C9,C10,C11, C12,C13,C14,C22	
6	Capacitor tantal	1u 35V 20%	C7,C8,C17,C18,C19,C20	
1	Phone-Jack	3.5mm Stereo	X10	
1	Mini-fuse	1.0A	F1	
2	Transistor	BC557	T1,T2	alt. BC558,BC559
1	Voltage-regulator	78L05 TO92	IC4	
2	Resistor	4K7 5%	R10,R11	alt. 4K7 1%
4	Resistor	20K 5%	R2,R3,R6,R7	alt. 20K 1%
2	Resistor	39K 5%	R4,R8	alt. 39K 1%
2	Resistor	220K 5%	R5,R9	alt. 220K 1%
3	Coil	10u 10% SMCC	L1,L2,L3	
3	Diode	BAT48	D6,D9,D10	alt. BAT42
3	Diode	1N4004	D1,D11,D13	alt. 1N4007
1	Diode	ZD2.7	D14	
1	Box-header	2x8 pole	X3	
1	Pinheader	1x2 pole	JP1	
1	DC-Jack	2.1/5.5mm	J1	
1	Capacitor electrolytic	100u 16V 20%	C5	
1	DSUB-connector	15 pole female print	X1	
1	Jumper	blue	for JP1	Power/Reset
1	IC	MAX232	IC3	
1	IC	MEGA328P-20PU	IC1	
1	IC	ULN2003AN	IC2	
1	DC-Connector	2.1/5.5/9mm		for DC-cable
1	DSUB-connector	15 pole male solder		for rotor-Cable
1	DSUB-case	for 15 pole		for rotor-Cable
0	not assembled		C15,C16,C21,C23, D2,D3,D4,D5,D7, D8,D12,DC1,L4,R1, R12,X2,XP1	

2. Assembly of RS232 cable

Materials needed:

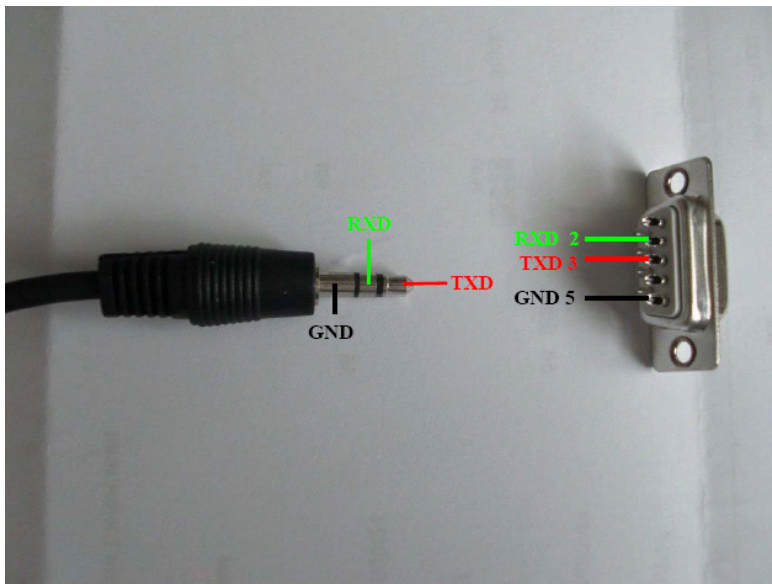
- Cable with 3.5mm Stereo phone-jack
- DSUB-connector 9 pole female
- DSUB-case for 9 pole

Pinning of DSUB seen from the connector-frontside



As the delivered cables differ with their colours, it has to be measured which of the inner cables is connected to what contact of the phone-jack. Alternatively to the 3-wire cable a 2-wire cable with shielding can be delivered. For this kind of cables the both shielding have to be twisted together. The shielding is representing GND.

GND: inner contact of the phone-jack : to PIN 5 of the D-SUB
 RXD: middle contact of the phone-jack : to PIN 2 of the DSUB
 TXD: tip-contact of the phone-jack : to PIN 3 of the DSUB



NOTE: If you use the ERC-M in MASTER-SLAVE-mode over RS232, the pins for RXD and TXD must be crossed for the Master-ERC-M: TXD to Pin 2 and RXD to Pin3 of the D-SUB.



3. Assembly of the PCB

Assemble and solder the components according to the following drawings.

