

Assembly Instructions Portable MikroKopterTool 3.9m (V15)

(If errors or useful additions to this description, please info to me)

First, the components must be sorted. Sometimes they are labeled and the other can be assigned quantitatively. I put one ahead of the resistors or capacitors, LEDs can be distinguished. In the parts list the characteristics of the components are marked to identify them more easily. In e.g. with the LED's are the only distinction based on the amount of other components are detected on the form.

Partlist:

im Bausatz	Anzahl	Information/Beschrift.	Value	Parts	Device
x	1	1584 blau	1M58	R48	Widerstand SMD 0805
x	6	1001	1k	R25, R26, R33, R34, R38, R47	Widerstand SMD 0805
x	1	2201	2k2	R41	Widerstand SMD 0805
x	2	22R0	22	R51, R52	Widerstand SMD 0805
x	1	4702	47k	R45	Widerstand SMD 0805
x	3	1003	100k	R39, R49, R50	Widerstand SMD 0805
x	7	2400	240	R8, R21, R23, R24, R31, R32, R36	Widerstand SMD 0805
x	1	3093	309K	R46	Widerstand SMD 0805
x	3	4700	470	R19, R20, R37	Widerstand SMD 0805
x	5	1801	1k8	R7, R9, R10, R11, R13	Widerstand SMD 0805
x	9	3301	3k3	R14, R15, R16, R17, R18, R28, R30, R40, R43	Widerstand SMD 0805
x	1	4701	4k7	R22	Widerstand SMD 0805
x	3	1002	10k	R1, R12, R42, R44	Widerstand SMD 0805
x	2	1000	100	R27, R29	Widerstand SMD 0805
x	3	1500	150	R3, R5, R6	Widerstand SMD 0805
x	2	Grösse 0603 grün	PGB101	R53, R54	VARISTORCN0805
x	14	transparent	1µ	C6, C7, C8, C9, C10, C13, C15, C16, C17, C18,C21,C23,C26, C29	KerKo SMD 0805
x	2	beschriftet	22p	C4, C5	KerKo SMD 0805
x	1	Weiss, unbeschriftet	33n	C31	KerKo SMD 0805
x	8	Weiss, unbeschriftet	100n	C3, C12, C14, C19, C27, C30, C32, C33	KerKo SMD 0805
x	1	transparent, unbeschr.	10µ	C22	KerKo SMD 0805
x	1	100CFK	100µF	C24	Elko Low ESR 53CLV-0605
x	3	10 25V	10µ 16V	C20, C25, C28	Elko-CT7343
x	1	A6E, transparent	1µ	C11	Elko SMCA
x	1		20 MHz	Q1	CRYSTALCTS406
x	1		L-PISG 4,7µH	L2	L-EUPISG, Pulse P0770.472T
x	1	100	10µH	L1	LQH3C, FASTRON 1008AS-100K
x	4	W1	SD 103BW	D3, D4, D6, D8, D9 !!!!!D3 auf keinen Fall bestücken!!!!!!	DIODE-SOD123
x	3	Z14, 3 Pins	SMDZD 3,3	D1, D2, D5	ZENER-DIODESOT23
x	1	TR14	MBRS140	D7	SCHOTTKY-DIODESMD
x	1		blau	LED2	LEDCHIPLED_0805
x	2		gruen	LED3, LED5	LEDCHIPLED_0805
x	4		rot	LED1, LED4, LED6, LED8	LEDCHIPLED_0805
x	1		rot	LED7	3mm LED
x	3	1Gt	BC847CSMD	T1, T2, T4	BC847CSMD
x	1		FDT434P	T3	FDT434P
x	2		74HCT125D	IC4, IC5	74HCT125D
x	1		FT232RL	IC6	FT232RL
x	1		LT1308	IC7	LT1308
x	1		MAX1811N	IC8	MAX1811N
x	1		MCP1703 3,3V	IC9	MCP1703DB
x	1		Atmega1284P-AU	IC2	Atmega1284P-AU
wahlweise	1		IC1-LED	Displaybeleuchtung	EA_LED55X46
wahlweise	1		EADOGM128	IC1	EA_DOG-M_DISPLAY
wahlweise	1		BTM-222_Bluetooth	IC3	BTM-222
wahlweise	1		WI232EUR	IC10	WI232EUR2
x	1		MINI-USB-SHIELD-UX60-MBX1		MINI-USB-A
x	1		SMA-	X2	SMA- Buchse
x	1		PS25/2	X3	PS25/2 Reichelt
x	4		SMDTASTER	S1, S2, S3, S4	SMDTASTER
x	1		20 pol Buchsenleiste		Präzisionsbuchsenleiste RM2,54mm
x	2		3 pol Buchsenleiste		3mm hoch
x	1		31mm Draht	BT-ANT1	ANTENNA Optional
x	1		5V Summer	SG1	F/TMB
x	1		FC_HD2X5	SV2	2x5 Pol Pinheader
x	1		ISP	SV1	6 Pol Pinheader
x	1		Gehäuse		Strapubox 2062

Important: do not solder D3!

The installation position of Q1 does not matter, will always fit.

Attention R35 is 0 ohm, i.e. a solder bridge, Bluetooth antenna is not optional, as solder wire 3.1 cm

Important Note:

On PKT only one 1S battery (3.7 V) are connected, the maximum voltage at the battery terminal must not exceed 5V.

Check the polarity!

**Do not use SJ1 to switch Outvoltage from 5V to 3,3V at SV2.
This leads to the immediate destruction of all 3.3 V components.
Reason: Layouterror**

The kit does not include the Bluetooth antenna, ISP connector, housing, LIPO.

The red highlighted components are optional and are not fitted.

In the circuit board are located centrally below the buttons holes, these can be used as a drilling aid for the key holes in the casing.

The assembly of printed circuit board should be gradual.

1. Lipoloader

Note on the battery, there must be a Li-ION or LIPO battery, so cell voltage 3.7 V.

First, the lipo charge controller and the USB connector is fitted.

Here are the jumper SJ2 SJ3 must be observed.

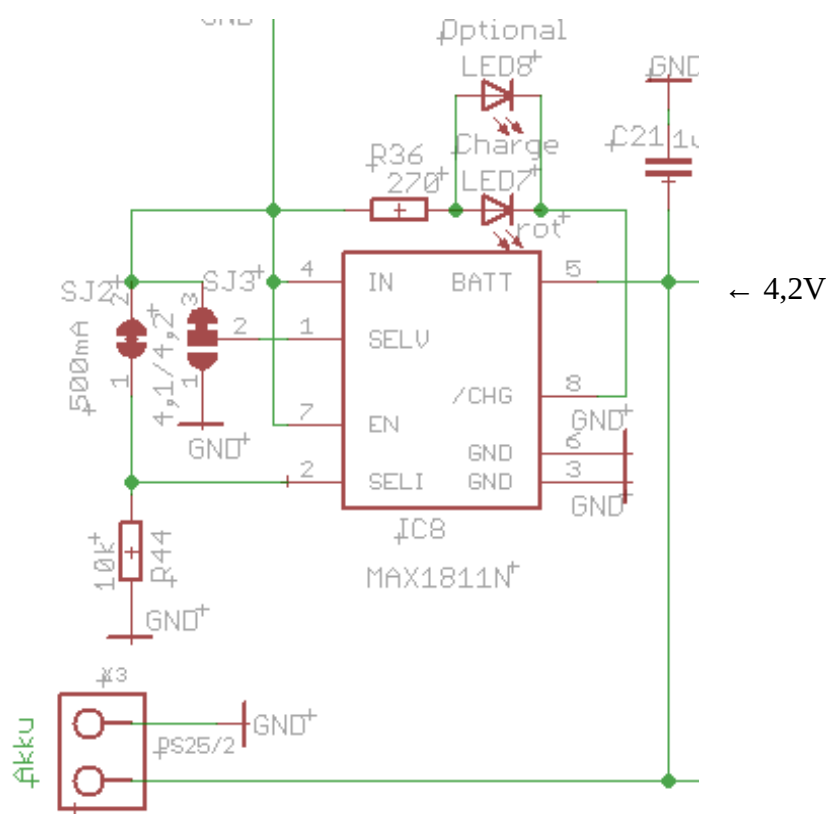
Depending on the battery here have the right connections are made.

The charging voltage can be set to 4.1 or 4.2 and the charging current of 100mA (no bridge) and 500mA (with bridge).

POINT: therefore also from PC via USB can be loaded with 500 mA, will later be described as the FT232 is programmed, the information he needs the USB to the PC USB 500mA. This only works if PKT is in USB mode and not in the Bluetooth mode.

Default is the bridge for LIPO 4.2V and 500mA charging current

Please also note the datasheet for Max1811N when it comes to the selection of the 1S-rechargeable batteries.



Connect USB cable to PC, now at the output of the MAX1811 should approximately 4.2 V can be measured. Then remove the USB cable again.

Excerpt from MAX1811 data sheet:

General Description

The MAX1811 is a single-cell lithium-ion (Li+) battery charger that can be powered directly from a USB port* or from an external supply up to 6.5V. It has a 0.5% overall battery regulation voltage accuracy to allow maximum utilization of the battery capacity.

The charger uses an internal FET to deliver up to 500mA charging current to the battery. The device can be configured for either a 4.1V or 4.2V battery, using the SELV input. The SELV input sets the charge current to either 100mA or 500mA. An open-drain output (CHG) indicates charge status.

The MAX1811 has preconditioning that soft-starts a near-dead battery cell before charging. Other safety features include continuous monitoring of voltage and current and initial checking for fault conditions before charging.

