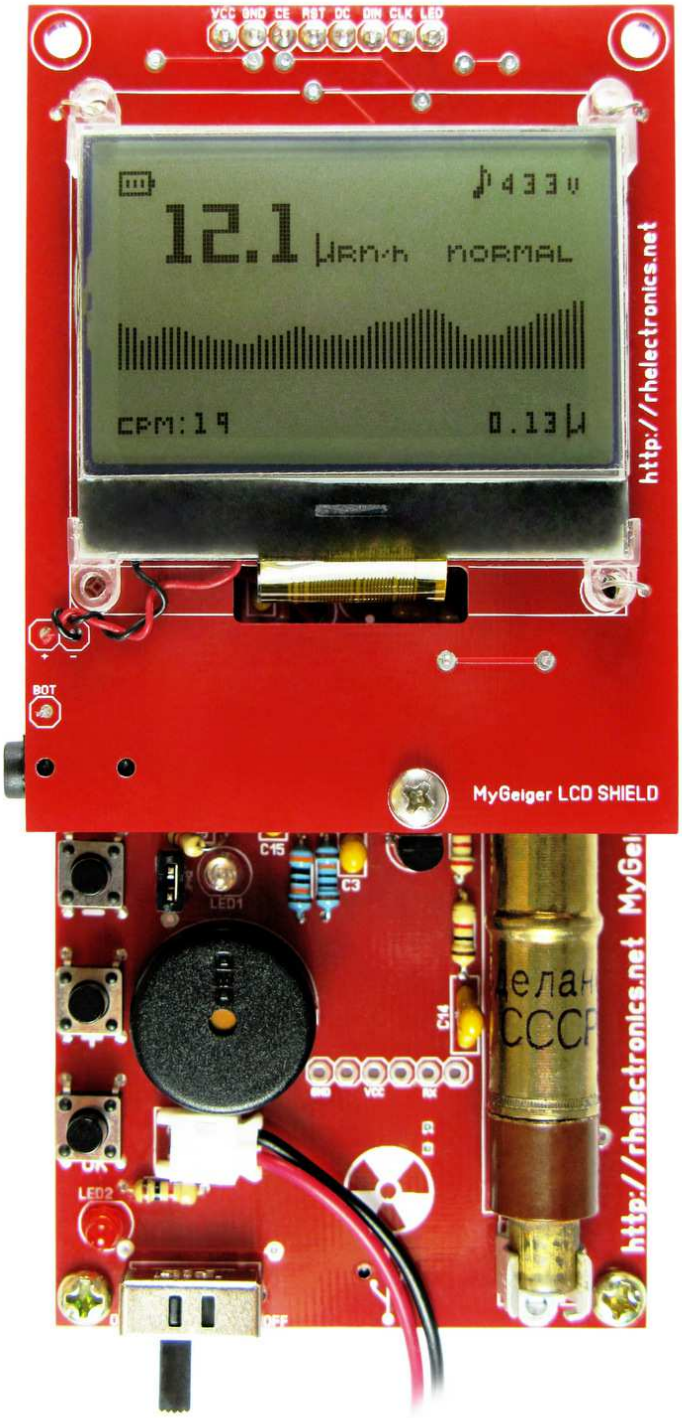
DIY Geiger Counter Module MyGeiger ver. 2.00

manual for pcb edition 2.10



http://rhelectronics.net

MyGeiger v2.0 – is the second edition of the original DIY Geiger Counter module developed and designed by RH Electronics. Thanks to user feedback from the MyGeiger v1.0, we have significantly improved MyGeiger by adding new features as suggested by the users.

What's new in 2.10 pcb edition? Improved PCB layout and HV upper limit cut-off solder jumper.

Technical specifications:

Compatible Geiger Tubes for PCB	SBM-20 / STS-5 / J305
Compatible Geiger Tubes for wire connection	LND-712 / LND-7317 / SBT-9 / SI-29BG and more
High Voltage	400V or 500V (select with DIP switch and jumper)
Measurement Period	Moving average every 5 seconds
LCD Display	Graphic LCD with smart backlight control
Display CPM Graph	Auto-scaling graph for the last 5 minutes
CPM counting ability with SBM-20 (tested)	0 CPM – 300000 CPM
Radiation Dose range with SBM-20 (tested)	0.01 uSv/h – 1000 uSv/h
Accumulated dose uSv counting	Yes, until power lost
Display range (min/max)	0.01uSv/h – 99.9 uSv/h; 0.10 mSv/h – 9.99 mSv/h
Radiation Dose units	Sieverts / Roentgen
Conversion Factor (calibration menu)	0.0001 – 0.0250 (saved to EEPROM)
Alert Threshold	100 CPM – 5000 CPM (saved to EEPROM)
Geiger Event indication	LED; Buzzer clicks
Led and Buzzer On/Off control	Yes, controlled with key
Tube voltage measuring	Yes
USB logging support	Build-in USB support
USB logging data	CPM or Bq/cm2
PC Windows Software for CPM data	Native freeware "Radiation Logger"
PC Windows Software for Bq/cm2	Third side compatible UART freeware
Supply Voltage	3.70V Li-PO / Li-Ion (battery not included)
USB battery charger	Yes, included built-in for one Li-PO or Li-Ion
Battery over-charge and over-discharge protection	Yes
Supply Current	5 mA – 7mA, depend on SD Logger jumper set
Battery indication	Yes
USB connection detect	Yes
PCB dimensions	118 x 55 mm
Geiger Bot	Compatible (optional)
micro SD Logger+ upgrade	Yes, (optional add-on)

Tiny power consumption: MyGeiger version 2.0 now consumes half the power than version 1.0,using **less than 5mA** in background mode without backlight. It can also continuously operate for over 200 hours with a 3.7V Li-PO rated at 1000mAh. At 3800mAh it will operate for over 30 days without the need to charge. This allows you to keep MyGeiger in your pocket, and run it for days without the need to charge until a 5V USB outlet is available.

Built-in lithium charger: The board has a built-in Li-PO **charger with protection circuit** abolishing the need to carry a special Li-PO charger. Charging status LED tells you when charging is complete. You can charge directly from your computer or from any 5V power supply with the USB jack. Do not exceed 6V for charging! Another important new function is the **battery over-discharge limiter protection.** When the cut-off 3V voltage is reached, the device goes into sleep mode with a power consumption of only 0.5mA (500uA). At this point, power off MyGeiger and connect the USB to charge the unit.

Pre-soldered SMD components: To make kit assembly as easy as possible, we ship MyGeiger with all SMD parts pre-installed and tested. **You'll need to solder only the DIP through-hole parts!** Even a beginner with good soldering skills can assemble this project.

Powerful MCU: The MyGeiger v2.0 uses a **powerful PIC18F2550 microprocessor** with better performance and more memory than version 1.0 with PIC16F876 microprocessor.

Tube high voltage (HV): Now you can select tube voltage output to 400V or 500V. Even under high radiation load, or when the battery is discharged, HV output stays between tube specific plateau limits. This function is controlled by RH original software algorithm.

The new PCB edition 2.10 utilizes a HV cut-off circuit to avoid tube over-voltage under high radiation load. The limiter circuit is controlled by a user selectable solder jumper.

New High Quality Graphic Display: After the Nokia 5110 LCD from the earlier version was discontinued, we upgraded the display type to a **high quality large graphic LCD** with blue backlight.Not only does it share similar low power consumption as before, it is also easy to read in daylight with the backlight on. It now comes pre-installed on a LCD shield board for ease of installation.

Built-in USB support: MyGeiger v2.0 comes with built-in USB support so you can log data directly to your computer, without having to add an additional TTL module! Choose to log in either CPM(Counts Per Minute) or Bq/cm2 data every 5 seconds.

FREE Logging Software: For collecti g, logging , and graphing CPM data, use our FREEware *Radiation Logger* application. Or for Bq/cm2 logging, a link is provided for FREEware easy to use third-party UART terminal software- both Windows compatible only at this time.

Battery Indicator and USB connection detect: MyGeiger v2.0 has a newly improved battery indicator and USB connection detection.

Radiation Dose Units: MyGeiger v2.0 can display radiation dose in uSv/h, mSv/h, uRn/h or mRn/h units. Select the unit type using the – tactile button, with a single quick push. Your choice is kept in eeprom memory even when unit is off. Accumulated dose in uSv units is also displayed on the LCD. Each time you turn on MyGeiger, a new accumulated dose count starts.

Measuring Period: All MyGeiger models calculate a moving average by counting radiation events every 5 seconds, and updates the average by corresponding with current data.

Auto Scaling CPM Graph: The last 5 minutes of all CPM readings is represented by a constant visual updating graph. It is auto-scaling and auto-scrolling showing a nice flow on the LCD.

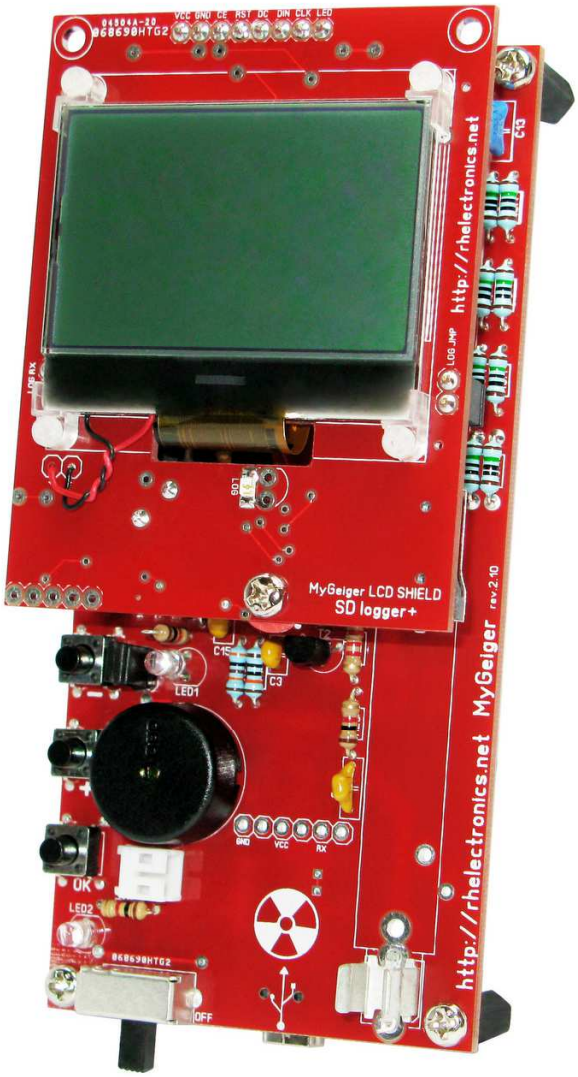
Maximum Radiation counting ability: MyGeiger v2.0 was successfully tested under high radiation load, up to 1mSv/h (1000uSv/h).