Please read the following instructions before you start:

1. The vertical assembled Diodes should have a distance (1-2mm) to the PCB while soldering. Otherwise there is the risk of overheating these components while soldering.
2. Take care of polarization of the following components (marked red in the assembly drawing):
 - Diodes D1,D6,D9,D10,D11,D13,D14
 - Capacitor Al C5
 - Capacitor tantal C7,C8,C17,C18,C19,C20
 - IC-socket for IC1,IC2,IC3
 - Transistor T1,T2
 - Voltage-regulator IC4
 - Box-header X3
3. Carefully compare the position of the PCB with the drawings before you start to assemble it.

Components :

Colour-code of Resistors:

4K7 5%	yellow-violet-red-gold
alt.: 4K7 1%	yellow-violet-black-brown-brown
20K 5%	red-black-orange-gold
alt.: 20K 1%	red - black-black-red- brown
39K 5%	orange-white-orange-gold
alt.: 33K 1%	orange-white- black-red-brown
220K 5%	red-red-yellow-gold
alt.: 220K 1%	red-red- black-orange-brown

Colour-code of Coils:

10uH 10%	brown-black-black-silver
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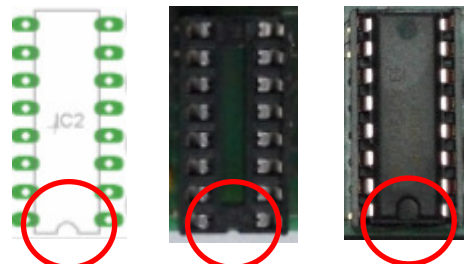
Capacitors ceramic:

22pF	Printing 22 or 22p or 220
100nF	Printing 104

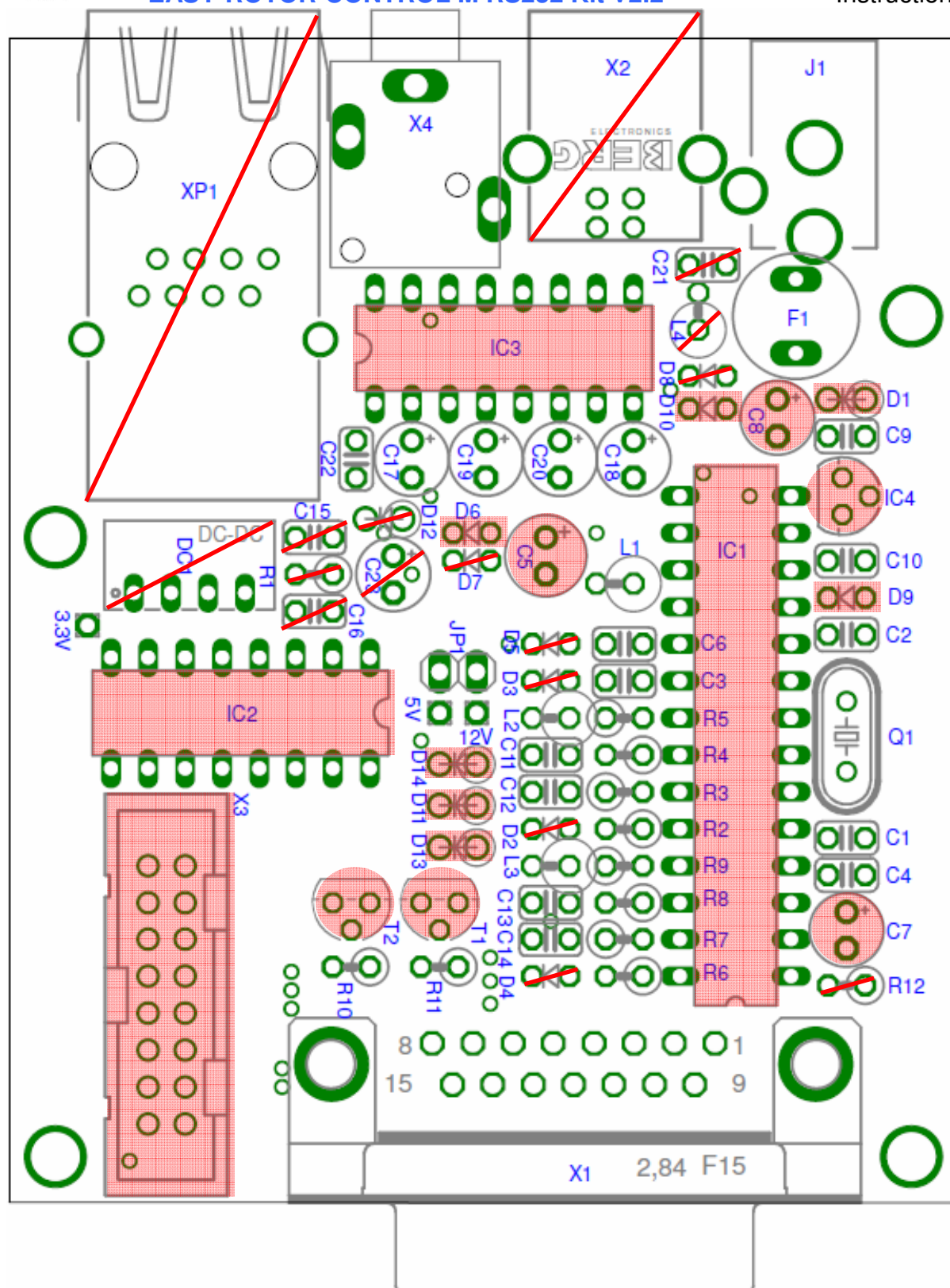
Diodes :