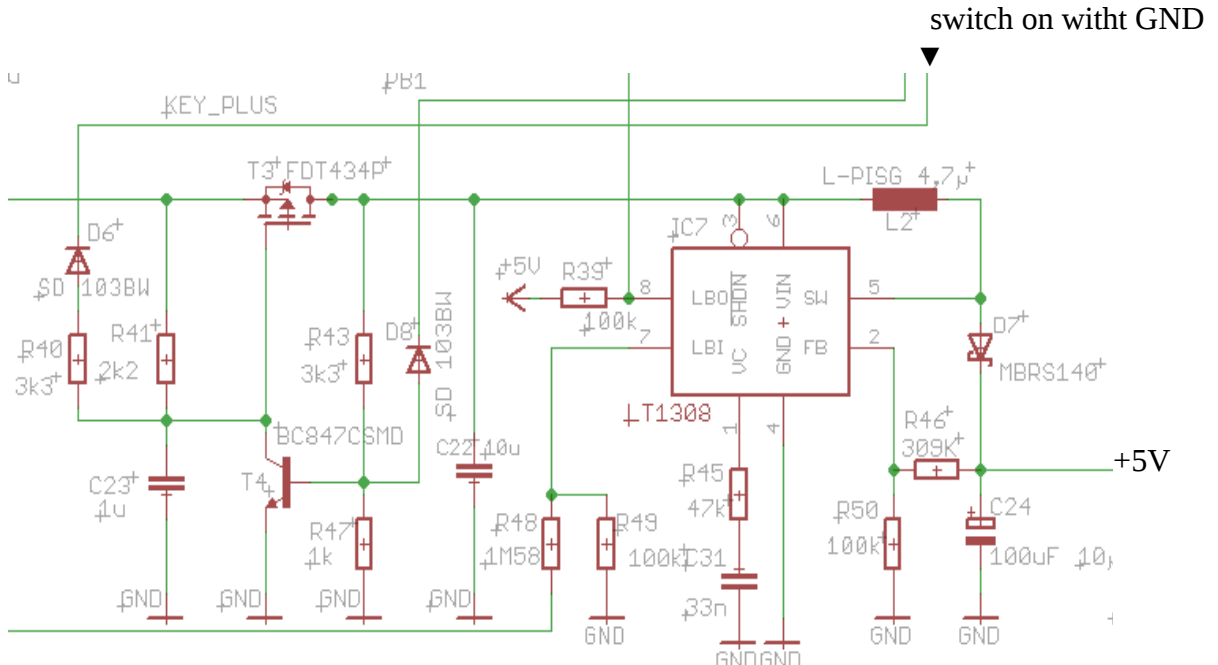
The MAX1811 is available in a small 1.4W thermally enhanced 8-pin SO package.

Features

- ◆ Charges Single-Cell Li+ Batteries Directly from USB Port
- ◆ 0.5% Overall Charging Accuracy
- ◆ Minimal External Components
- ◆ Input Diode Not Required
- ◆ Automatic IC Thermal Regulation
- ◆ Preconditions Near-Depleted Cells
- ◆ Convenient Power SO-8 Package (1.4W)

For the charge control can be used to solder SMD LED, or alternatively a 3mm LED.

2. Power supply +5 V to the voltage converter



Do not Lipo for checking, should anything be fitted incorrectly or a short circuit exist, then it smokes. Re-insert USB cable, gauge to the output +5 V and GND and then connect the cathode of D6 GND, alternatively, you can also temporarily switch S1 with two solder pins to show the display and use it, this is the slide switch. The voltage remains switched on. Off can be connected to GND at the cathode of D8.

It may well be that after inserting the USB voltage without GND D6 is turned on. Important at the moment is to measure the 5V to D7/C24 are

If 5V is to measure the part is finished. Remove USB cable

3. Voltage Monitoring

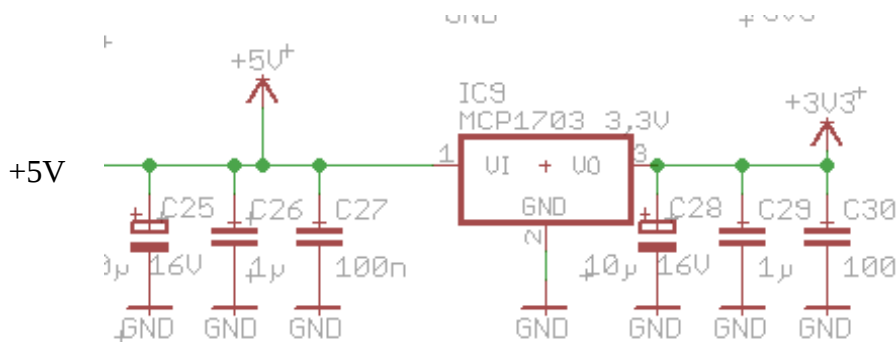
For monitoring the voltage of the PKT-Lipo the LT1308 is in charge, there is life, the resistors R48 and R49. The resistance of 1.58 M is getting a bit difficult, you can also use alternatively 1.5 M. With 1.58 M resistor, the warning threshold is between 3.3 to 3.4 volts, with 1.5 M at about 3.2 volts, for safety reasons set slightly higher. Due to the scatter in the resistances accurate compensation only with 1% resistors would be possible. The LT1308 toggles even before the low battery terminal voltage of the LBO pin reach as the PKT give an early warning can be switched only when LBO is permanently switched off, the PKT.

The formula to calculate:

$$R48 = \frac{V_{LB} - 200mV}{2\mu A}$$

see also the LT1308 data sheet.

3. 3V power supply with voltage regulator



Creating After the assembly of this part of SJ1 pin 1 meter and turn on voltage (see above). Alternatively, one can also measure where the 3.3 V Displaypin 34.

4. Remaining components

If the voltages are all in order until the remainder can be fitted to the Wi.232 and Bluetooth module.

The LED lighting of the displays put on the display, remove the protective film before.

The lighting is on the side, with each of the three pins, soldered to the left and right display

The Atmega1284 is already flashed with the bootloader, so switch on the PKT with the button switch S1 . If the boot loader runs, the PKT can be flashed with the software from SVN.

To start the boot loader must be at power with the left button simultaneously pressed the right button until the red LED (left) is lit. Then you have 30 seconds time to load the program. Then turn off your boot loader and the program starts.

Then you have to start again, start from either the menu or the boot loader when you turn down the right button down.

If the processor was soldered without a boot loader, is the bootloader programming necessary with a AVR Programmer. To these must be connected to the 6-pin. ISP connector to be soldered on the PCB. The boot loader can only be flashed through the ISP connector.

Programmer connect to ISPt and flash the boot loader.

Settings for the Fuse bits:

Low-Fuse: D7

High-Fuse DC

Ext-Fuse: FC

Either you use the programmer for each associated program or you can use AVR-Dude.

In this case, start with the following parameters AVR-Dude:

Windows

```
avrdude-pm1284P-cstk500v2-PCOM1-b115200-V-u-Uflash: w: bootlader_1284P.hex: a-Ulfuse: w: 0xd7: m-Uhfuse: w: 0xDC: Uefuse m: w: 0xfc: m
```

-PCOM1 is the respective COM port to which the programmer is

Linux:

```
avrdude-pm1284P-cstk500v2 -P/dev/ttyUSB0-b115200-v-u-Uflash: w: bootlader_1284P.hex: a-Ulfuse: w: 0xd7: m-Uhfuse: w: 0xDC: Uefuse m: w: 0xfc: m
```

(Note: Beware of copy and paste check!)

-P/dev/ttyUSB0 Is the respective COM port depends on the programmer.

If the boot loader is active to flash to the program, call AVR-Dude with the following parameters:

```
avrdude-pm1284p-cavr109 -P/dev/ttyUSB0 Uflash-b115200-V: W: GPL_PKT_V3_5_2_FC086_HW3_9_atmega1284p.hex: a
```

(Note: Beware of copy and paste check!)

P = COM interface as described above.

After the flash is switched off again PKT, then turn with the left button, hold button until the buzzer beeps.

Until then, everything is fine now can gradually (note round mark in the housing and solder as shown in drawing), the Bluetooth module and the Wi.232 be installed. Modules must be installed with insulation under the modules PCB-Borad to prevent the modules make contact with the circuit board . Use tape or a thin plastic strip, a little distance on board also helps with any desoldering of the module.

BTM-222 first order, then Wi232

After placing BTM-222 switch on PKT, the module is detected and initialized.

Bluetooth PIN and name can be changed in Setup.

The Bluetooth antenna must be a wire (3.1 cm) soldered.

Then the module is soldered Wi.232.

After assembly of the module Wi232 and switch on, PKT, the module is automatically recognized and configured with the default parameters. This can be changed in the setup menu.

5. Bluetooth manually configure

Alternative way to configure the Bluetooth BTM-222

If the module is always initialized with the PKT, it stands to 57600, Echo of and Answer of.

These MK-USB with an adapter for the pins 1 and 9 are cross connect to PKT and in the setup menu, go to Bluetooth and select the PC configuration. Serial terminal program, for example Hyperterminal with 19200 on the PC and proceed according to the wiki BTM-222.

Required AT commands

To the BTM-222 to operate at the copter, it is imperative to set the following parameters:

ATR1 Device is slave

ATL4 57600

ATE0 ECHO off (otherwise the reset FC) *

ATQ1 feedback off! *

ATN = Name of the BT module (optional)

ATP awarded PIN = 1234 (default = 1234, optional)

If the parameters were changed with a * are no more messages in Hyperterminal. If you want to change something, these two parameters must be brought back to its original state!

Optimized order:

ATL4 57600

Now change the baud rate in the terminal program to 57600 baud!

