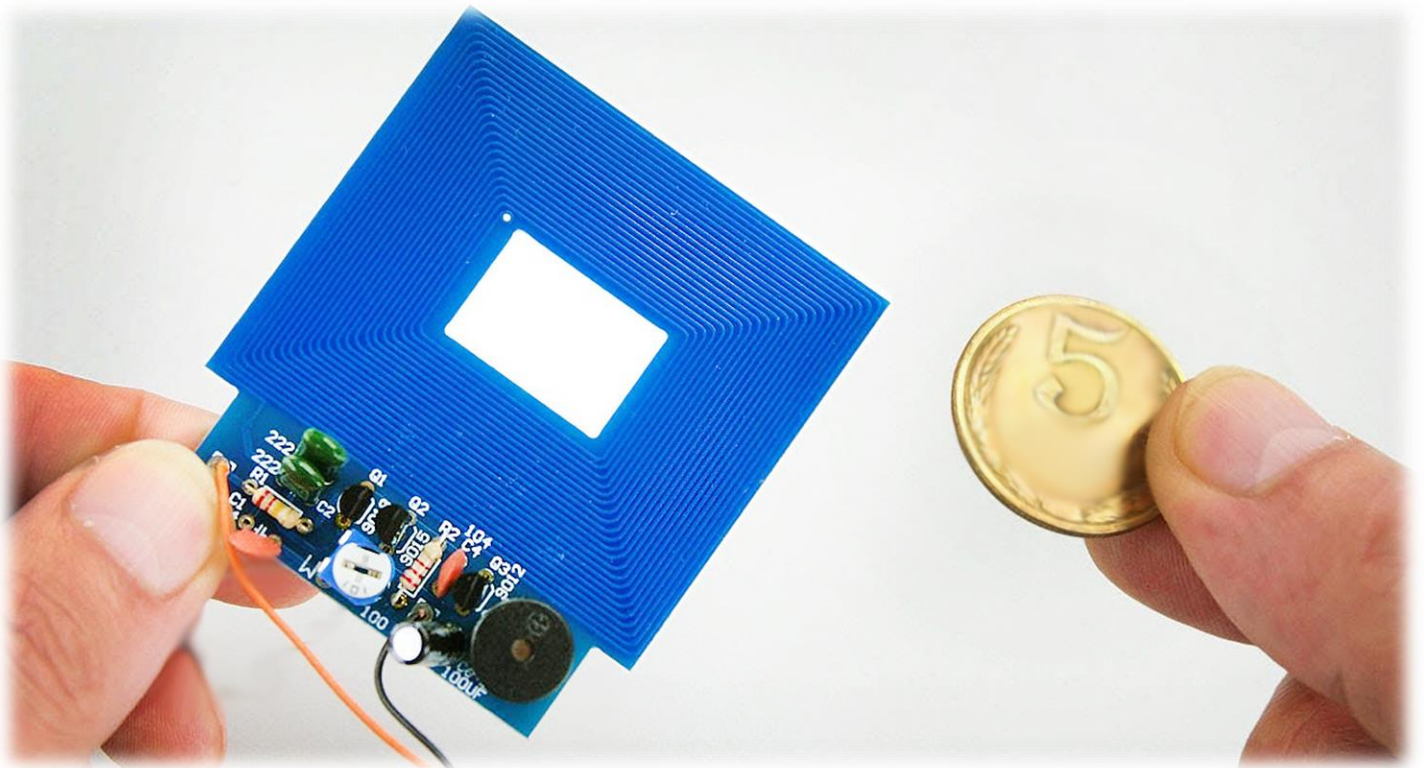


Pocket Metal Detector with On-board Printed Coil D.I.Y. Kit

Part Number: **AK-285**



ABRA
www.abra-electronics.com

1. Description:

This kit is a low-power metal detector. It is designed to function using simple electronic components. This metal detector benefits from an internal coil embedded into the Printed Circuit Board (PCB) which makes it a better option in terms of ease of handling compared to the traditional versions with a copper coil hanging off the side.