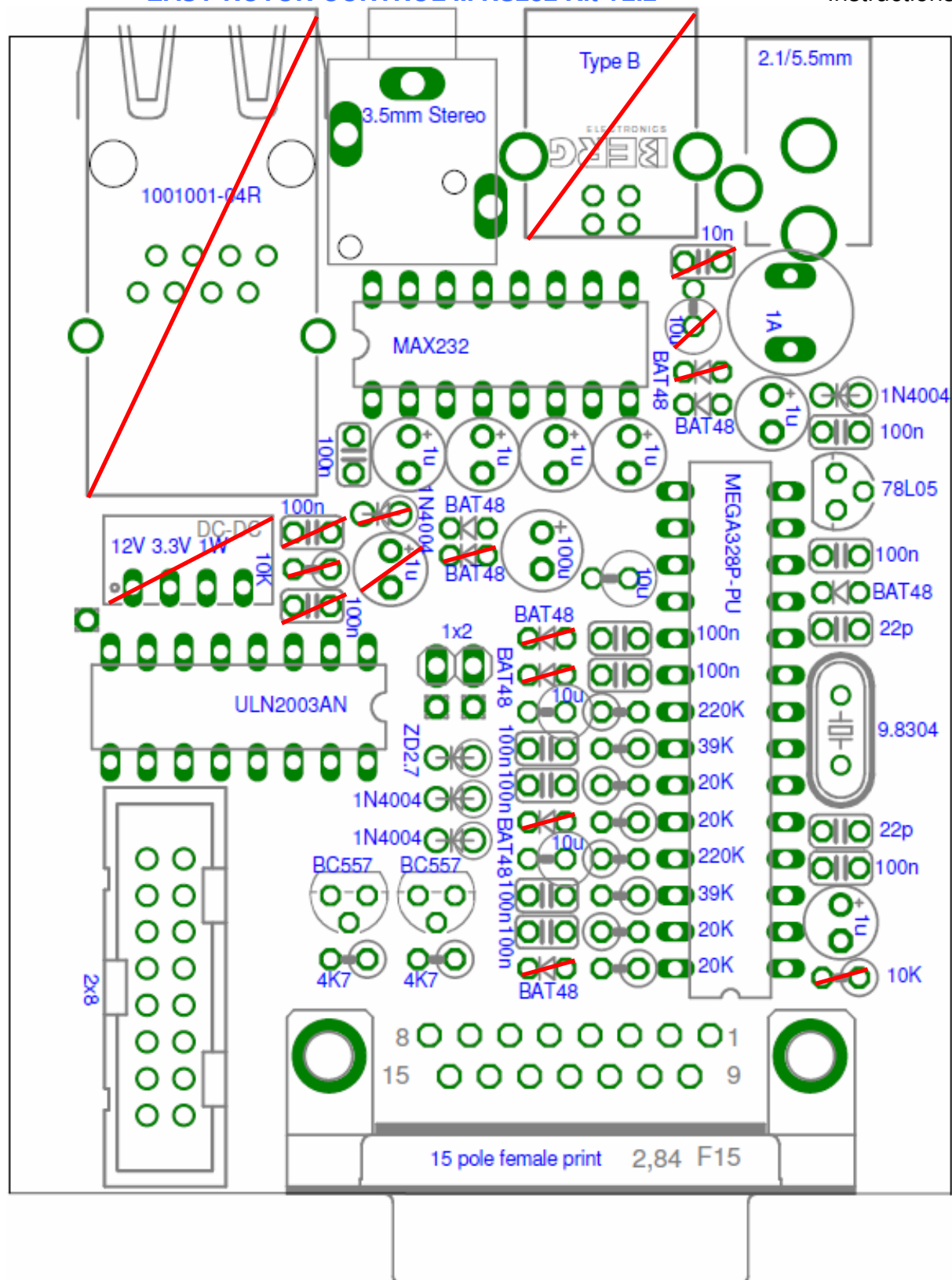


ICs and sockets



Not to be assembled components are marked with a red line in the assembly drawing