Kit sound and Silent Operation: Now with improved sound, similar to a classic Geiger counter click. Buzzer mute and LED flasher can be controlled by pressing the + tact button for reducing power consumption and silent operation. These settings are saved to eeprom memory.

Alarm: You can set CPM alert value at device start-up. Your choice is written to eeprom memory for next use. When radiation levels become dangerous, the LCD backlight will flash to inform you about high level. The alert is set using 10 CPM increments from 10-200 and 100 CPM increments from 200-5000.

Micro SD Logger upgrade: For extra cost you can upgrade to the LCD Shield with Logger+ circuit. The logger microprocessor is open source and code-based using a Arduino IDE compiler. During typical operation the Atmega328 enters idle sleep mode, keeping the power consumption low. SD Logger adds only 1.5mA-2.0mA to the total kit consumption. When serial data is transferred from the main PIC18F2550 uProcessor to the USB output, Atmega328 enters active state for several micro seconds and writes current data to the SD card. If the SD card is missing, or if you do not need SD log functions, you can turn off the SD logger by removing the LOG jumper to save power.

If you need SD card Logger function, be sure you select the upgraded version before you put it to the shopping cart! More technical info about SD Logger can be found in additional PDF file, see all downloads available on the website.



Powering the Kit:

Please read this section carefully! We are not responsible for any technical problems because of wrong power source or battery connection! Li-PO / Li-Ion batteries contain explosive materials, do not short or overheat the battery! Do not open or disassemble lithium cells!

The MCU requires 3.00V-5.00V to operate. The kit was intended to run on one 3.7V lithium cell. The PCB comes with a special charging circuit and 2 mm PH connector. This connector has polarity! Please check polarity before you connect the battery.

LIPO CHARGE CHIP DO NOT HAVE REVERSE POLARITY PROTECTION!

There are many Li-PO/Li-Ion batteries you can select and purchase for your device. We do not sell or provide these batteries. Below are suggested types and companies that supply them.

1. Li-PO 3.7V from Sparkfun Electronics. Select at least 850-1000mAh https://www.sparkfun.com/products/339
2. Li-PO 3.7V from eBay sellers, check connector polarity!
3. Lithium 3.7V cells from mobile phones require you to have some previous skills in usage of thispower source because you need to solder proper connector.
4. Li-Ion 3.7V batteries. Big choice of sizes and capacity on the market. From 10440 (AAA) to 18650 size can be found. This kit's PCB supports an AAA holder to be installed, but 10440 typically measure about 300mAh in actual capacity and can power the kit for about 60 hours. An 18650 with 3800mAh capacity, can power the kit for a month while in background mode. If you select a Li-Ion battery, make sure you have the proper connector and be sure to watch polarity!

The charging circuit by default provides charging with about 450mAh current. If you are using higher capacity batteries, then it will take longer than several hours to reach full charge.

Battery Management: The voltage of a fully charged and discharged 3.7v lithium battery is approximately 4.20V and 2.75V respectively. The board includes a high quality Li-PO charger with circuit protection for one 3.7V battery. Microcontroller software monitors the battery voltage often, to activate battery over-discharge protection in case it discharges. The Battery Indicator Icon on the LCD has3 stripes which represent the following:

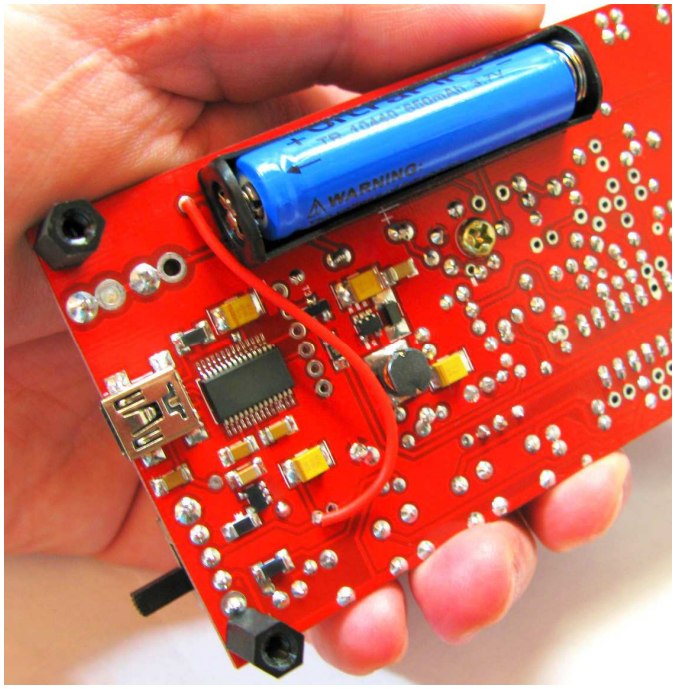
3 stripes – full battery 3.85V-4.20V
2 stripes – half battery 3.30V-3.85V
1 stripe – low battery 3.00V-3.30V

We strongly recommend to charge the counter when the battery indicator is in low position (1 stripe). In case you cannot reach USB to charge, the counter will continue to work down to 3.00V cut-off VDD. When battery voltage will be 3.00V or less, the counter enter sleep mode with lowest current consumption.

If you see this screen, please power off MyGeiger and connect a USB cable to charge. MyGeiger can operate while the battery charges, however charge time will be longer.

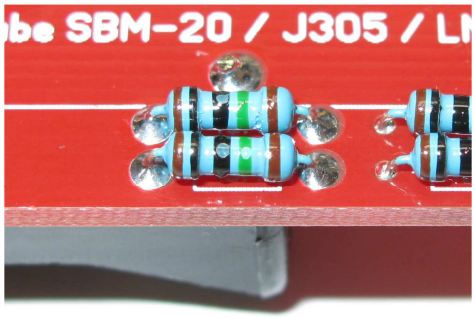
The Main board PCB has a red LED to indicate charging status. Red LED on while charging, and off when charging is complete.

10440 AAA 3.7V Li-Ion battery holder installation:



The PCB allows installation of a AAA battery holder. You need to solder one additional wire to connect the battery to the + point of the Li-PO connector, as shown above. 10440 batteries are very compact and can be found with many capacities from 300mAh to 650mAh. It also can be charged with the PCB built-in USB Lithium charger.

For a clean holder installation please solder the 2x10M resistors from the top side of the PCB as shown below, and then cut the leads from the bottom side of the PCB.



Geiger Tube Compatibility:

MyGeiger v2.0 supports many 400V and 500V tubes. Default parameters are pre-set for the SBM-20. There are several software settings you need to set in calibration menu when using different tube model:

1. *CF* Conversion Factor used for converting CPM to uSv/h units. Default is 0.0057
2. *BG* maximum normal background CPM level for your tube. Default is 30
3. *SQ* surface area of your tube in square centimeters units. Default is 22
4. *DT* dead time in microseconds. Available since 2.15 firmware only! Default is 190

DL is detecting limit, calculated by software from your BG and SQ parameters, you do not need to set this parameter. BG, SQ and DL used for calculating Bq/cm2. Becquerel logging actual for testing small size radioactive samples, that physical size is smaller than tube surface size. Becquerel mode is experimental function that currently we are not guarantee it has high precision results. Becquerel logging mode is not intended to measure background radiation.

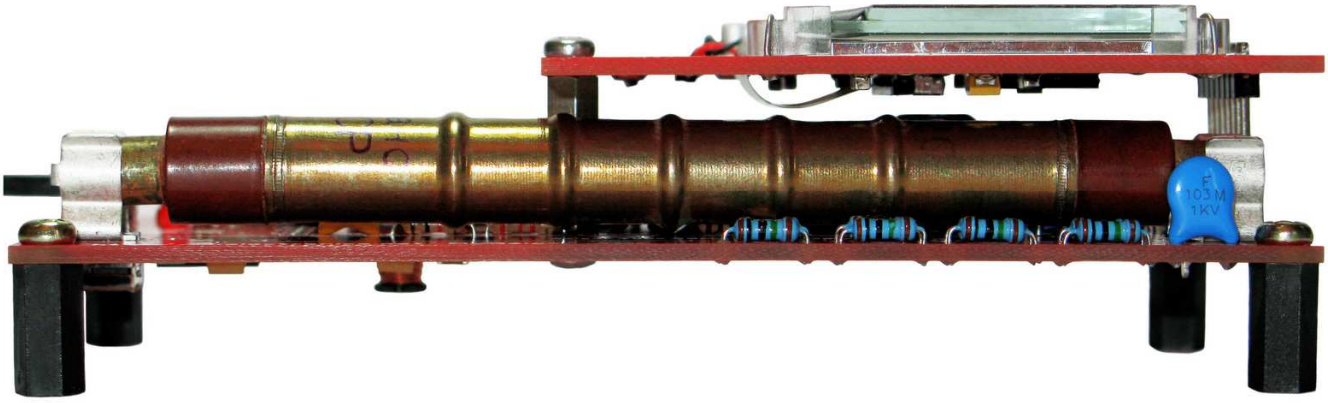
To select tube voltage you need to set DIP Switch 1. OFF position for 400V and ON for 500V. Then trim the 2K potentiometer to the middle position. Power the kit and check voltage value on LCD. For 400V tubes HV should be between 400V-450V, and for 500V tubes between 500V-550V. If higher or lower, turn off the kit and turn t h e 2K potentiometer a little to the right or left. Check HV voltage again. **Do not adjust the potentiometer when the kit is powered!**

Model	Voltage	Factor	BG	SQ
SBM-20	400V	0.0057	30	22
SI-29BG	400V	0.0081	15	12
SBM-19	400V	0.0021	100	80
SI-180G	400V	0.0031	70	42
SBT-9	400V	0.0117	10	16
SBT-11	400V	0.0050	30	5
J305 / M4011	400V	0.0081	20	25
LND-712	500V	0.0081	15	16
LND-7317	500V	0.0024	50	16

Take note, the values in the table above are experimental, from our practical tests results only. Factor and BG values can be different for your specific tube and specific geographical position. To determine your BG value, measure the maximum background CPM in your area. Some countries and regions may have higher natural background levels than listed on this table!
R22 is the tube load resistor, supplied is 4.7M ohm. Please make adjustments depending on the required value for your supplied GM tube. Example- LND 712 requires a 10M ohm resistor.