ATR1 Device is slave

ATN = Name of the BT module (optional)

ATP awarded PIN = 1234 (default = 1234, optional)

ATQ1 feedback off! *

that was the last command, which is acknowledged with an OK

ATE0 ECHO off

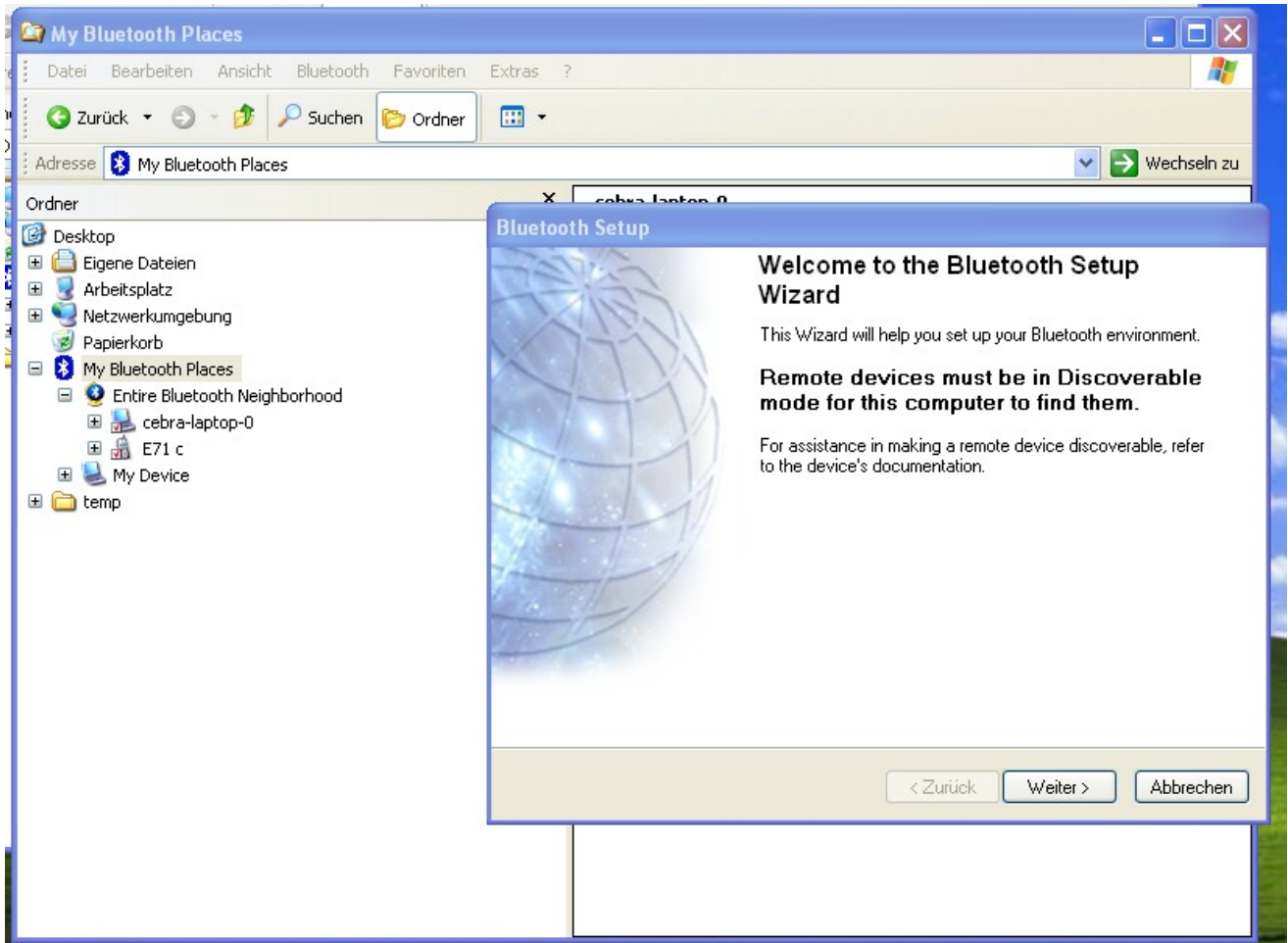
this command returns an OK!

More info here:

[http://www.mikrokopter.de/ucwiki/BTM-222?highlight=%28btm-222%29#BTM-222 Bluetooth Modul](http://www.mikrokopter.de/ucwiki/BTM-222?highlight=%28btm-222%29#BTM-222%20Bluetooth%20Modul)

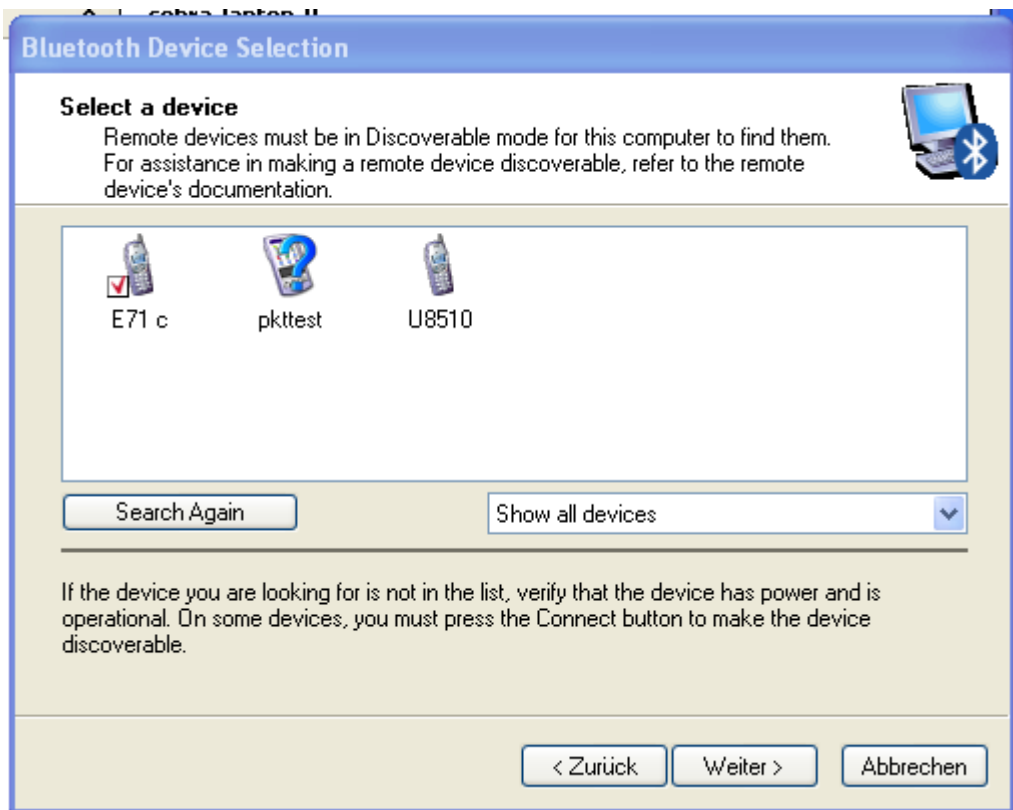
6. Bluetooth in the PC

If the PC in the Bluetooth configuration, the PKT is visible, but no services will be displayed (No Services found), then you have the Bluetooth configuration of the PC under the Local Services to add a serial device. If that is there to connect to this Bluetooth serial device and it has a COM interface that can connect to the MikroKopterTool.