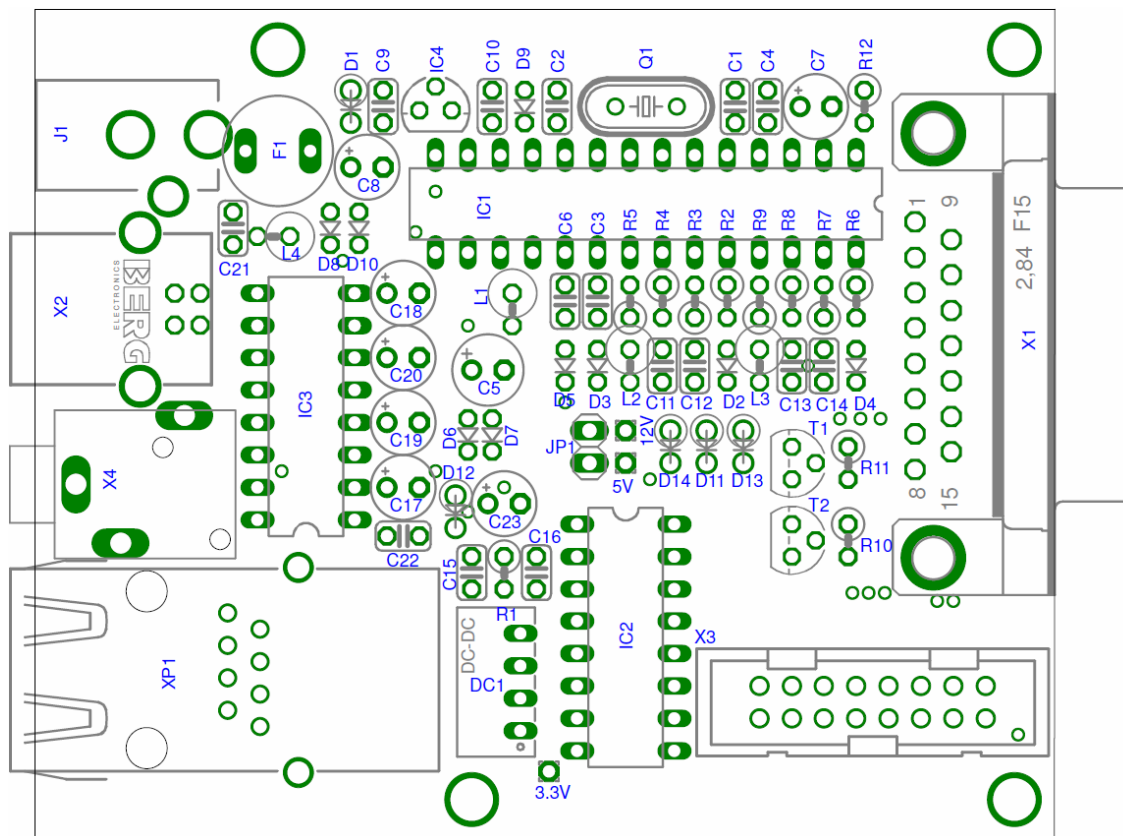
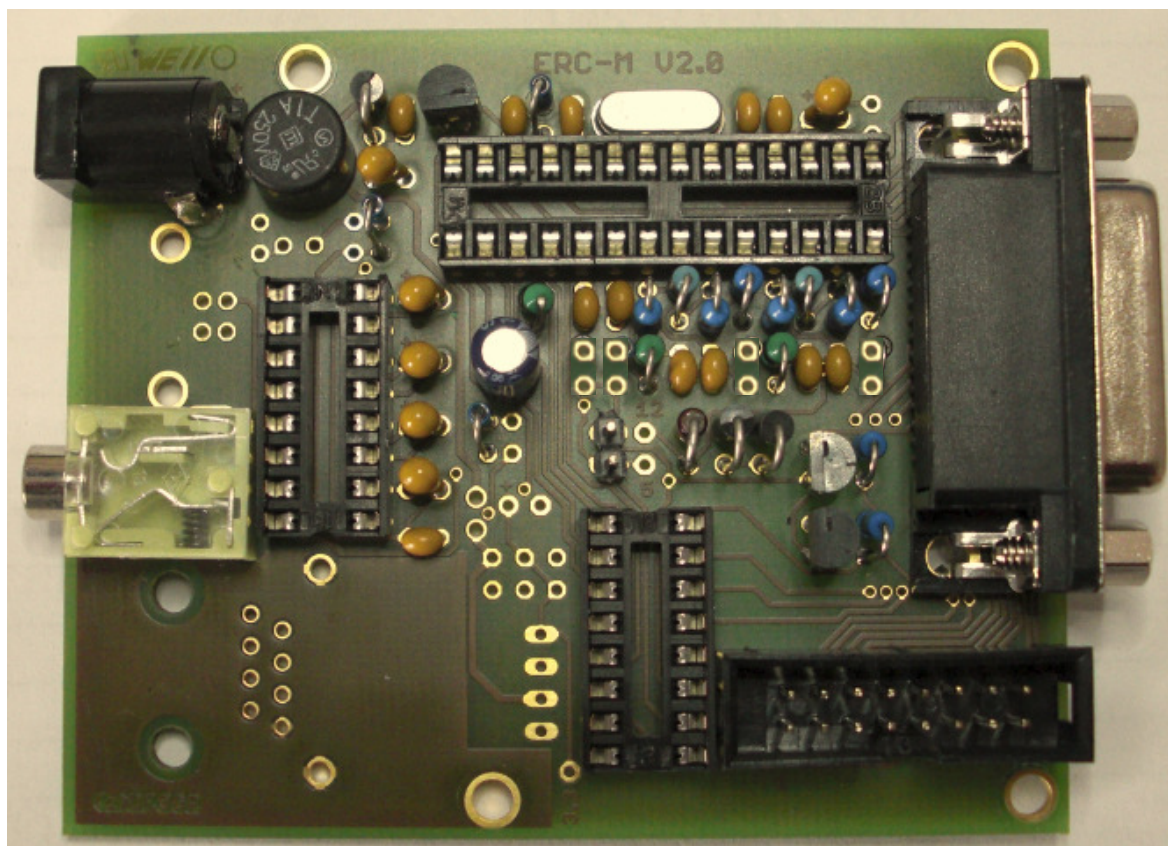