This kit can be used in a variety of personal or educational applications while also being a simple soldering project for beginners. For example, in order to safely drill into a wall, a metal detector such as the AK-285 kit can be used to locate unknown metallic objects such as electric wires, ethernet cables, gas or water pipes.

This is a D.I.Y. kit that requires soldering through-hole components on a double-sided printed circuit board. It is designed for users with minimal soldering tools and skills. You must insert the components on one side of the board and solder the leads on the opposite side. The assembly process should take anywhere between 10 to 20 minutes.

2. Specification:

- **Required Input Voltage:** 3 – 5VDC
- **Current:** $\approx 10\text{mA}$
- **Maximum Detection Range:** 5cm ($\approx 2''$)
- **Best Detection Range:** 2cm ($\approx 25/32''$)
- **PCB Dimensions:** 66 x 61mm (2.6x2.4'')

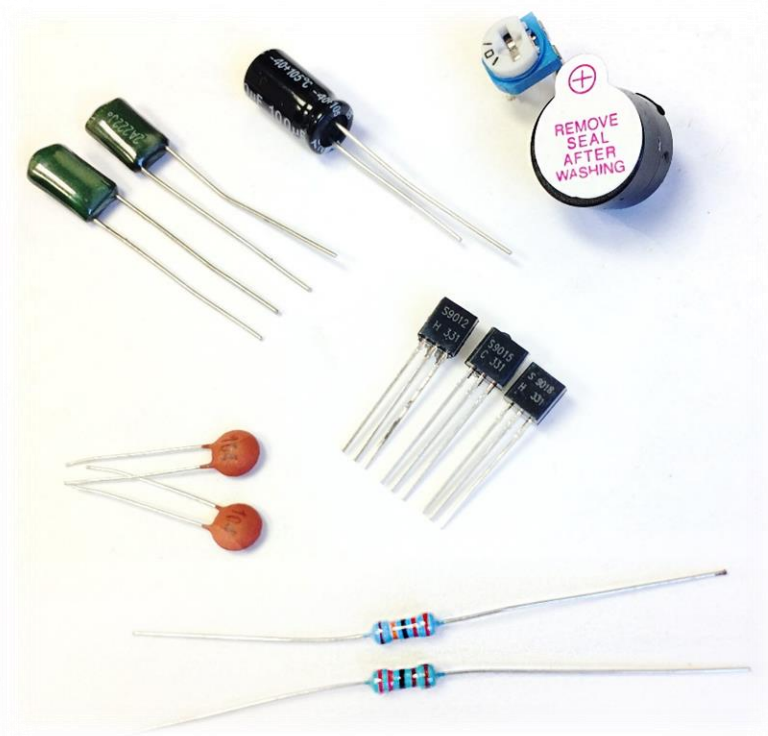
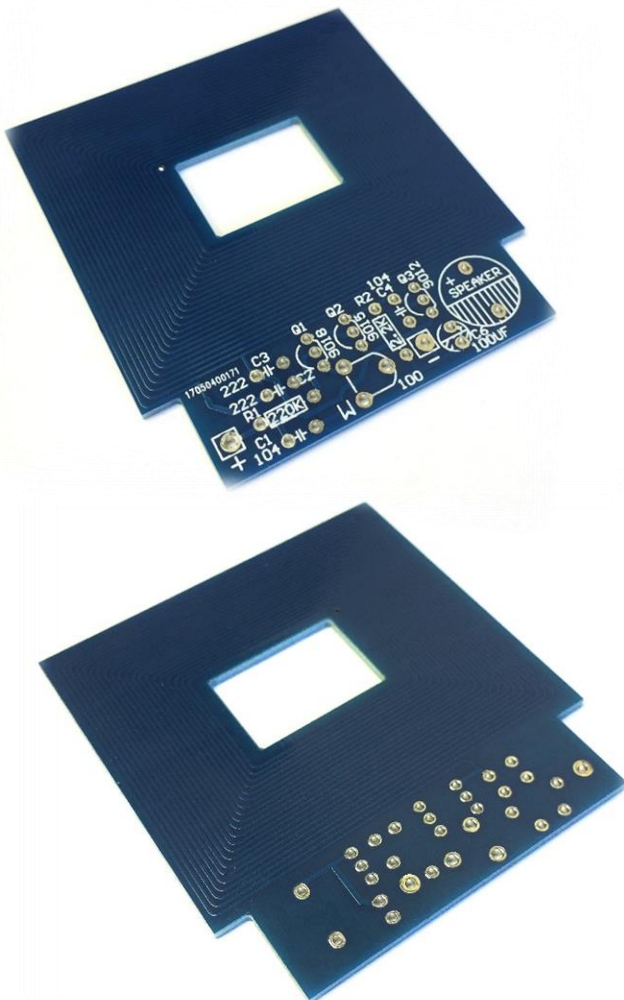
3. Advantages and Features:

- Easy to assemble and use
- Easy to handle
- Affordable price
- Small and lightweight package
- Can be powered up using commonly available batteries
- Low potential for electrostatic discharge (ESD) damage due to lack of IC components
- User-friendly PCB layout with precise silkscreen labelling
- Warning buzzer
- Adjustable sensitivity
- Can be turned ON/OFF using the battery holder switch

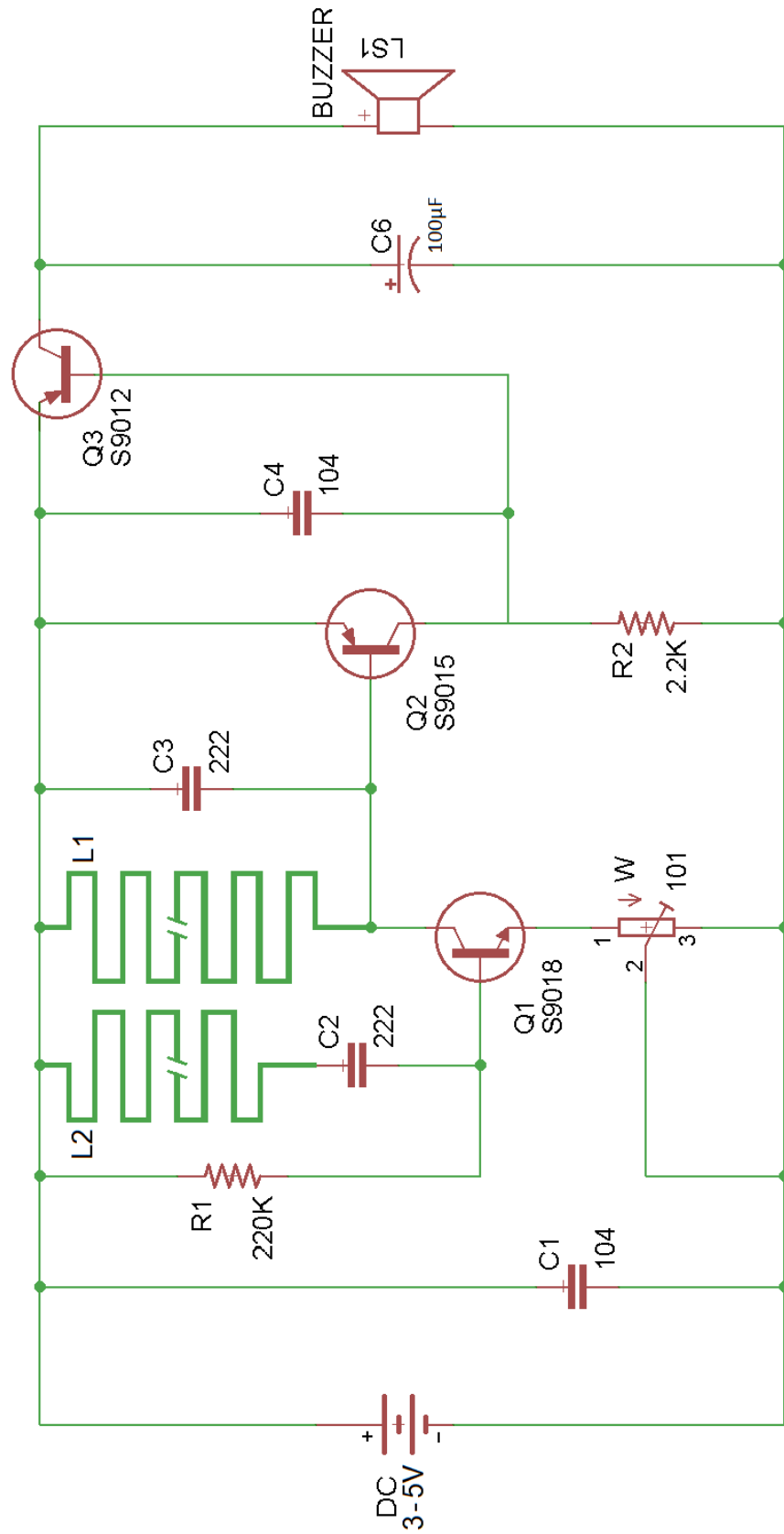
4. Bill of Materials

This package includes **14** pieces which are listed below along with their labels and quantity.

Component	Label on PCB	Value / Type	Quantity
Resistors	R1	220K Ω	1
	R2	2.2K Ω	1
Variable Resistor	W	100 Ω	1
Ceramic Capacitors	C1, C4	104 (100nF)	2
Polyester Capacitors	C2, C3	222 (2.2nF)	2
Electrolytic Capacitor	C6	100 μ F	1
Transistors	Q1	S9018 NPN	1
	Q2	S9015 PNP	1
	Q3	S9012 PNP	1
Buzzer	LS1	Electromagnetic SOT Continuous Beep	1
PCB	—	Double-sided Through-hole	1
Battery Holder	150-320-ESW	2xAA with Removable Cover and ON/OFF switch	1



5. Circuit Schematic:



6. Assembly:

1) In order to assemble the module, you need the following tools:

Must Have

- Temperature Adjustable Soldering Iron
- A variety of soldering tips
- Brass wool
- Wet sponge



Phillips Screwdriver



60/40 or 63/37, Tin-Lead Solder



Wire Stripper



Flush Cutters



Lint Free Cloth



***It is recommended to have some isopropyl alcohol and a fine soldering brush handy to clean off the excess flux on the circuit board when the soldering is done.**

Recommended

Isopropyl Alcohol



Soldering Brush



Rosin Flux Pen or Paste



***ATTENTION* DO NOT USE RUBBING ALCOHOL, IT WILL DAMAGE THE COMPONENTS.**

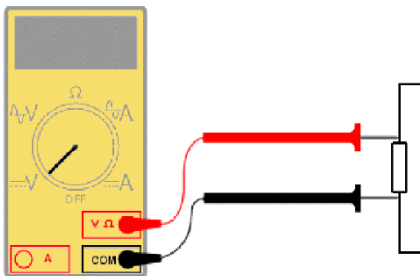