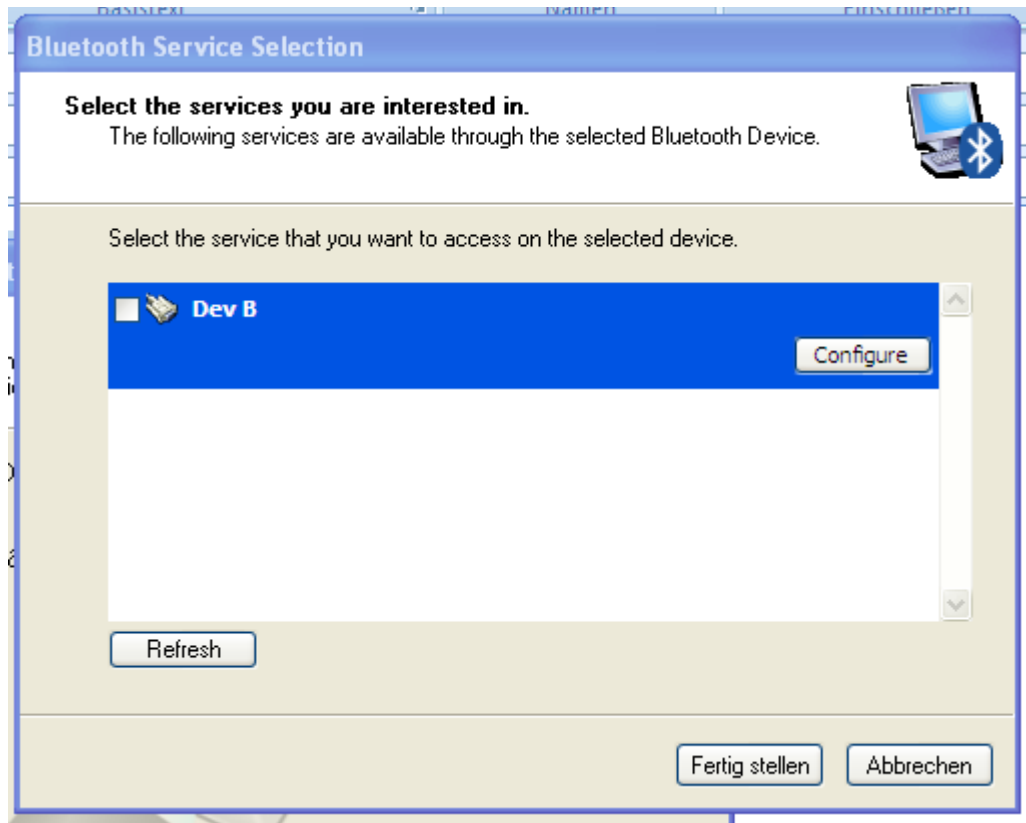
1. Second Bluetooth devices search

If the device PKT GNU GPL (In the example pkctest) appears click continue

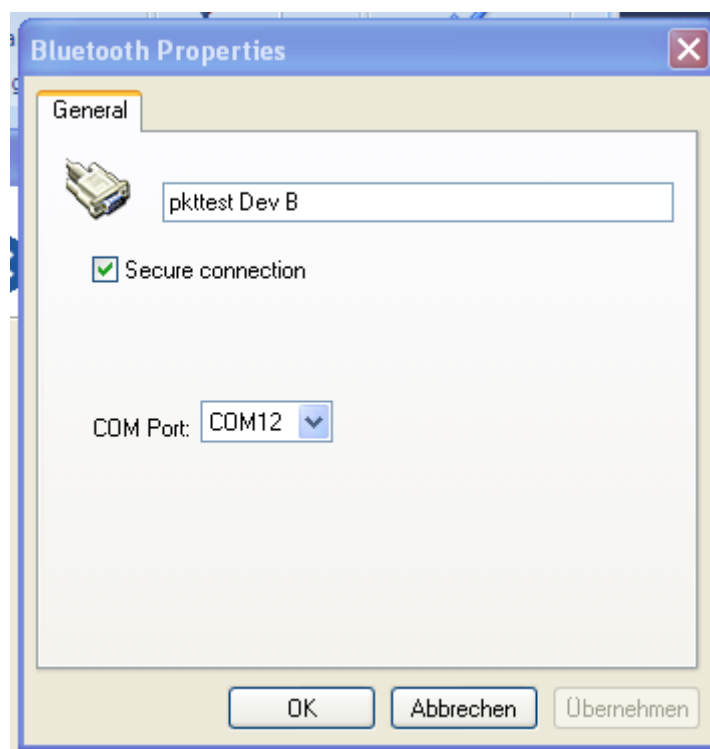


3. Put in Pinnumber = 1234

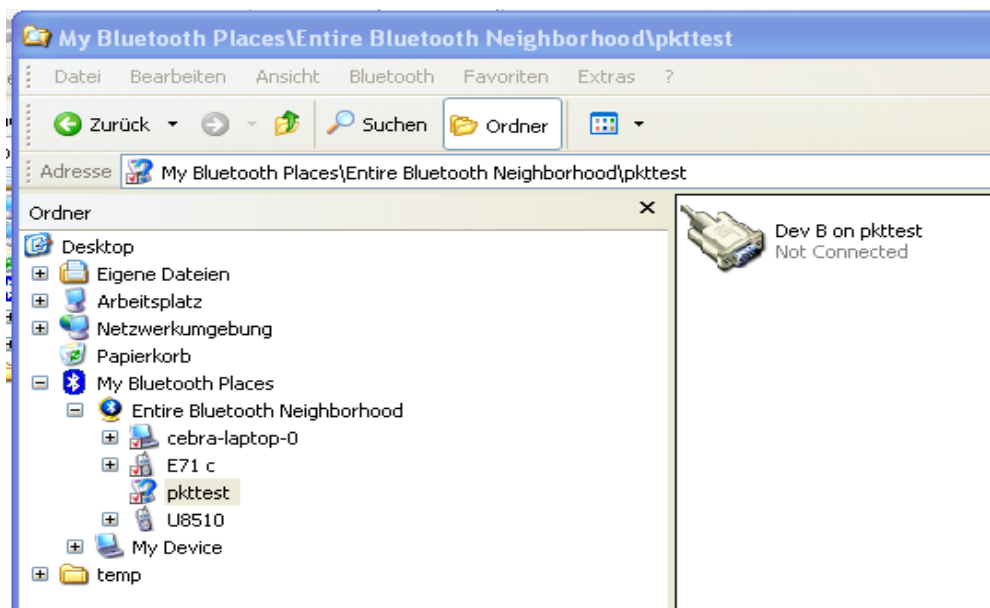
4. After successful pairing will open a window, then click on Configure



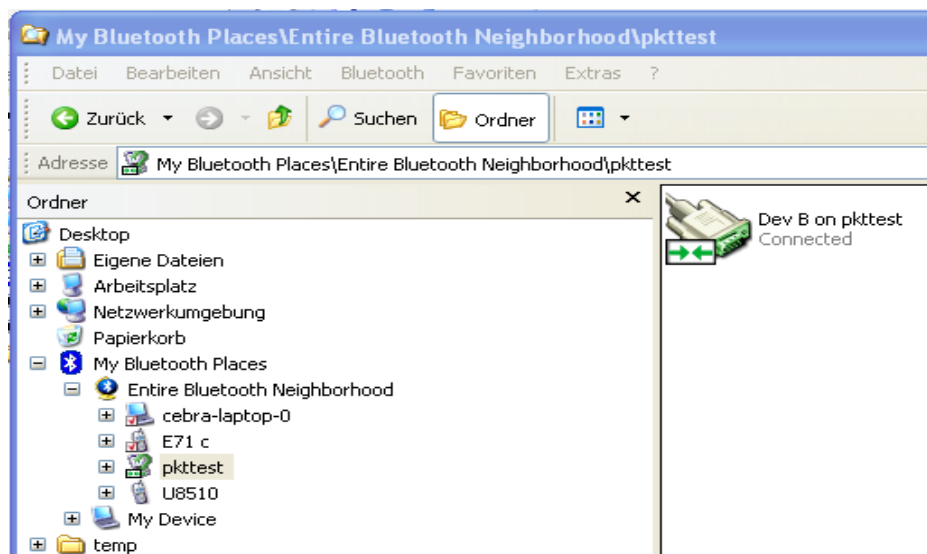
5. COM Port select default or taking over, finished with OK



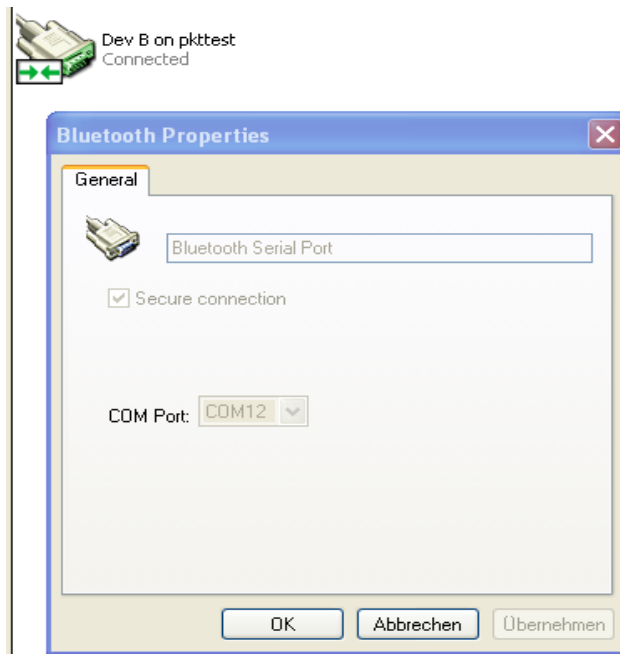
Then appears in the Bluetooth Places, the PKT with the connector as a serial symbol



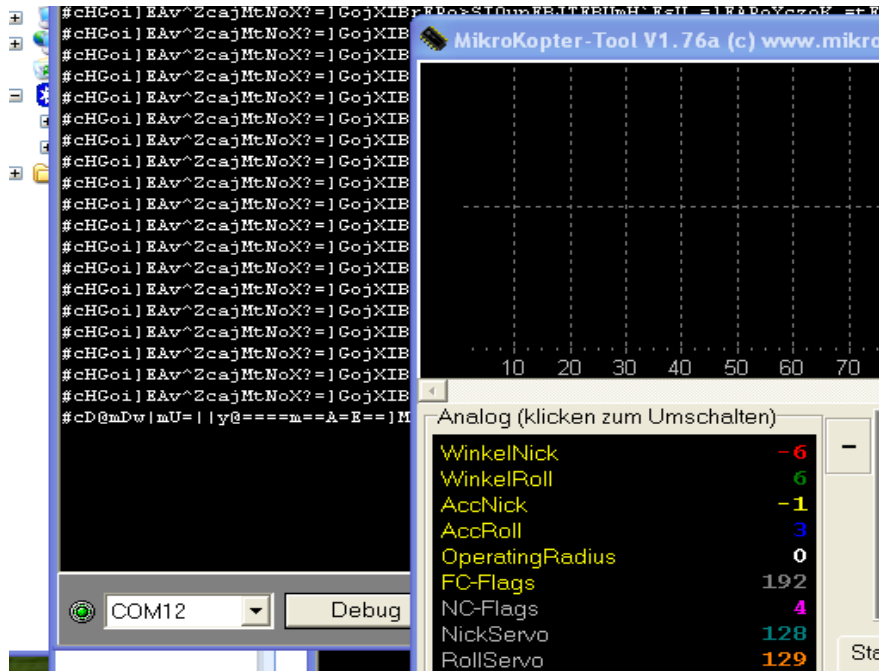
7. by double-clicking the icon to connect to the PKT.



Clicking the right mouse button on properties you can also see the COM port



MikroKopterTool start and set the appropriate COM port.



Once this is configured, you do not need activate the Bluetooth manually. In the moment when the MikroKopterTool used when starting the same COM port, the connection to the PKT is established automatically.