EASY-ROTOR-CONTROL M RS232 Kit V2.2

Instructions

Check carefully the assembly. So, this is how it should look like.





So far, don't put the ICs (MEGA328, MAX232 and ULN2003) into their sockets. First a little electrical test should be performed:

4. Connection of the DC-supply and check of the voltage-regulator

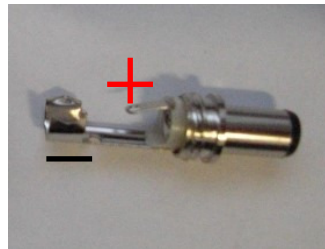
Now put the jumper on the 1x2 pinheader JP1 (the jumper supplies the ERC with +5V).

After checking all assembled components for identity, polarization and solder-bridges, prepare a DC-cable with 10 to 15VDC by using the DC-connector supplied with the kit or use any other DC-supply with that voltage and an appropriate DC-Connector of 2.1/5.5mm.

Connect the **Plus(+)-pole** to the centre contact and the **Minus(-)-pole** to the outer contact.

Before connecting the DC-connector to the ERC-M, measure the voltage at the connector, if it is in the range needed.

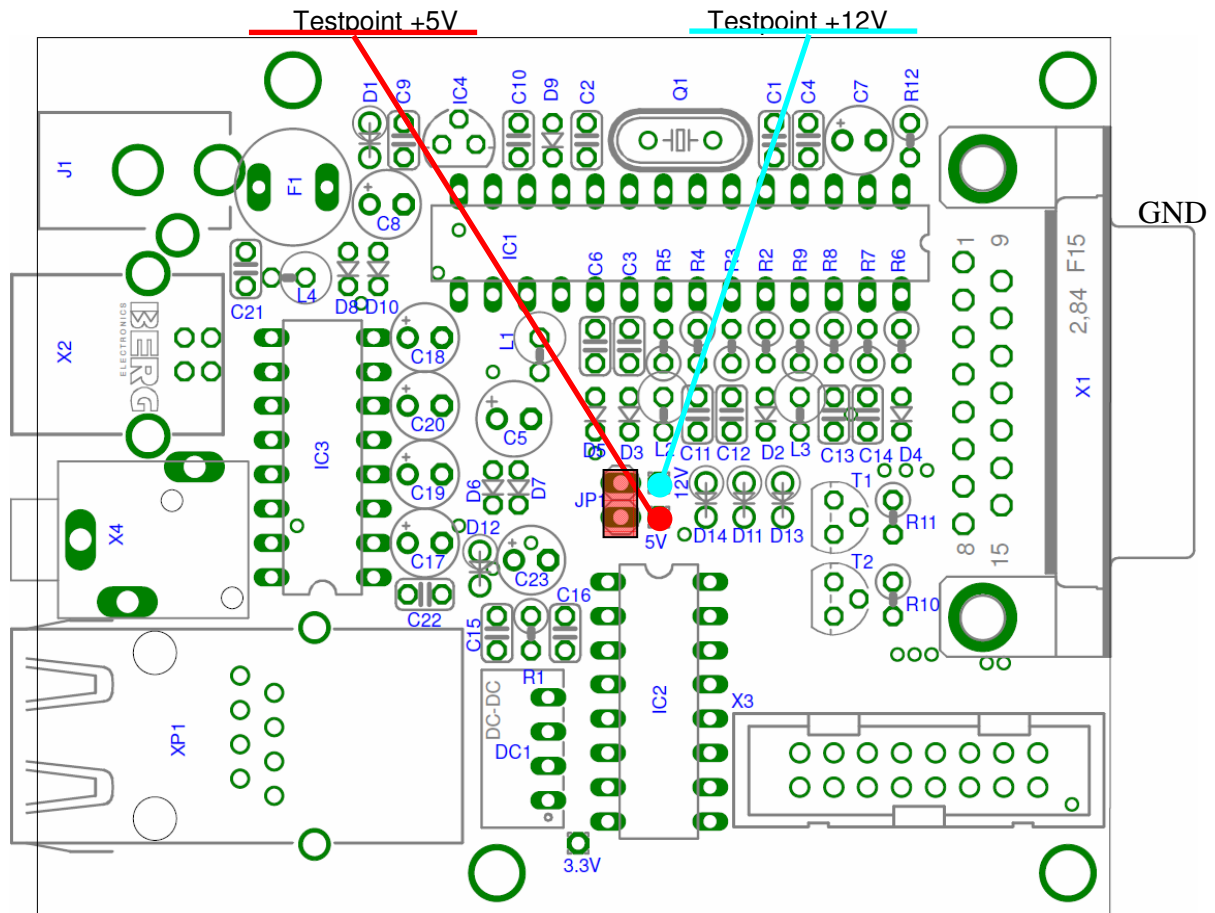
If DC is reversed, nothing will happen as the Circuit is proven against wrong polarization.



Now plug the DC-connector into J1 of the ERC-M. After connecting DC correctly, you should measure +5VDC +/-0.2V at the test-point +5V and +10 to +15VDC at test-point +12V against GND.

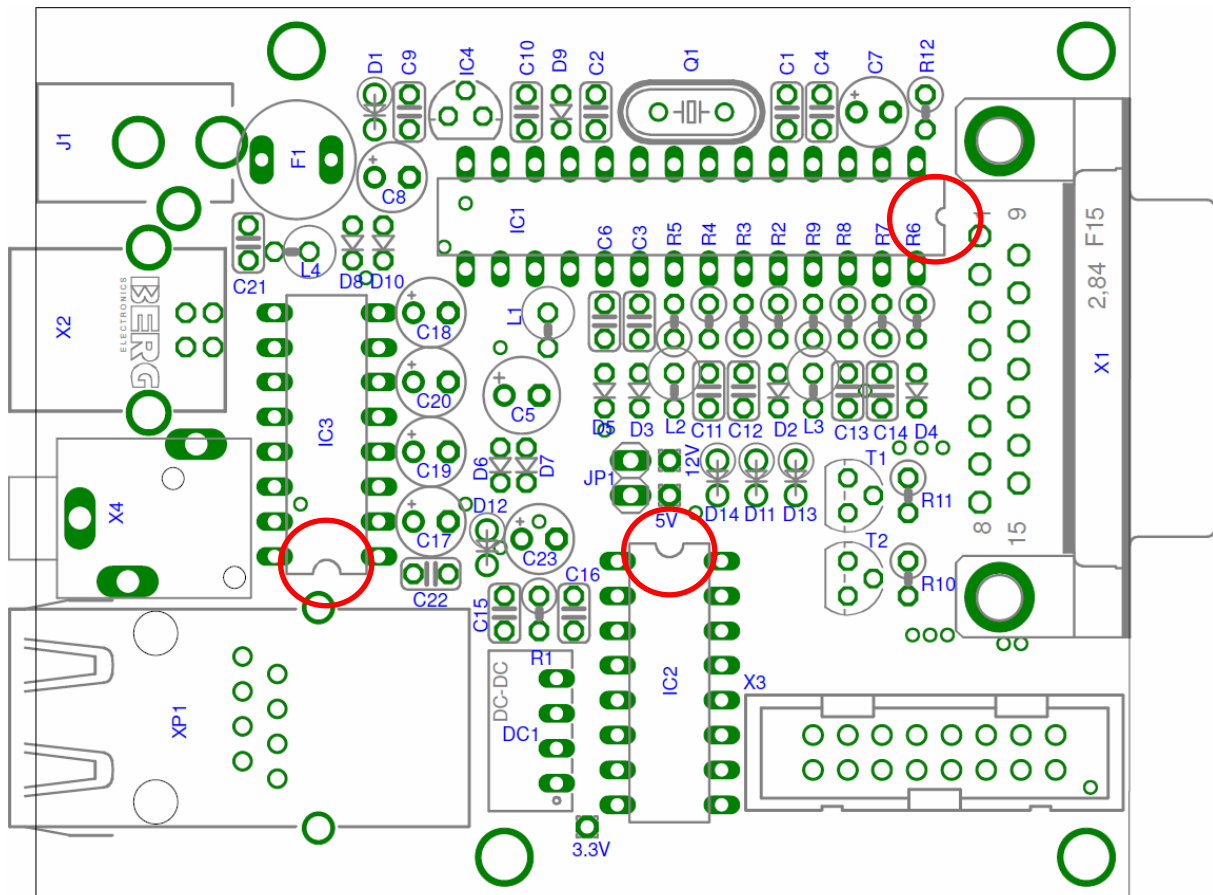
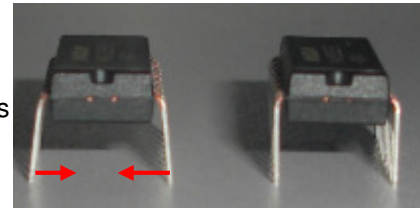
Disconnect the supply now.