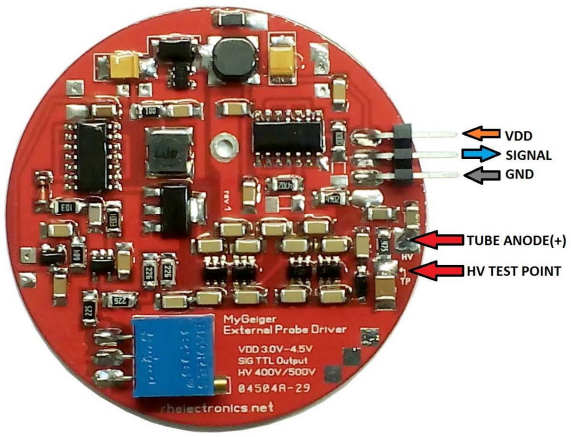
Tube Voltage Settings: DIP Switch 1 is used to select High Voltage range. OFF position is for 400V range; ON for 500V range. Remember also to check HV JMP solder type jumper on the bottom side of the PCB (see HV limiter section of the manual below)

Tube Installation: Power off the kit before installing the Geiger tube. Please be aware of the correct polarity. To install an SBM-20, you will need to remove the LCD Shield. Geiger tubes are very fragile. Handle with care! Do a visual inspection. The tube must be free of cracks and dents. Shake the tube and listen for any sounds inside. There should not be. Clean rust from tube terminals for good electrical contact. The tube has an anode (+) and cathode (–) sides. The anode side is marked on tube body and it connects to the R22 resistor.



External probe Addon:

By default MyGeiger high voltage source allow to connect Geiger tube with short wires only. Excessive capacitance on the anode side of the tube reduce counting performance and decrease standard tube lifetime. If you use Geiger tube installed inside counter enclosure, or SBM-20 installed on the PCB clips, then everything will work fine. But in case you need to use external probe construction with cable connection RH Electronics offer a special addon to drive Geiger tube externally and connect digitalized TTL level tube signal to MyGeiger board.



The *RH Geiger Probe Driver* module offers a different method for signal path and allows you to use a probe cable up to several meters in length without a reduction in CPM or HV performance. Maximum cable length depends upon cable quality. For example, a 5 meter probe cable requires a microphone cable with high quality, low noise and low DC resistance. For a 3 meter cable, a standard good quality audio cable will be sufficient. For a 2 meter probe, almost any audio cable will work fine.

You can find more technical details by following the link:
http://www.rhelectronics.net/store/high-voltage-geiger-probe-driver-module-380v-550v-with-ttl-output.html

SKU: RH-K-GK-HV
UPC Number: 635292807381

Assembling notes:

This kit requires good soldering skills and ability to read electrical circuit. Print out the circuit and keep it in front of you during the soldering for easy reference.

Remember, do clean solder work and install right components in the right place. It is always hard to unsolder components from the PCB. RH Electronics cannot be responsible if you'll overheat your PCB or will damage the kit components by incorrect soldering. Double check yourself before you solder. All components must be installed as electrical circuit show, in proper polarity and right direction. Take your time when performing solder work. It may take about 3 hours to complete the kit. Recommended to use 0.8mm or 1.00mm thickness 60/40 lead solder wire with low melt point.

Do not use lead free solder! Lead free solder require higher temperature to flow that may destroy PCB pads! For good solder flow trim solder station temperature to 350-380C Celsius.

A solder joint should look like the picture above. We recommend reading a general soldering guide from Sparkfun Electronics. If necessary to remove excess solder from the pad, use disordering tools such as braided wick or a small solder pump.

VERY IMPORTANT: After soldering, the board must be washed with isopropyl alcohol and soft antistatic brush to remove all flux! Flux traces affect the high voltage converter and may cause different technical problems with the board. You can use special industrial flux removers or buy isopropyl from hardware store. Dry the PCB properly before first powering. You can dry the board with fan or hot air station trimmed to 100C.

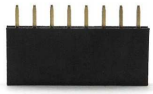
LIPO CHARGE CHIP DO NOT HAVE REVERSE POLARITY PROTECTION!

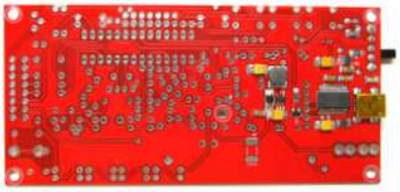
If the Lipo battery was connected by mistake in reverse polarity then charge IC will be damaged immediately. There is no way to predict it so please be careful and check wires polarity in advance you connect it. Use recommended lipos models from Sparkfun / Adafruit.

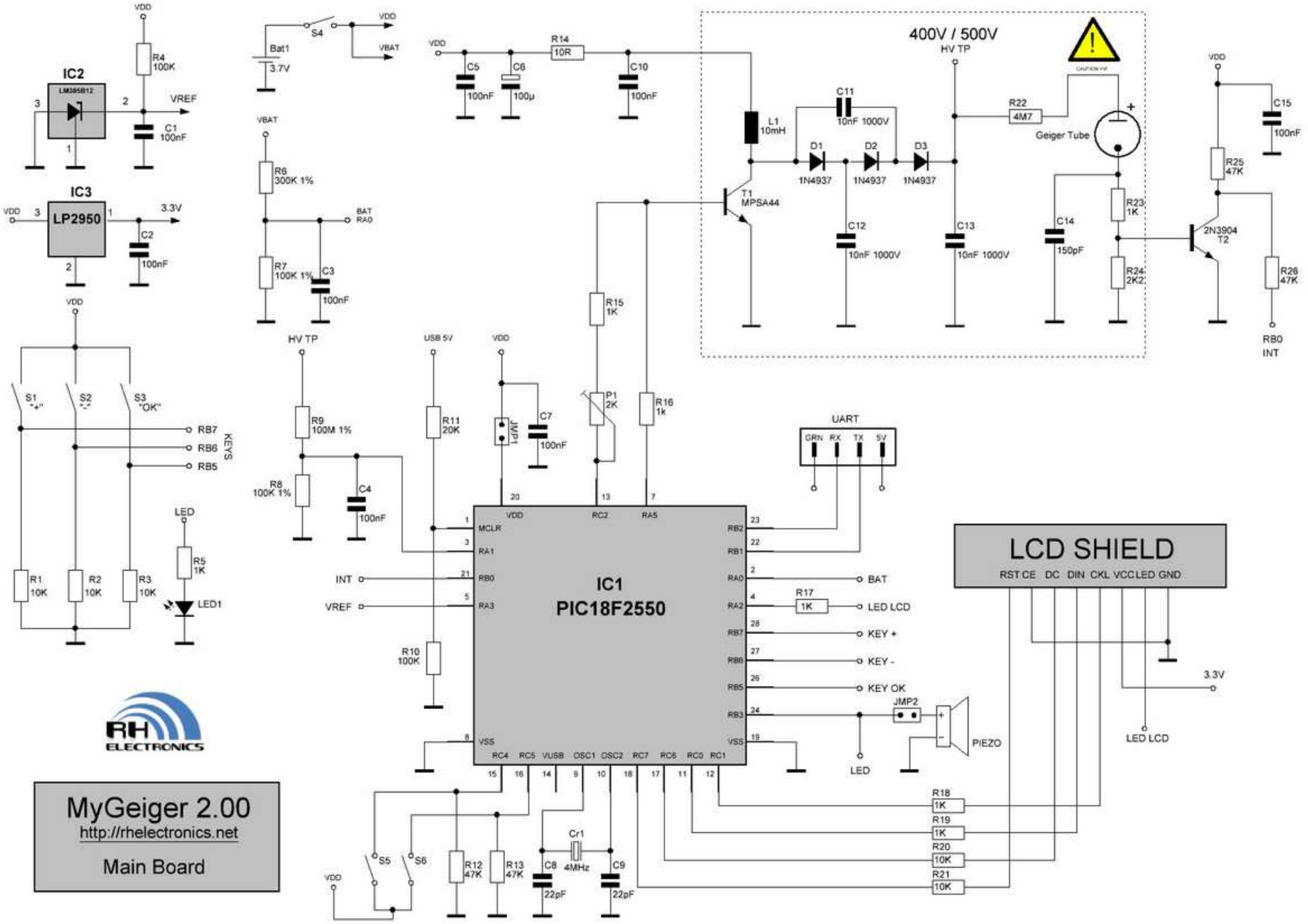
RH Electronics do not cover charger chip replacement for free. Warranty does not cover reverse polarity damage! If it happens then you can replace MCP73831T chip by yourself or contact us for repair request.