7. Funktionen of LED's

Led1: bootloader active

LED2: Bluetooth is turned on

LED3: Bluetooth Data active (flashes 3 times when booting from BTM222)

LED4: Bluetooth link to the PC is active (flashes 3 times when booting from BTM222)

LED5: USB Rx/D

LED6: USB Tx/D

LED7: Lipo charging indicator

LED8: alternatively, Lipo Charge Indicator

5.

8. FT232 USB chip set

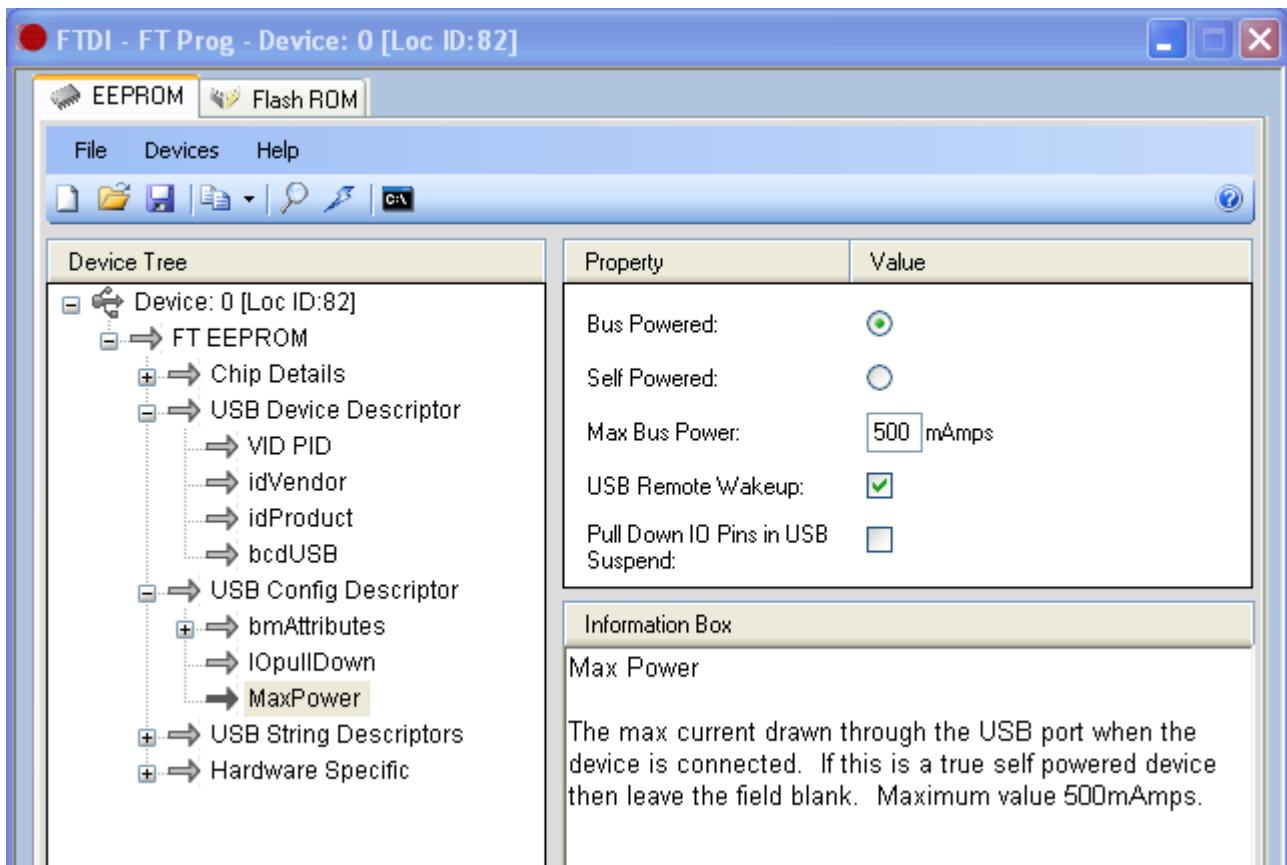
Finally, we assign FT232RL USB chip can be configured. This is necessary so that the USB chip tells the computer the power it needs 500mA. Then you can also load the PKT Battery with the PC. Alternatively, of course, is also a standard USB chargers. This should then also provide 500mA to shorten the charging time.

To program the FT232RL must be downloaded from the website of the manufacturer's program.

Link: # <http://www.ftdichip.com/Support/Utilities.htm> FT_Prog

Here, you download the program FT_Progxxx and installs it on your PC. Please note the instructions and readme's manufacturer.

To configure connect the PKT via USB to the PC and turns PKT on. FT_PROG start and then click on the magnifying glass, then the device must be found. Settings must be set in the Max Bus Power MaxPower 500mA, see screenshot:



All documents could be found in Mikrokofter SVN:

http://svn.mikrokofter.de/listing.php?rename=Projects&path=%2FTransportables_Koptertool%2Ftags%2FV3.x%2FHW_Koptertool3_x%2F&#A06db779f1441cecff34195d9adf0c50e

9. Tips and Tricks

1. USB

Just plug the USB connector when RPK is on, otherwise it could happen by not turn on / plugged in USB connector with the PC's USB port is. You put the USB while the PKT, the PC recognizes the USB device and it is made, a defined starting position.

2. after flashing the boot loader

if the boot loader is flashed, then he will start immediately after the flash in a loop and the backlight comes on. you now press the right button turns on LED1, and waits for the new program. If anything via USB, it will shutdown PKT after 30Sek. and you have to back with the left button + right button to turn on LED1 (red) is lit to start the flash process for the program.

3. FC at the time the software needs to be 0.86, other FC software is not supported at this time

4. To isolate the modules use the drawn film of display.

5. The charging LED can light up even if no USB cable is plugged. This happens when the battery voltage is too low.

6. USB connector solder

The USB connector is pretty disgusting when soldering occurs when a short circuit between the legs, the people get away as well, not without unsolder them back together again. This also applies to ne paste stencil.

For me it has proven itself, the tin-pin to 5's on the board and spread to the pin arrangement of the socket with flux.

Then thread jack with tweezers, push down so well with a fine tip and solder pin by pin, without adding more solder. Then solder the four corners.

Alternative (quadflyer8): but if it is confined, and should have more pins solder ne, Clean Desolder Wick is the drug of choice.

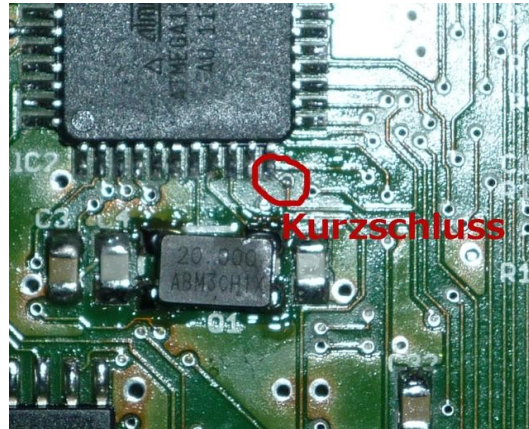
The braid together a little push, so they keep on it and fanned out wide, then the braid over the place and be sucked with the soldering iron on the braid. That sucks reliably, even when specifically FT232 ...

7. Battery

Batteries from the iPod, (Reichelt) BATTERY IPHONE 3G:: 1600mAh, Li-Pol, for 3rd Generation iPhone fit into the case, since in principle one can choose what they like. Please check the forum thread for tips, or ask, there's always advice on such matters.