The jumper on JP1 must remain now on the pinheader.



5. Insert ICs

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.





6. The Service-Tool

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

Start the Setup-File **SETUP ERC-M_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.

6.1 Configuration of the COM-Port

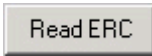
On shipment, the Service Tool is configured to COM1, which is most properly not the com-port, where you connected the ERC-M, hence after Start-Up the program may bring up an error-message because of the wrong COM-Port.

Choose the right COM-Port. 

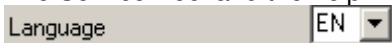
The Service Tool will check the availability of the ERC-M at the chosen COM-Port. If successful, the Service Tool will read the configuration-parameters of the ERC-M and populates the configuration- and the calibration-windows.

You can now perform a little hardware-test before the installation. Click the -button and all LEDs on the HID-PCB and relays on the rotor-cards will be switched on sequentially.

6.2 Read the ERC-M-configuration-parameters

The parameters of the ERC-M can be read by clicking the  button.

6.3 Language

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

6.4 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  button.



7. Theory of operation

A Microcontroller receives commands via the RS232- or USB or LAN-interface in the Yaesu GS-232B (or GS-232A) or DCU-1 protocol from the programs that support controlling rotators.

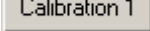
The ERC-M takes the task to move the rotator to the desired position or to stop the rotator while it is moving. Also changes of the direction are possible while the rotator is moving. The current position of the rotators is calculated from the measured rotor-feedback-voltages AZ and EL. To achieve accurate function, the ERC-M has to be calibrated to the specific value of the rotor-feedback-voltages (ref. to the next chapter).

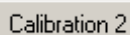
Depending on the direction to move, the contacts CW and CCW or UP and DWN are tighten to ground. With a programmable delay the contact AUX1 and AUX2 will be activated to control the speed or the brake of the rotator.

The ERC-M is powered either the USB-bus, by the control-box it is connected to or by external 10..12VDC. The current consumption is according to the USB-specifications. Using an USB-hub may require to power this hub. Wherever there is a suitable DC-supply available on the rotor-controllers remote-jack, it is taken from there to supply the ERC-M. The ERC-M is than switching automatically to the external supply in order not to drawn current from the USB-bus.

8. Calibration

After the ERC-M 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-M, it has to measure the rotor-feedback-voltages at both ends including overlaps (turning radius $> 360^\circ$). The

calibration is a software-guided procedure, which will be started by pressing the  or



button of the service tool. Just follow the instructions given by the calibration assistant.

If the feedback-voltage of the rotator has unlineraities, an extended calibration can be performed every

30° for azimuth or every 15° for elevation by pressing the  or  button.

9. First check of calibration with Rotor-Control M

The rotor-control-program Rotor-Control M is on the CD supplied with the kit.

Start the Setup-File **SETUP RC-M_Vnn.EXE** 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 puts an icon on your desktop.