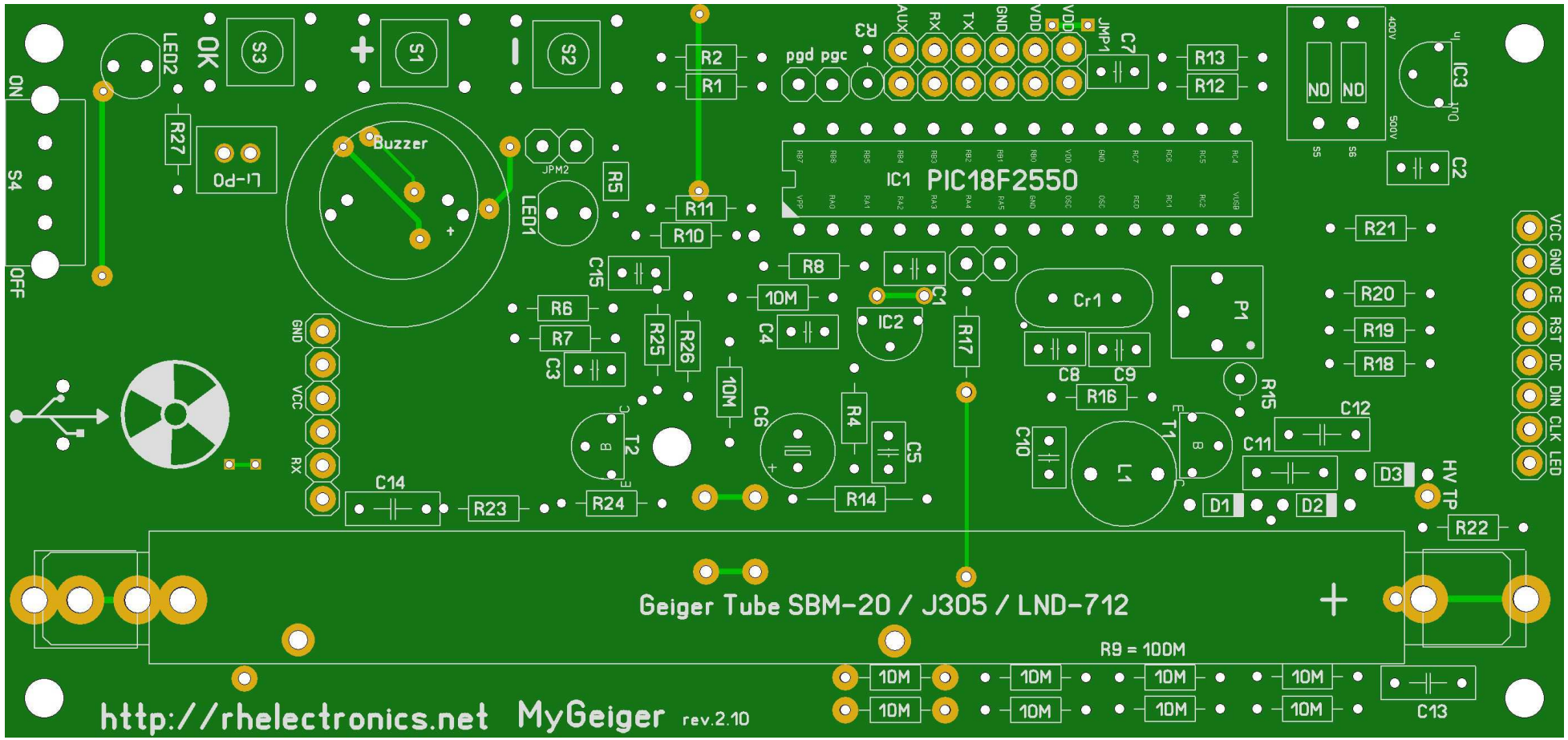
The common sign for MCP73831T reverse polarity damage is USB symbol always presented on the LCD.

Image	Name	Quantity	Value	Description
	R1, R2, R3, R20, R21	5	10K ohm	¼ W resistor
	R5, R15, R16, R17, R18, R19, R23	7	1K ohm	¼ W resistor
	R12, R13, R25, R26	4	47K ohm	¼ W resistor
	R11	1	20K	¼ W resistor
	R24	1	2.2K	¼ W resistor
	R14	1	10 ohm	¼ W resistor
	R22	1	4.7M ohm	¼ W resistor
	R6	1	300K	¼ W resistor 1%
	R4, R7, R8, R10	4	100K ohm	¼ W resistor 1%
	R9, 10x10M	10	10M ohm	¼ W resistor 1%
	P1	1	2K ohm	HV Trimmer
	C1, C2, C3, C4, C5, C7, C10, C15	8	100nF	Ceramic Capacitor (104)
	C8, C9	2	22pF	Ceramic Capacitor (220 or 22)
	C14	1	150pF or 100pF	Ceramic Capacitor (151 or 101)
	C11, C12, C13	3	10nF	HV Capacitor (103)
	C6	1	100uF	Electrolytic Capacitor

	LED1	1	LED	3mm LED
	D1, D2, D3	3	1N4936	Fast Rectifier Diode
	Cr1	1	4.000MHz	Crystal HS-49S
	Buzzer	1	Piezo Buzzer	Passive Type
	L1	1	10mH	Radial Inductor
	S1, S2, S3	3	Tact Switch	Controlling Buttons
	S5, S6	1	DIP Switch 2 Position	Controlling Jumpers
	8 Pin Female Header	1	8 Pin	LCD Shield Connector
	2 Pin Male Header	2	1 Pins	JMP1, JMP2
	JMP1, JMP2	2	Jumper Cup	Programming Jumper, Buzzer connection
	Tube Clips	2	Tube Clips	SBM-20 Holder
	Screw	6	Metal Screw	M3x6
	Standoff	4	Plastic Standoff	M3x12
	Standoff	1	Standoff	M3x15

	**Socket**	**1**	**DIP 28**	**IC socket**
	**T1**	**1**	**MPSA44**	**HV NPN Transistor**
	**T2**	**1**	**2N3904**	**NPN Transistor**
	**IC2**	**1**	**LM385B12**	**VREF IC**
	**IC3**	**1**	**LP2950, KY5033**	**3.3V LDO**
	**IC1**	**1**	**PIC18F2550**	**Pre-Programmed Microcontroller**
	**PCB**	**1**	**2.00 Revision**	**Double Layer High Quality PCB**
	**LCD SHIELD**	**1**	**2.00 Revision**	**High Quality LCD Shield**

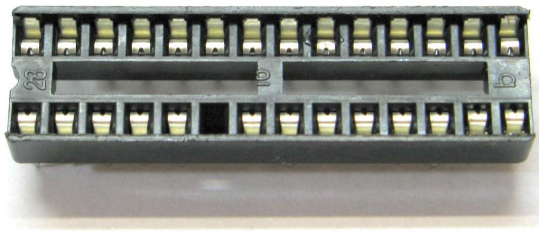

IC2
LM385B12
R4 100K
VREF
C1 100nF
IC3
LP2950
3.3V
C2 100nF
Bat1 3.7V
S4
VBAT
R6 300K 1%
R7 100K 1%
C3 100nF
BAT RA0
C5 100nF
C6 100µ
R14 10R
C10 100nF
400V / 500V
HV TP
L1 10mH
C11 10nF 1000V
D1 1N4937
D2 1N4937
D3 1N4937
T1 MPSA44
C12 10nF 1000V
C13 10nF 1000V
R22 4M7
Geiger Tube
C14 150pF
R23 1K
R24 2K2
2N3904 T2
R25 47K
C15 100nF
R26 47K
RB0 INT
S1 "+"
S2 "-"
S3 "OK"
RB7
RB6
RB5
KEYS
R1 10K
R2 10K
R3 10K
LED
R5 1K
LED1
HV TP
R9 100M 1%
R8 100K 1%
C4 100nF
USB 5V
R11 20K
R10 100K
JMP1
C7 100nF
P1 2K
R15 1K
R16 1k
IC1
PIC18F2550
MCLR
RA1
RB0
RA3
VDD
RC2
RA5
RB2
RB1
RA0
RA2
RB7
RB6
RB5
RB3
VSS
RC4 RC5 VUSB OSC1 OSC2 RC7 RC6 RC0 RC1
INT
VREF
BAT
R17 1K
LED LCD
KEY +
KEY -
KEY OK
JMP2
PIEZO
LED
UART
GRN RX TX 5V
LCD SHIELD
RST CE DC DIN CKL VCC LED GND
3.3V
LED LCD
R18 1K
R19 1K
R20 10K
R21 10K
S5
S6
R12 47K
R13 47K
Cr1 4MHz
C8 22pF
C9 22pF
MyGeiger 2.00
http://rhelectronics.net
Main Board


ON
OFF
S4
LED2
OK
S3
S1
S2
R27
LI-PO
Buzzer
JPM2
LED1
R5
R2
R1
R11
R10
pgd pgc
AUX
RX
TX
GND
VDD
VDD
R3
JMP1
C7
R13
R12
IC1
PIC18F2550
NO
NO
40AV
500V
IC3
INO
C2
R21
VCC GND CE RST DC DIN CLK LED
C15
R8
10M
C1
R6
R7
C3
R25
R26
C4
IC2
R17
Cr1
P1
R20
R19
R18
C8
C9
R16
R15
C12
C11
D3
HV TP
R22
GND
VCC
RX
C14
R23
R24
T2
10M
C6
R4
C5
R14
C10
L1
T1
D1
D2
Geiger Tube SBM-20 / J305 / LND-712
R9 = 100M
10M
10M
10M
10M
10M
10M
10M
10M
C13
http://rhelectronics.net
MyGeiger
rev.2.10

Assembling Instruction:

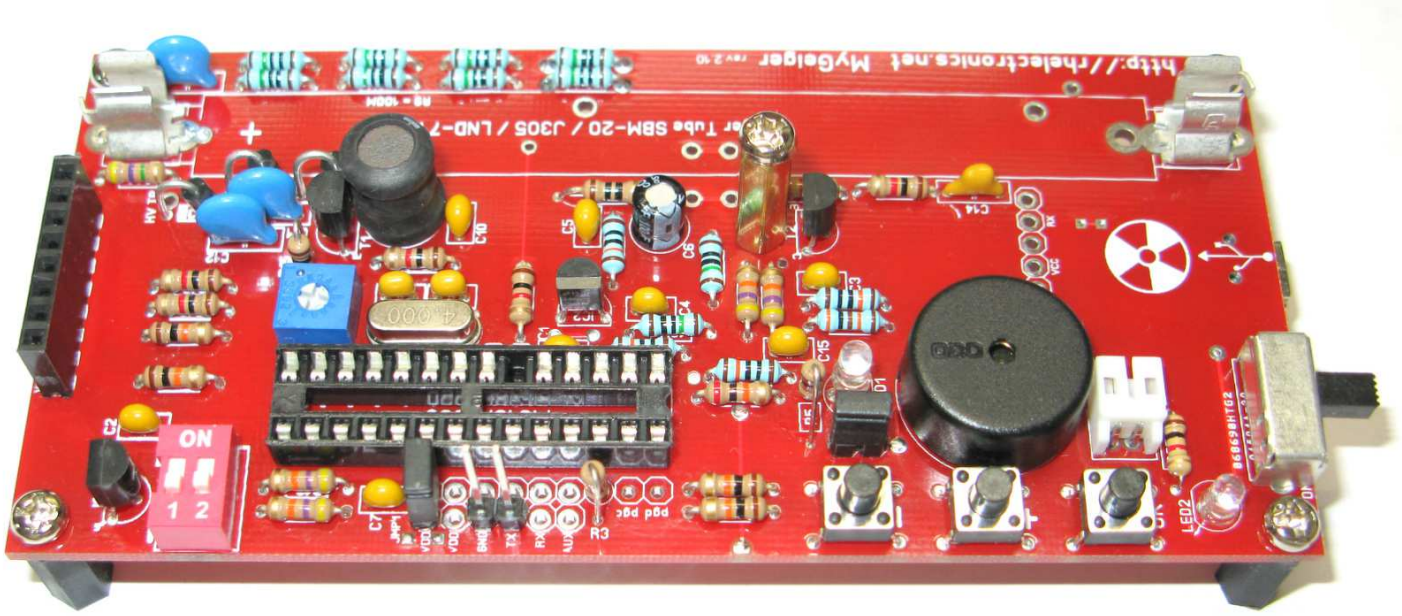
Please check the components list above. Use a printed electrical circuit with PCB silkscreen to place all required components. Because MyGeiger ships with pre-assembled SMT components, you need to solder only the through hole parts. The electrical circuit in the manual does not show the SMT parts!