10. 10th Errors and Causes

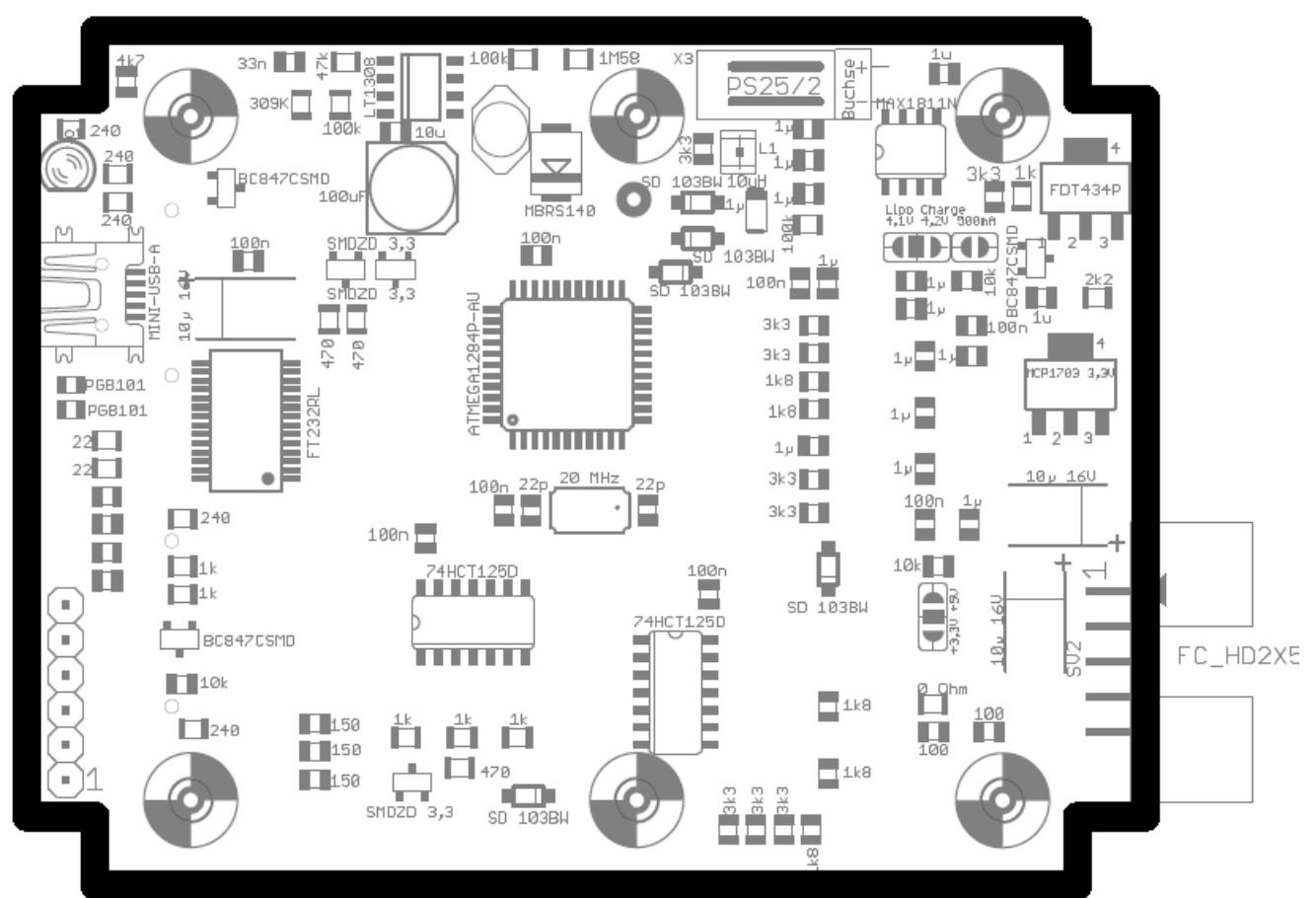
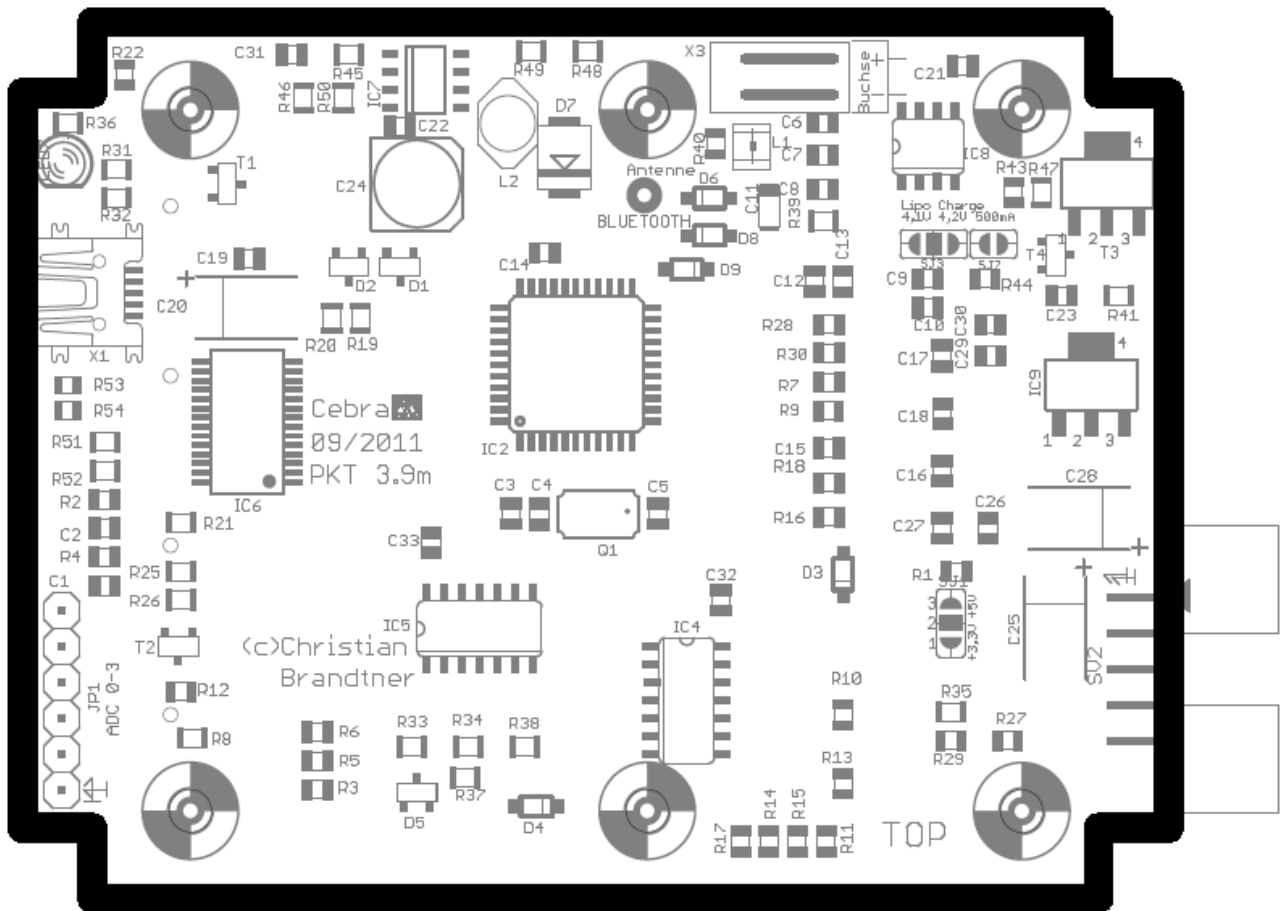
1. Flashing via USB does not work. Reason: D3 is equipped, desolder!
2. Flashing via USB does not work. Reason: fusebits not programmed or wrong. When copy & paste from the PDF making sure that everything that was copied is in the command line, because the line break can go wrong.