- 2) Open the package and verify the components. (refer to section 4. **Bill of Materials**)
- 3) Lay down all the components on your workbench and proceed to the next step.
- 4) Prepare your soldering tools.
 - a) Use an appropriate tip for the application. Also, make sure the soldering tip is clean. Gently use a brass wool or a brush to clean the tip when needed. Another way of cleaning the soldering tip is to use a wet sponge.



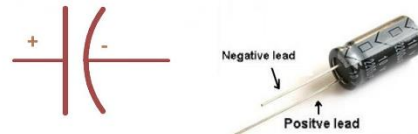
- b) The soldering iron temperature depends on the type of solder used. If you are using a typical **60/40 lead solder**, depending on the thickness the temperature should be set anywhere between **370 to 500 °F (187 to 260 °C)**. If you are using a lead-free solder, increase above temperatures **by 40 to 70 °F (5 to 20 °C)**.
***ATTENTION* HIGHER TEMPERATURES WILL DAMAGE THE COMPONENTS ALONG WITH THE CIRCUIT BOARD.**
***ATTENTION* DO NOT TOUCH THE SOLDERING IRON WHEN IT IS HOT.**
- c) It is recommended that you clean the board with a fine brush, isopropyl alcohol and lint-free cloth to get rid of any pre-existing residue, glue or dirt. This way the solder will create a better joint with the copper surface.
- d) Have your flush cutter, needle nose plier or tweezers handy.
- e) Having a roll of paper tape helps you to keep the components in place when soldering on the bottom side of the board.
- f) Have a rosin flux pen or paste handy. Adding flux to the pads before soldering the components makes the wetting process easier by letting the melted solder to flow better on the pad and create a better joint.
***ATTENTION* SOLDERING SHOULD BE DONE IN A VENTILATED AREA. BREATHING SOLDER FUMES WILL HARM YOU.**