First you need to prepare the 28 Pin IC Socket for installing onto the PCB. As you can see below, you have to remove pin 6 from the plastic base of the socket. You can push it out to the upper direction. **This is a very important step for kit soldering** because we need to isolate processor pin 6 from the rest of the circuitry on the PCB.

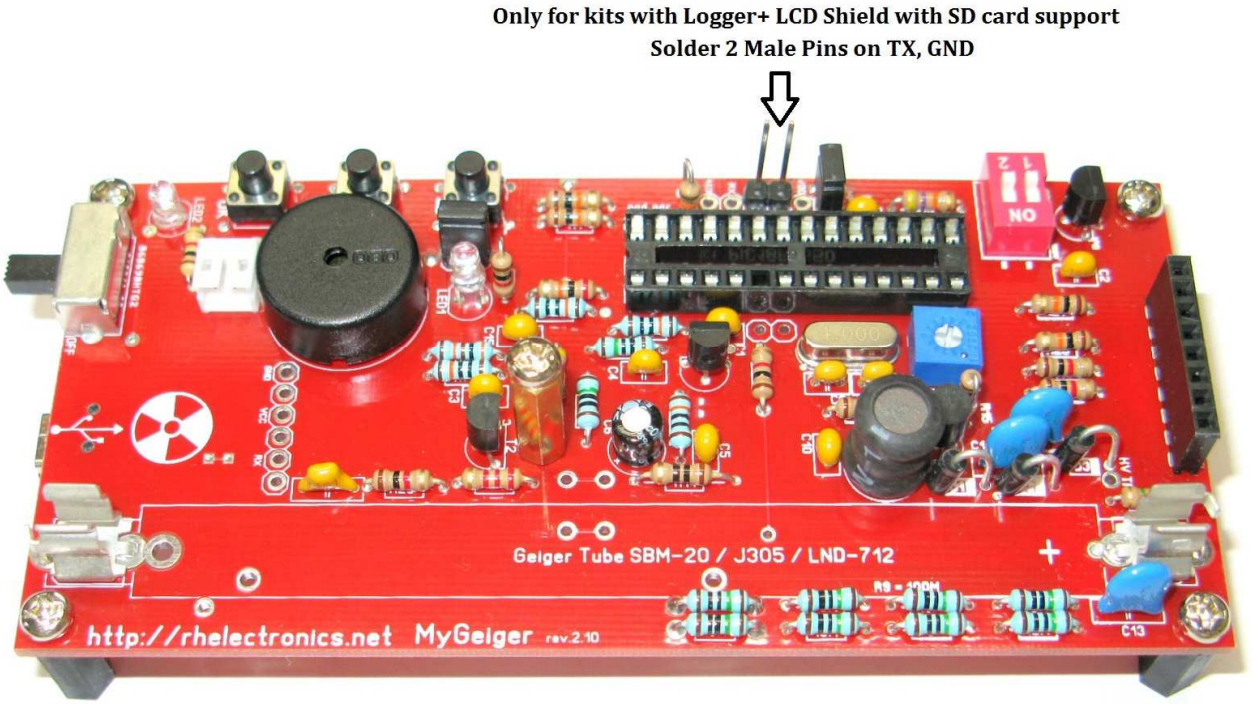


Pay special attention to IC's, transistors, diodes, LED, electrolytic capacitor, buzzer and buttons direction! PIC18F2550 chip direction toward buzzer. The event LED cathode should be toward the buzzer.

If you are in doubt about any component direction or polarity please check electrical circuit and PCB silkscreen diagram.



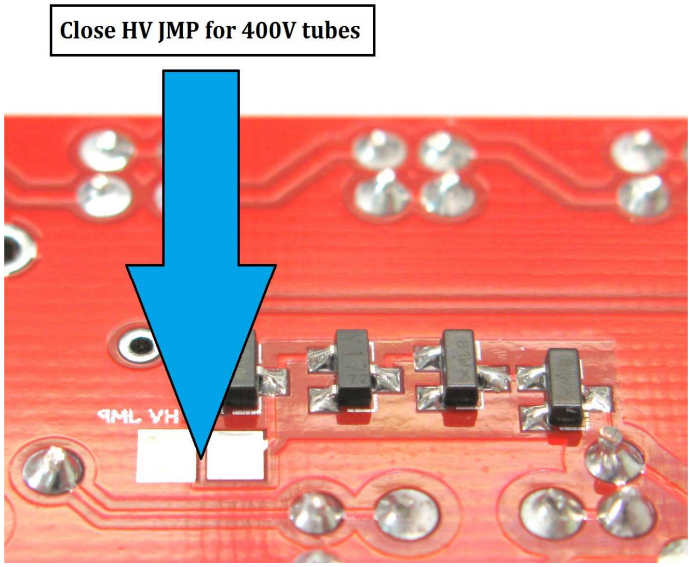
2 Pins Male headers soldered only if you purchased Logger+ LCD Shield with SD Card support. It require for sending serial output to SD Logger Shield.



Now it's time to take the middle point test, before you insert the PIC18F2550 into its socket. Flip the DIP switches to OFF position and turn blue potentiometer to halfway point. Connect a Li-PO battery, making sure to have the right polarity. Then:

1. Check IC3 for 3.3V output.
2. Check VREF voltage on pin 5 of the IC Socket. VREF voltage is 1.21V – 1.25V. Very important your board produces the correct reference voltage. We test IC2 before shipping, but if for some reason you read a different VREF then please contact support ASAP.
3. Check that C6 R14 measures 5V.

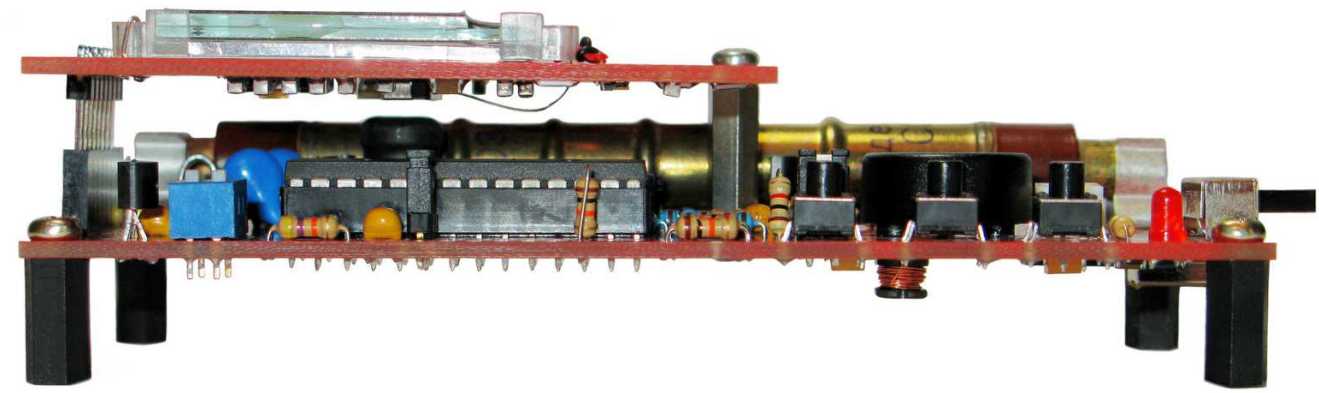
HV limiter: This part of SMT circuit is intended to limit the upper level of the HV output. By default it is set to 600V which is necessary for all 500V tubes. If you are going to use an SBM-20, or any other 400V range tube, then close the HV JMP solder type jumper. Use any type of 1206 SMT link or use solder joint. HV limiter circuit is required only under very intensive radiation load conditions.



Now it's time to wash the PCB carefully with isopropyl alcohol to remove all flux! The main board has to be very clean and free of any flux remains, especially in the high voltage area and 100M divider. Even a small flux trace can create a high voltage leak and cause different technical problems.

Remember to dry the board properly before you connect battery. Usually hot air fan trimmed to 50C-100C can be used to dry the PCB.

After wash is complete, insert the PIC18F2550 into the socket. Please verify chip direction. The notch is toward the buzzer. The Microcontroller ships with the latest firmware uploaded and default settings for SBM-20 Geiger tube. We strongly recommend you closely examine and electrically test all of your solder-work after washing. Compare all caps and resistors values again. Compare IC's, diodes and transistors direction. Install JMP1 and JMP2 if you still haven't. With power switch in OFF position, connect the battery. After installing the LCD Shield over the main PCB, you are ready for MyGeiger's first power-on.



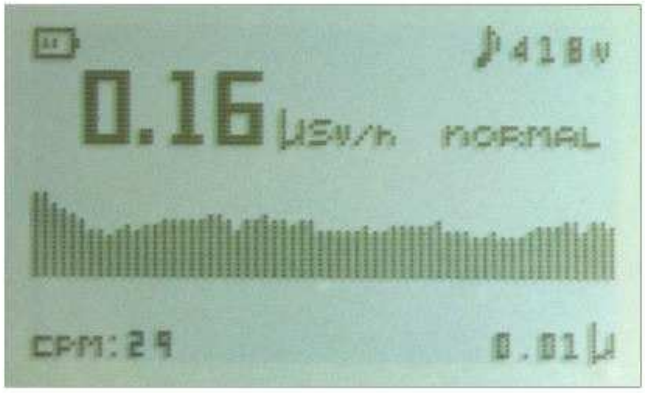
DIP Switch settings:

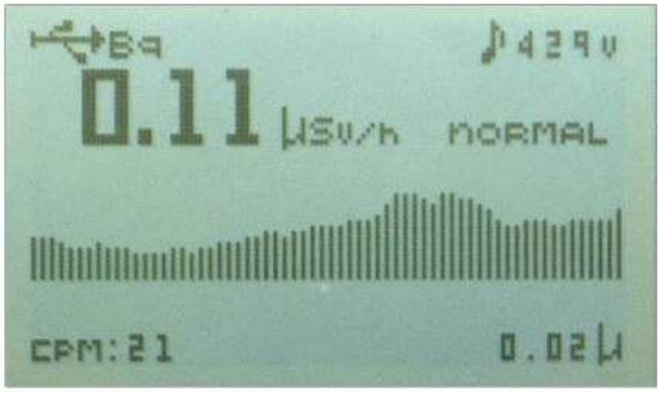
DIP switch 1 is used to select the HV range. OFF position for 400V range; ON for 500V range. Remember also to check HV JMP solder type jumper on the bottom side of the PCB (see HV limiter section of the manual above)!