3. Flashing via USB does not work. Reason: not properly soldered quartz resolder.
4. Flashing via USB does not work. Reason: solder bridge between pin-hole and Atmega



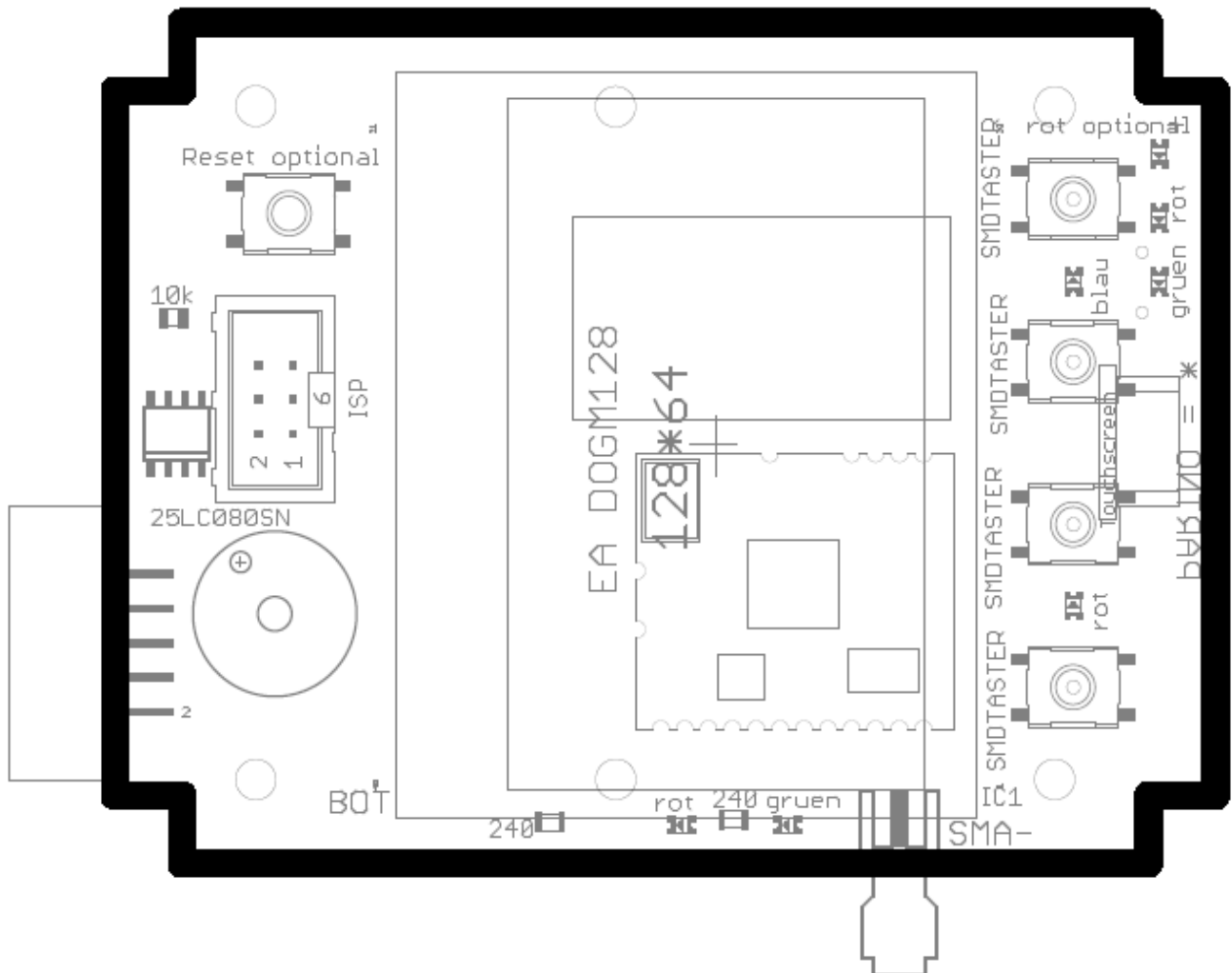
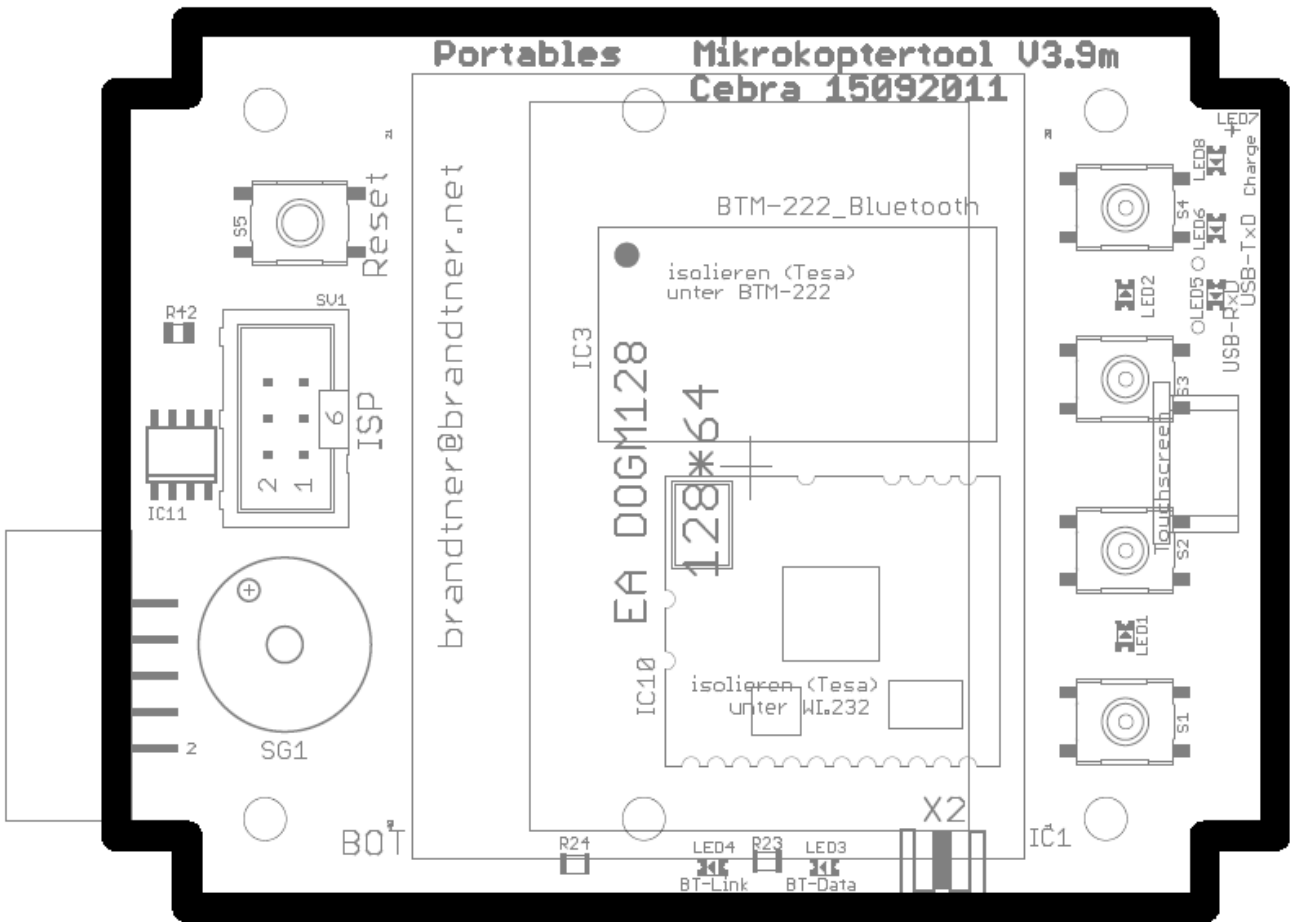
5. BTM222 LED2 does not blink. Reason: solder bridge between pin and feedthrough BTM222.