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

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

The green pointers and numbers show the current position of the rotators.

Targets can be put at the red numbers.

You can control the rotators for Azimuth and Elevation separately or together. Click the GO- or STOP-buttons.

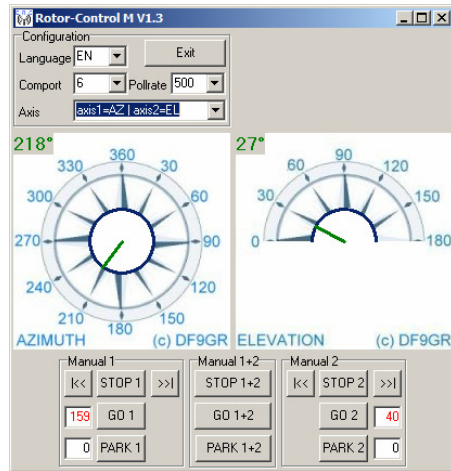
You can also move a rotator to a target-position by clicking on any point of the graphics.

By clicking the button PARK, the rotators move to their configured parking positions.

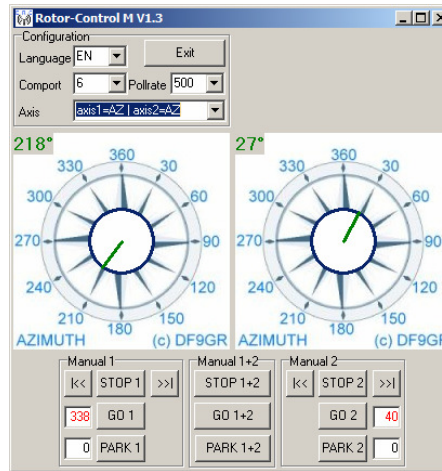


Rotor-Control M can be configured to work for a single-axis setup or a dual-axis setup.

AZ&EL



AZ&AZ



AZ only



10. Connect the ERC-M to other programs

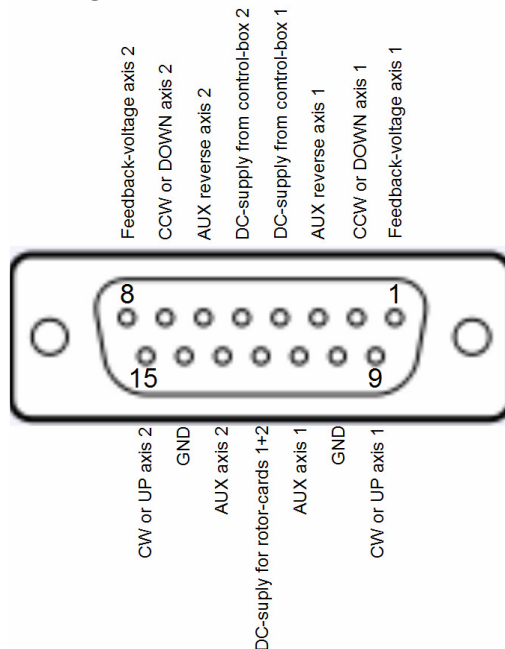
Please take care about the following issues, if you want to control your ERC-M with other programs :

- Choose the right COM-port
- COM-port-speed in the program must be same as in ERC-M
 - o The speed of ERC-M is shown during the start-up on the LCD or 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-M (Yaesu GS232B, GS232A or Hygain DCU-1)
 - o The protocol of ERC-M is shown during the start-up on the LCD or in the service-tool

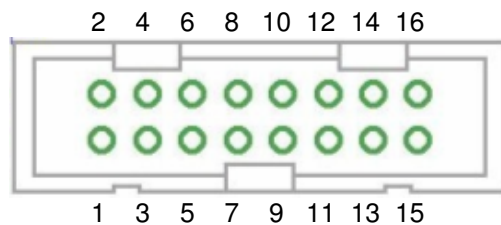
Appendix

Appendix 1: Pin-out of D-SUB15 ERC-M

Connector seen from outside to the female connector on ERC-M or on the back of the desktop-housing.



Appendix 2: Pin-out of the HID-connector on ERC-M



Pin		Pin	
1	GND	9	LCD E
2	VCC	10	LCD RS
3	Keyboard Common	11	LED AUX2
4	+5V	12	LED AUX1
5	LCD D7, Keyboard UP	13	LED DWN
6	LCD D6, Keyboard DWN	14	LED UP
7	LCD D5, Keyboard CW	15	LED CCW
8	LCD D4, Keyboard CCW	16	LED CW

Appendix6: Schematics