High Voltage Calibration:

Trim P1 to the middle and check HV readings on the kit's LCD. Dial in P1 position until HV on display reads between 420V-450V or 520V-550V on background level (depend on your DIP1 switch selected).

Because T1 is under the LCD, you can trim it only when you disconnect the power source and remove the LCD. Usually it's not a problem, after 2-3 times of trials, you'll find the right point for the trimmer. **Trim P1 only when power switch is OFF!**


418v
0.16 µSv/h
NORMAL
CPM:29
0.01µ

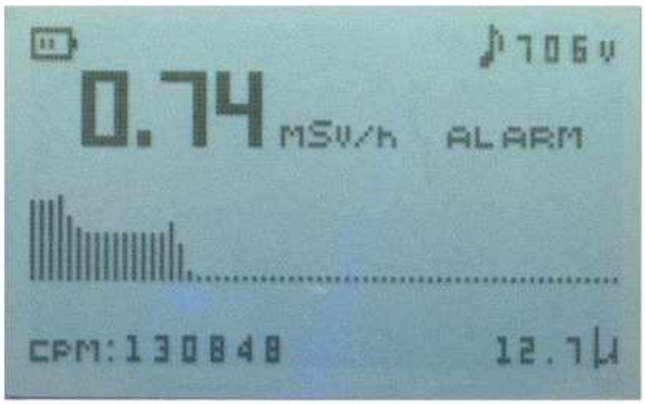

Bq
429v
0.11 µSv/h
NORMAL
CPM:21
0.02µ

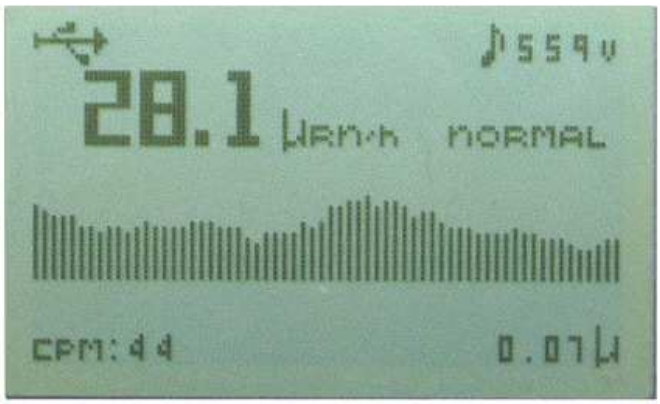

Bq
435v
2.89 µSv/h
ALARM
CPM:508
0.23µ


Bq
428v
16.0 µRm/h
NORMAL
CPM:25
0.36µ


415v
52.0 mRm/h
ALARM
CPM:81384
11.7µ


664v
0.44 mSv/h
ALARM
CPM:78456
3.94µ


706v
0.74 mSv/h
ALARM
CPM:130848
12.7µ


559v
28.1 µRm/h
NORMAL
CPM:44
0.07µ

Button Functions:

The kit has 3 tactile switches: (–) minus, (+) plus, or (OK) ok.
During regular dosimeter operation it has following functions:

1. To turn on the LCD backlight for several seconds press the *OK* button.
2. To select or deselect silent operation press + *plus* button.
3. To change display units from uSv/h to uRn/h quickly push the – *minus* button.

During dosimeter boot you can set the alert value:
When you see Set Alert on the display press the + or – button to change the CPM alarm amount. After the desired value is selected press OK. You don't need to set the alert level each time you start the counter because the setting is saved in EPROM. Just wait several seconds and the board will continue to load.

How to use the calibration menu:
To enter calibration menu make a long press on – button anytime during dosimeter operation. Use + and – buttons to set the values and *OK* to save and continue.

In the calibration menu set the Geiger tube conversion factor (0.0001-0.0250), tube maximum background CPM (BG), and tube active surface area in square centimeter units (SQ). At the end of the calibration menu, your asked about the kit's UART output (sends CPM or Becquerel readings to the computer) Press + for YES (will send Becquerel) or – for NO (will send CPM). After calibration is done, the counter will auto reboot.

Computer Logging:

MyGeiger has a built-in FTDI FT232RL virtual COM Port IC for USB logging. You will need a USB cable with mini-usb male connector. To allow logging please download and install FTDI FT232RL drivers: http://www.ftdichip.com/Drivers/VCP.htm

USB Serial Port Settings:

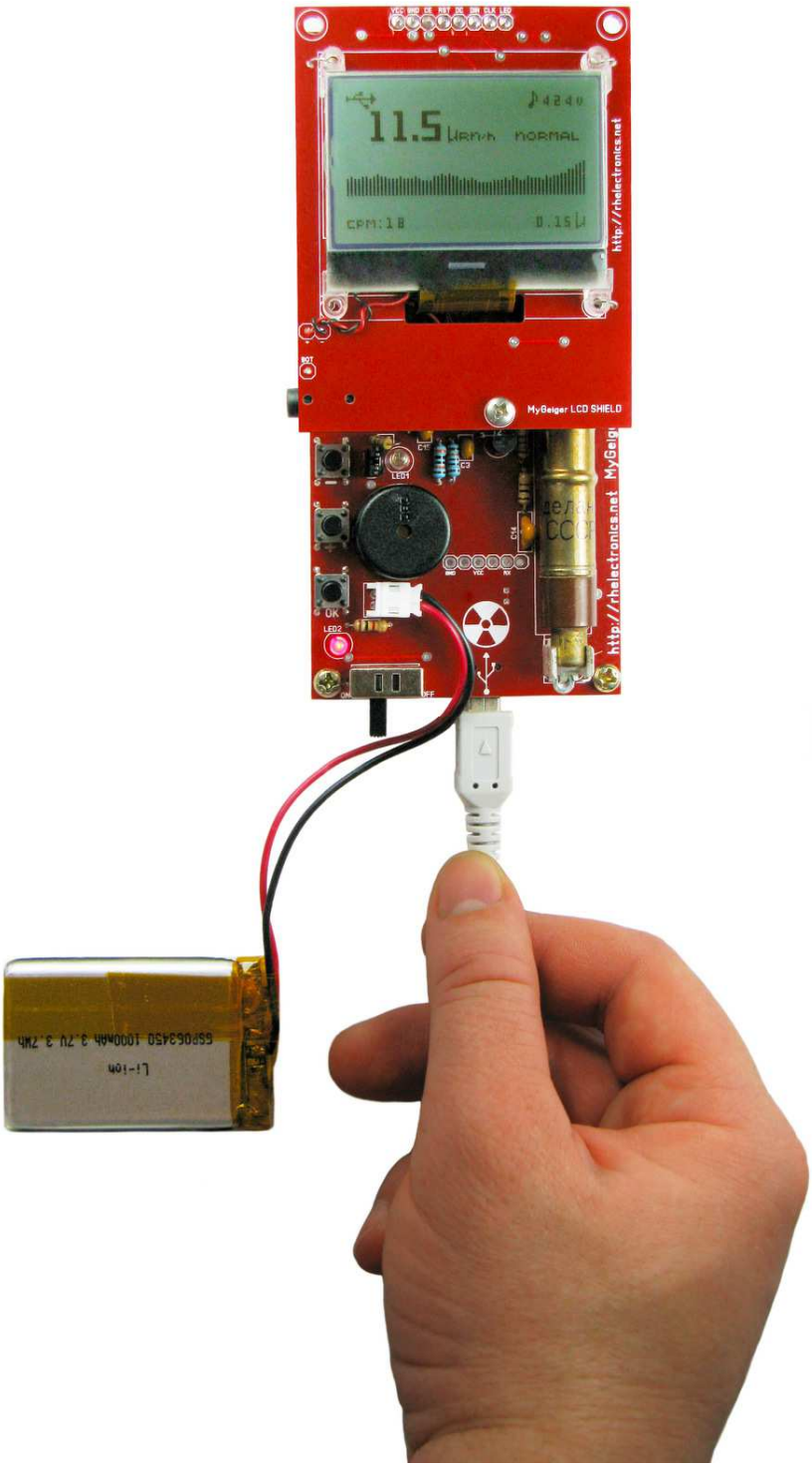
1. Baud Rate: 2400
2. 8 Data Bits
3. Parity none
4. 1 Stop Bit

Radiation Logger Software:

Please download the latest version of our FREEware PC data logging software from our website: http://radiohobbystore.com/radiation-logger/

Set MyGeiger for CPM output, in the calibration menu *Bq to UART*, then press – for NO.

Radiation logger software works with Windows OS. It allows the creation of CSV log files and graphcreation on your PC from previously saved logs files. It supports direct uploading to http://xively.com and to http://radmon.org MyGeiger sends CPM data to the computer via UART protocol each time it updates on the LCD.


11.5
NORMAL
CPM:18
0.15
http://rhelectronics.net
MyBeiger LCD SHIELD
OK
LED1
LED2
Li-ion
3.7V 3.7Wh
1000mAh

Known issues with CPM Output:

1. Computer logging with Radiation Logger application is intended for background radiation and moderate radiation levels. We recommend usage for radiation levels up to 100uSv/h (30000CPM) only. When a higher CPM value is presented, some data transmissions can be lost due to PIC software UART implementation limits.
2. Because t h e CPM output requires text UART transmission, it may cause t h e buzzer soundto stop for several micro-seconds. You will notice this only under high radiation load.

Becquerel Output Logging:

Becquerel logging is used for testing small sized radioactive samples, where the samples physical size is smaller than the tube surface size. Becquerel mode is an experimental function that we cannot guarantee precision results.

Download and run **Terminal.exe** program. https://sites.google.com/site/terminalbpp/

Set counter for *Bq to UART* in MyGeiger calibration menu, press + for YES.

Terminal.exe is a basic COM port freeware application with configurable connection settings and the ability to create log files. You can view log files with freeware Notepad++ editor.