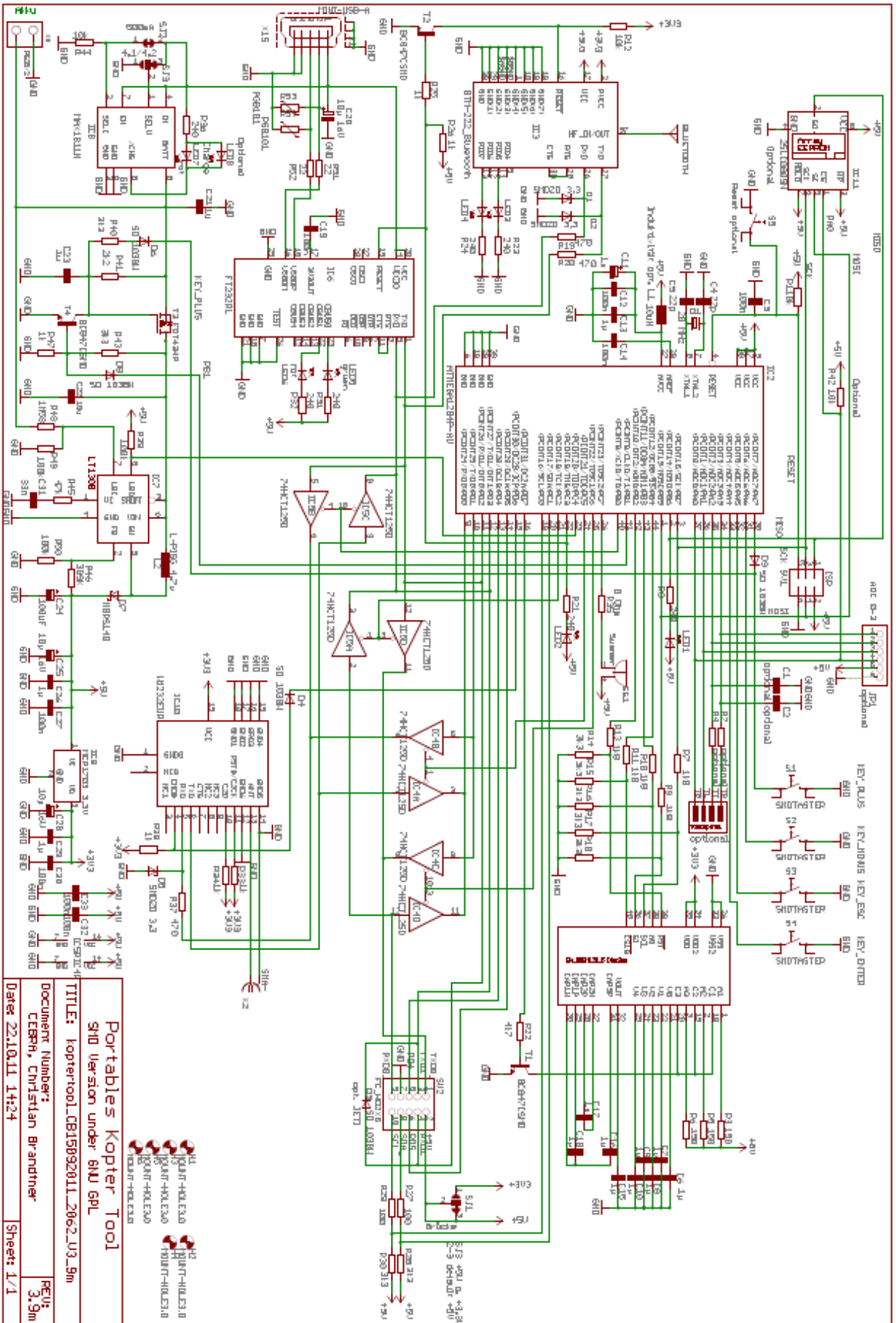


6. placement plan
 Topside



Bottomsite

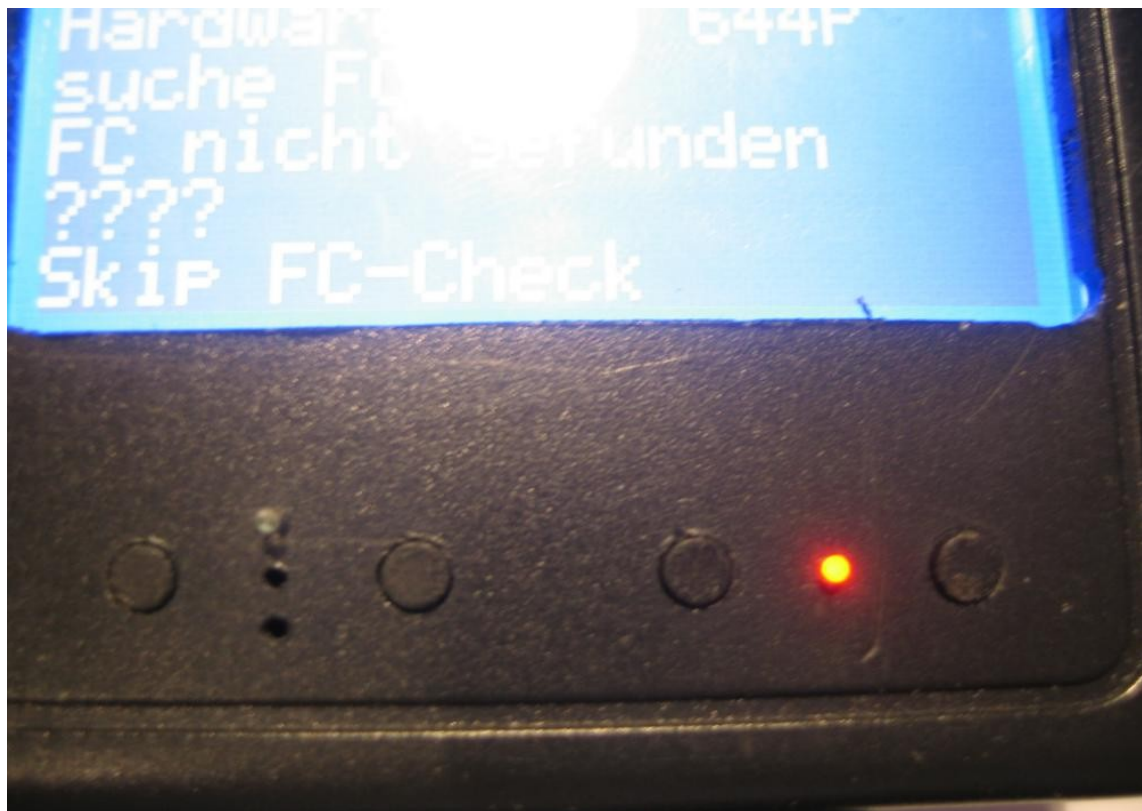




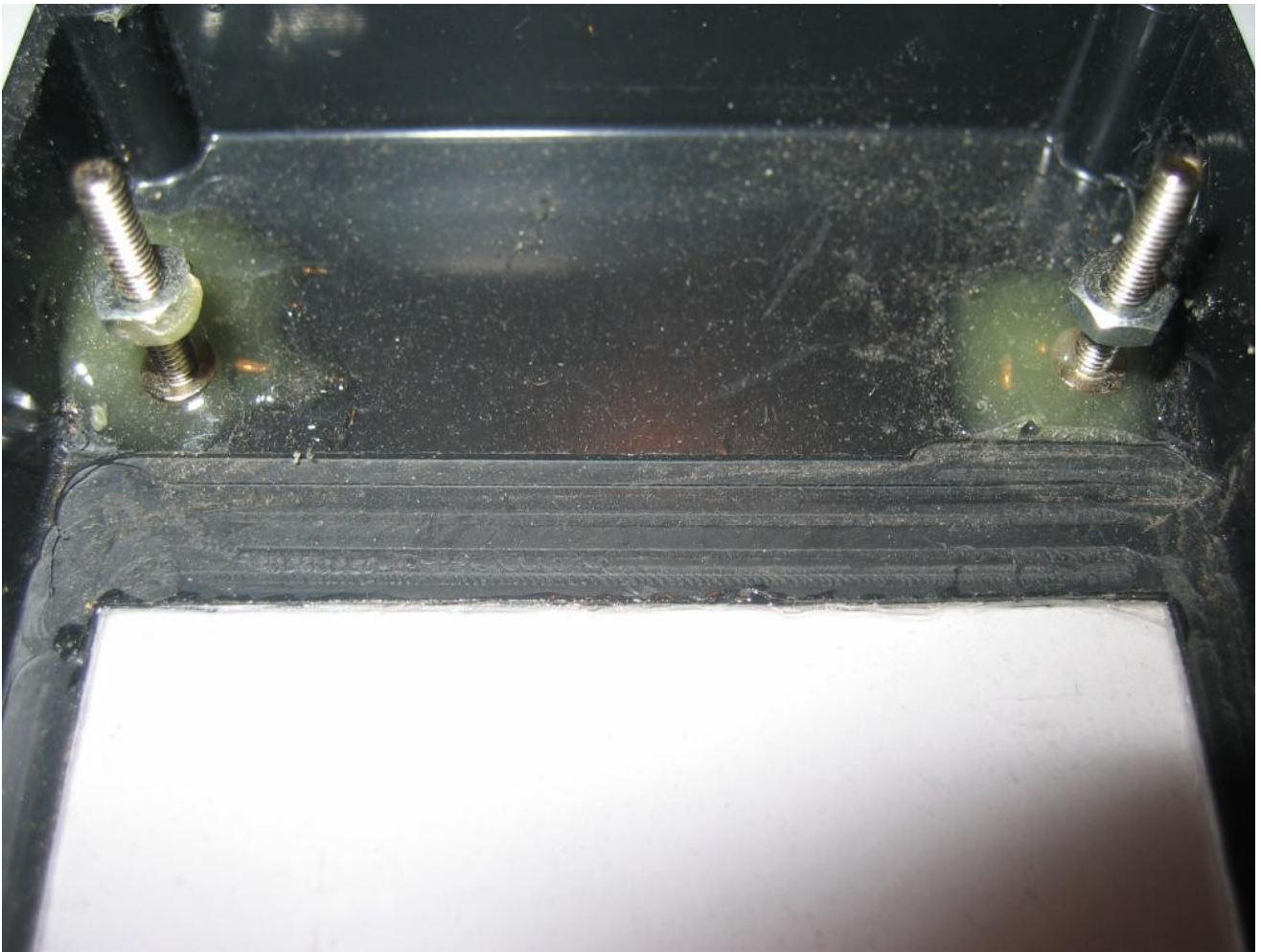
High-resolution circuit and PCB layout is also in SVN as a PDF

Tips for Housing:

Extension of the SMD LEDs with 1 mm plastic optical fiber, I'd still have some at home



Recess for display in the drill stand with cutter so that the screen is closer to the edge of the cover:



Here you can see also an alternative for fixing the circuit board, if one is inclined to do in the case screws on the back side and front view without screws.

Has also another reason, I used a IPOD Touch LIPO, which is somewhat too broad and does not fit in the housing between the injected attachment points for the PCB. I clipped this and so the lipo fits perfectly into the case.

Those who wish can also be glued into the case, a windshield, I got to test a broken CD case, suitable cut and pasted. Can you see in the picture perhaps barely so.

All images are from my patterns and do not fit exactly to the new hardware

alternative:

Megaburli can mill suitable housing, please contact him over to Forum

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08.09.11

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x	2		22R0	22	R51, R52	Widerstand SMD 0805
x	1		4702	47k	R45	Widerstand SMD 0805
x	3		1003	100k	R39, R49, R50	Widerstand SMD 0805
x	7		2400	240	R8, R21, R23, R24, R31, R32, R36	Widerstand SMD 0805
x	1		3093	309K	R46	Widerstand SMD 0805
x	3		4700	470	R19, R20, R37	Widerstand SMD 0805
x	5		1801	1k8	R7, R9, R10, R11, R13	Widerstand SMD 0805
x	9		3301	3k3	R14, R15, R16, R17, R18, R28, R30, R40, R43	Widerstand SMD 0805
x	1		4701	4k7	R22	Widerstand SMD 0805
x	3		1002	10k	R1, R12, R42, R44	Widerstand SMD 0805
x	2		1000	100	R27, R29	Widerstand SMD 0805
x	3		1500	150	R3, R5, R6	Widerstand SMD 0805
x	2		Grösse 0603 grün	PGB101	R53, R54	VARISTORCN0805
x	14		transparent	1µ	C6, C7, C8, C9, C10, C13, C15, C16, C17, C18, C21, C23, C26, C29	KerKo SMD 0805
x	2		beschriftet	22p	C4, C5	KerKo SMD 0805
x	1		Weiss, unbeschriftet	33n	C31	KerKo SMD 0805

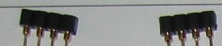


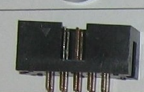
Tab mit Bild

x	1		100CFK	100µF	C24	Elko Low ESR 53CLV-0605
x	3		10 25V	10µ 16V	C20, C25, C28	Elko-CT7343
x	1		A6E, transparent	1µ	C11	Elko SMCA
x	1			20 MHz	Q1	CRYSTALCTS406
x	1			L-PISG 4,7µH	L2	L-EUPIG, Pulse P0770.472T
x	1		100	10µH	L1	LQH3C, FASTRON 1008AS-100K
x	4		W1	SD 103BW	D3, D4, D6, D8, D9	DIODE-SOD123
x	3		Z14, 3 Pins	SMDZD 3,3	D1, D2, D5	ZENER-DIODESOT23
x	1		TR14	MBRS140	D7	SCHOTTKY-DIODESMD
x	1			blau	LED2	LEDCHIPLED_0805
x	2			gruen	LED3, LED5	LEDCHIPLED_0805
x	3			rot	LED1, LED4, LED6, LED8	LEDCHIPLED_0805
x	1			rot	LED7	3mm LED
x	3		1Gt	BC847CSMD	T1, T2, T4	BC847CSMD
x	1			FDT434P	T3	FDT434P
x	2			74HCT125D	IC4, IC5	74HCT125D
x	1			FT232RL	IC6	FT232RL
x	1			LT1308	IC7	LT1308
x	1			MAX1811N	IC8	MAX1811N
x	1			MCP1703 3,3V	IC9	MCP1703DB
x	1			Atmega1284P-AU	IC2	Atmega1284P-AU

Tab mit Bild

1		IC1-LED	Displaybeleuchtung	EA LED55X46
1		EADOGM128	IC1	EA_DOG-M_DISPLAY
1		BTM-222_Bluetooth	IC3	BTM-222
1		WI232EUR	IC10	WI232EUR2
1		MINI-USB-SHIELD-UX60-MIX1		MINI-USB-A
1		SMA-	X2	SMA- Buchse
1		PS25/2	X3	PS25/2 Reichelt
4		SMDTASTER	S1, S2, S3, S4	SMDTASTER
1		20 pol Buchsenleiste		Präzisionsbuchsenleiste RM2,54mm

Tab mit Bild

2		3 pol Buchsenleiste		3mm hoch
1		31mm Draht	BT-ANT1	ANTENNA Optional
1		5V Summer	SG1	F/TMB
1		FC_HD2x5	SV2	2x5 Pol Pinheader
1		ISP	SV1	6 Pol Pinheader
1		Gehäuse		Strapubox 2062
1		Leiterplatte		
1		Lipo Akku 1S		z.B. AKKU IPOD TOUCH