Terminal log file example:
Date: 22.05.2014 - 17:37:44

1146 CPM, 8.45454 Bq/cm^2
1149 CPM, 8.47727 Bq/cm^2
1131 CPM, 8.34090 Bq/cm^2
1128 CPM, 8.31818 Bq/cm^2
312 CPM, 2.13636 Bq/cm^2
292 CPM, 1.98484 Bq/cm^2
269 CPM, 1.81060 Bq/cm^2
247 CPM, 1.64393 Bq/cm^2

Date: 22.05.2014 - 17:38:31
End log file

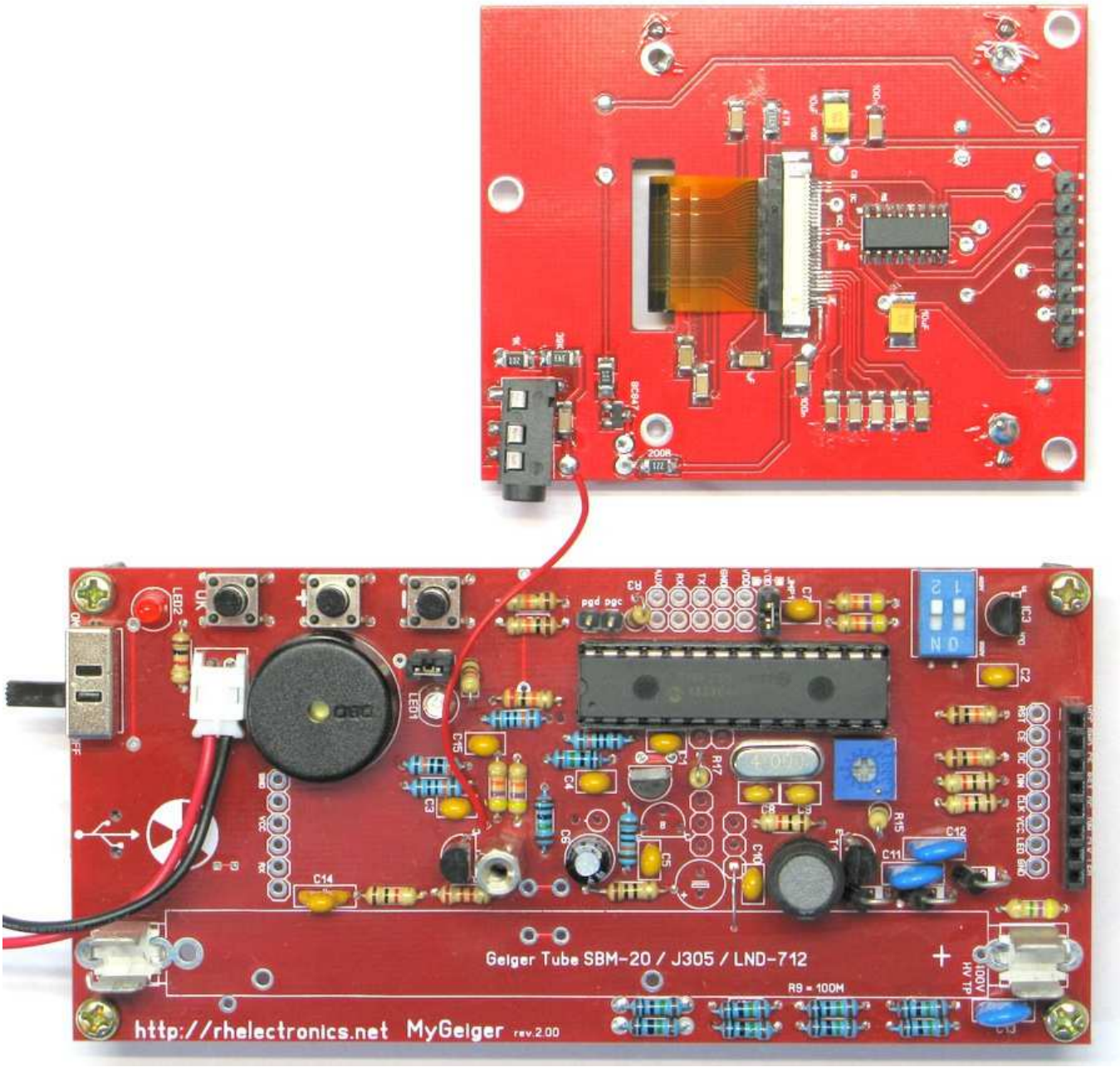
Known issues with Becquerel Output:

1. Terminal.exe can log from COM ports with numbers between COM1 and COM10 (or from COM1 to COM64 depending on program version). If your COM port number is higher in Windows, then you'll need to set COM port number manually in Windows Device Manager (Port properties–Port Settings–Advanced) Take note, sometime this manual operation can cause problems later on when using other applications, so you can always Restore Defaults if something goes wrong.
2. Because Bq/cm2 output requires long text UART transmission it may cause buzzer sound stops for several micro-seconds. You can notice this issue under high radiation load only.

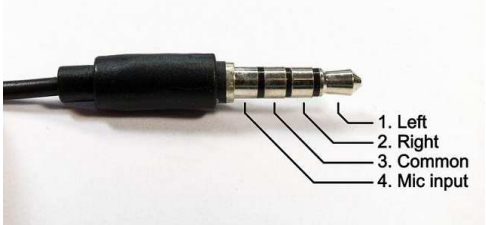
Geiger Bot (optional function):

https://sites.google.com/site/geigerbot/

Take note, this method will work only for LCD Shield with audio jack (without SD Logger+)! If you want to connect MyGeiger to an iPhone or iPad with the Geiger Bot application then please add one wire link as shown below:



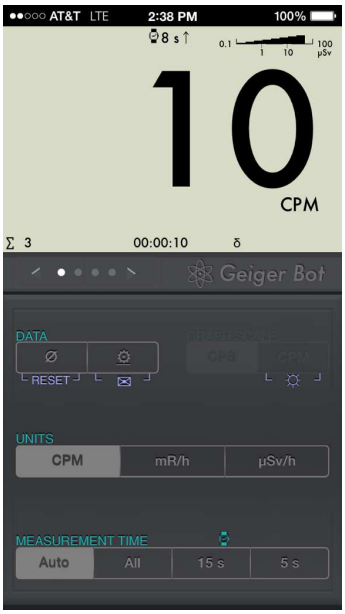
The Main board and LCD Shield has a connection pad marked as *BOT*. Use about 6cm length wire and 4 wire 3.5mm audio cable (one with microphone stripe, see example below)

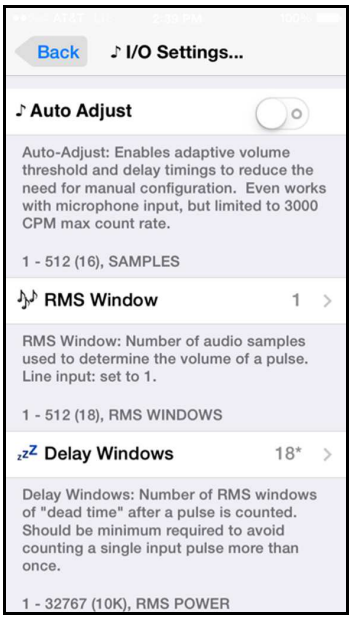


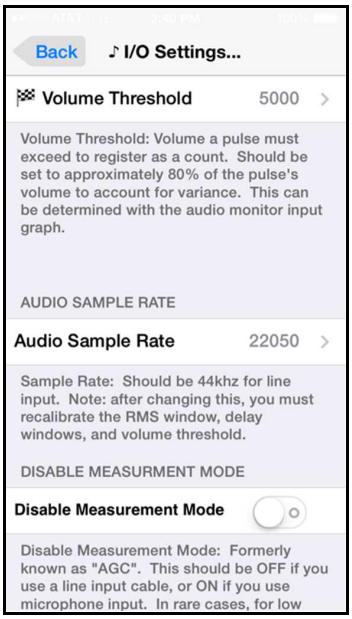
Geiget Bot Software Settings:

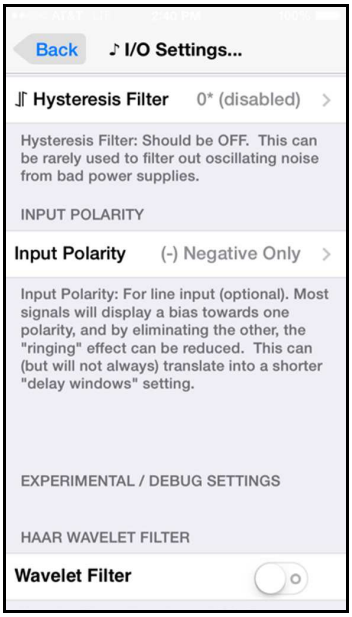
Geiger Counter->Custom GM tube-> I/O settings

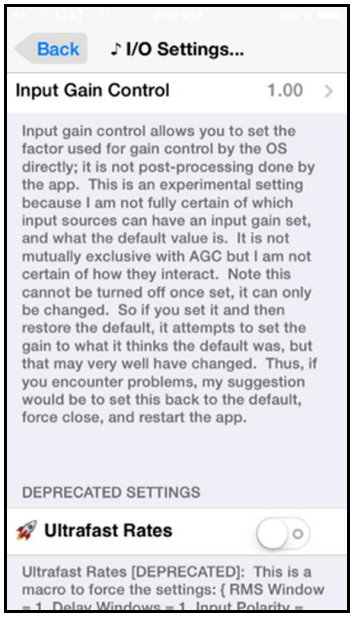
Auto-Adjust:	OFF
RMS Window:	1
Delay Window:	18
Volume Threshold:	5000
Sample Rate:	22050
Disable Measurement Mode:	OFF
Hysteresis Filter:	0
Input Polarity:	Negative Only
Wavelet Filter:	OFF
Input Gain Control:	1.00
Ultrafast Rates:	OFF

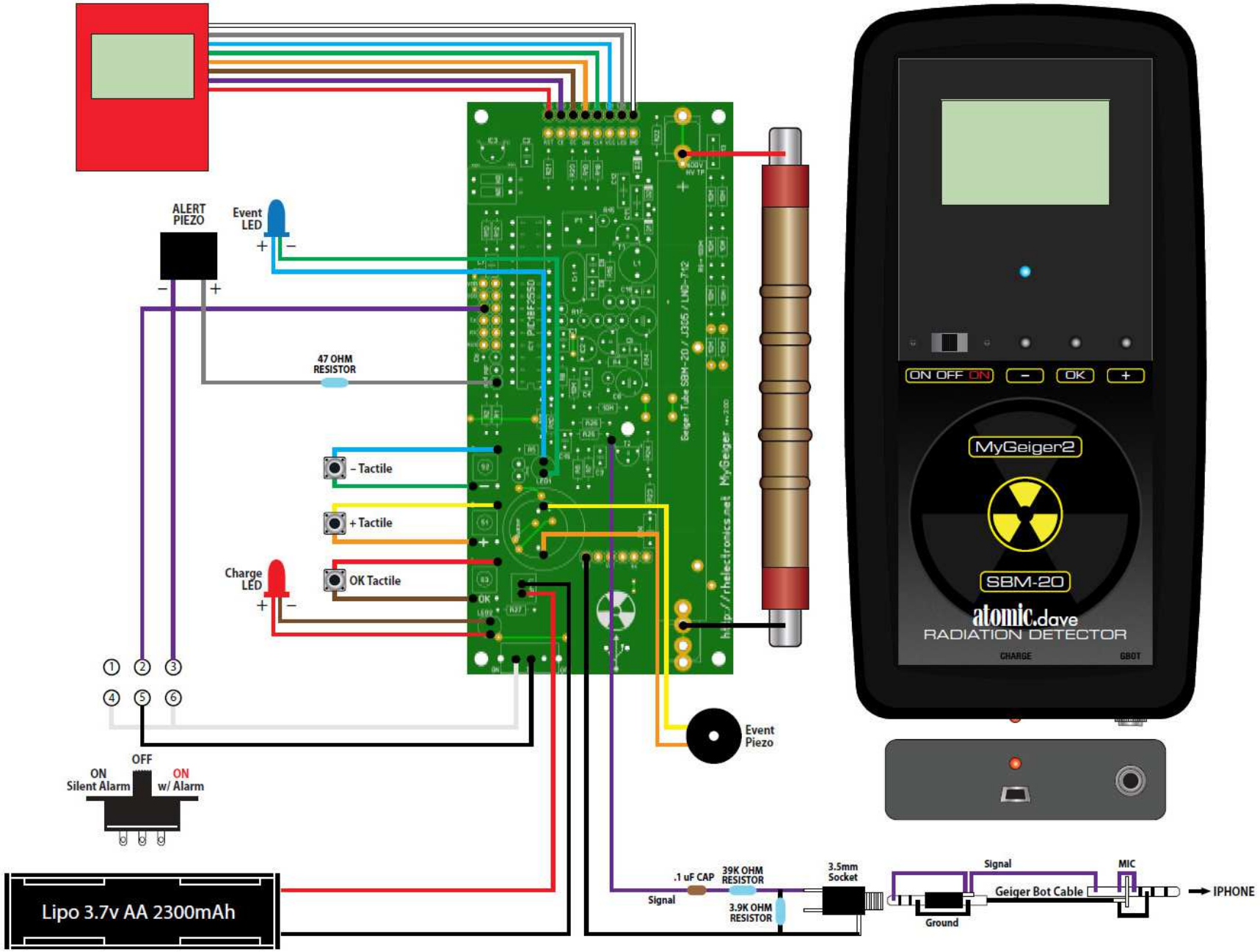






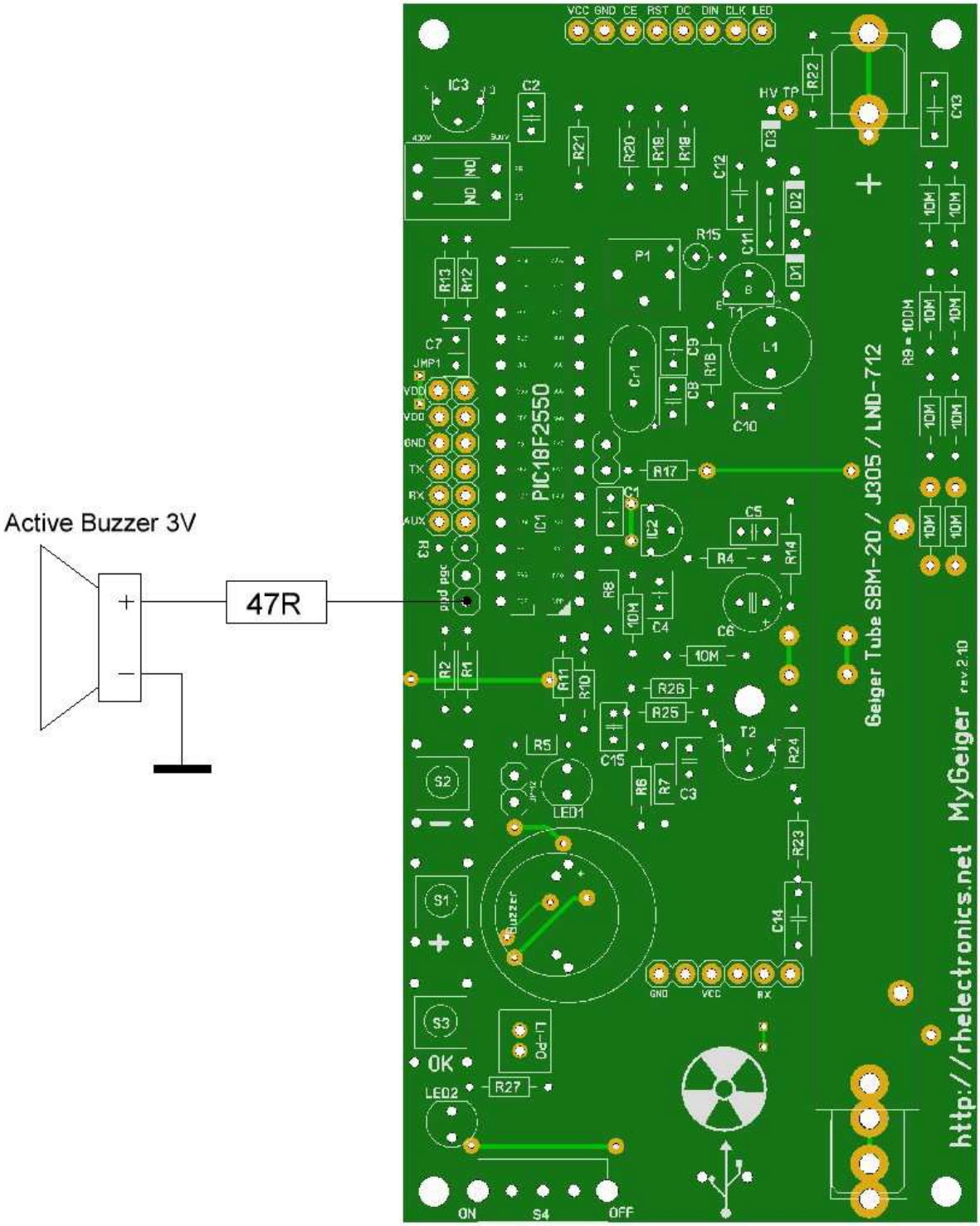





ALERT PIEZO
Event LED
47 OHM RESISTOR
– Tactile
+ Tactile
OK Tactile
Charge LED
1 2 3
4 5 6
OFF
ON Silent Alarm
ON w/ Alarm
Lipo 3.7v AA 2300mAh
Event Piezo
.1 uF CAP
39K OHM RESISTOR
3.9K OHM RESISTOR
Signal
3.5mm Socket
Ground
Signal
MIC
Geiger Bot Cable
IPHONE
ON OFF ON
OK
MyGeiger2
SBM-20
atomic.dave
RADIATION DETECTOR
CHARGE
GBOT

Atomic.Dave kindly provided the installation diagram above for his MyGeiger enclosure design. You can use his wiring breakout diagram for an external Geiger Bot socket. This will definitely help if you have an enclosure, or if you have a SD Logger LCD Shield and you need a Geiger Bot output.
Check his items on eBay: http://www.ebay.com/usr/atomic.dave

Alert Buzzer:
Since the 2.13 firmware update, the kit supports an additional alert buzzer. You need to use an Active type Buzzer that operates at 3V DC. 47ohm resistor should be wired to pin 28 of the processor, marked as *PGD* on the PCB. Please see diagram below:



General warnings and suggestions: Avoid long wires connected inside and outside the enclosure. Avoid loose contacts for power source or batteries. Never wrap wires around the connection pins! Use proper connectors or solder tinned wires directly to the PCB pins. **Check the polarity and direction of all connections you make!** Do not touch the GM tube with your hands when the device is powered. Do not place the Geiger module on any metal surface. A plastic case is recommended for the counter. Do not short tube terminals. Do not try to measure the high voltage tube clips with a regular voltmeter!

Troubleshooting: Most of the problems with the kit are caused by incorrect soldering or shorted circuits between components. Please recheck your soldering.

High voltage problems:

1. Wash the PCB and check T1, D1, D2, D3 polarity.
2. Check voltage multiplier soldering is correct on all points! Excess solder may cause shorts and create additional connections between components.
3. Check that the VREF voltage is correct, pin 5 of PIC should measure 1.25V
4. Check that the PWM signal from pin 13 of PIC is delivered to the T1 base.
5. Check if L1 coil has DC resistance at about 12-20 ohm.
6. Check 100M divider is soldered correctly.
7. Check R8 value is 100K.

WARNING!
When powered up, this unit produces a high voltage of at least 400V from the tube clips! If you buy this kit you are fully responsible for any possible injury caused during assembly or use of this device. Never touch the PCB during operation. Place the finished kit into a plastic case to prevent touching high voltage elements before powering on.

Need help with the DIY Kit you purchased?
Please send a support request to us at: support@rhelectronics.net

Support request requirements:
• Include your order number or eBay ID
• Please describe your problem fully; attach screenshots or pictures and explain what you already tried to resolve the problem.
• Attach high resolution focused photos of your soldered kit, from both sides of the PCB.
• Please wait up to 24 hours for a response.
• Please follow our support instruction because we can help you only if you work with our support team. If you do not provide enough information for the support team or drop out from communication we will not be able to resolve the problem.

Several advices for successful kit assembling:
• Print the circuit schematic page from user manual and refer to it OFTEN during soldering.
• Follow the User Manual for assembly and calibration.
• Take your time! Please solder clean and accurate.
• Use only Rosin Flux and Solder 60/40 with low melting point.
• Clean the PCB with isopropyl alcohol after soldering.
• Locate and download components datasheets for reference.

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