Optional
Use a digital multimeter to measure the resistor values



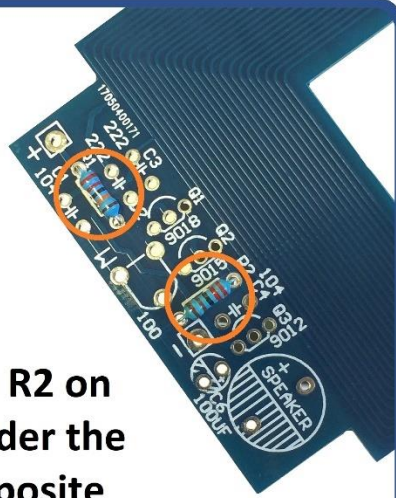
Pay attention to the electrolytic capacitor polarity.



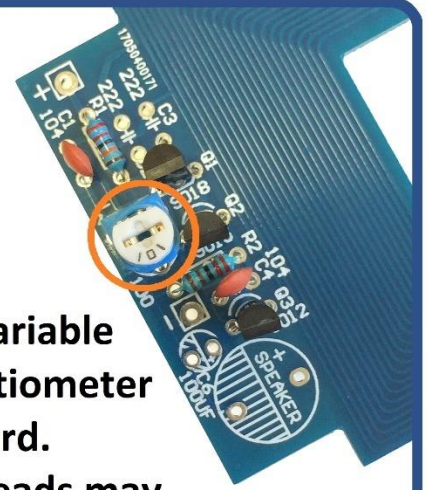
****Ceramic capacitors do not have polarity.****



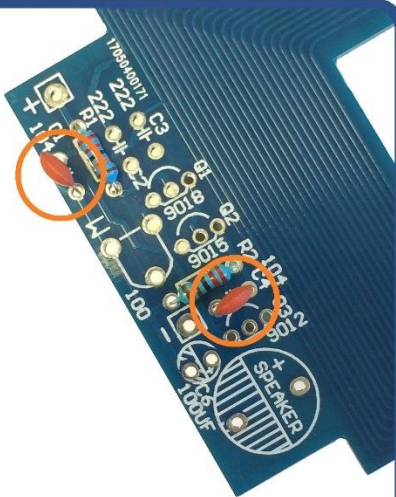
1. Insert R1 and R2 on the PCB and solder the leads on the opposite side of the board.



4. Solder the variable resistor/potentiometer (W) on the board. Soldering the leads may require slightly more heat.



2. Repeat the process for C1 and C4.



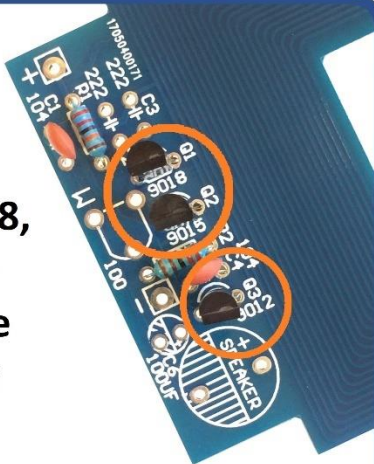
5. Solder the electrolytic capacitor (C6) and the buzzer (LS1) on the board.

***Pay attention to the polarity of these components.
*Soldering the buzzer may require slightly more heat due to leads with thicker diameter.**



3. Place the S9018, S9015 and S9012 transistors on the board and solder the leads on the bottom side.

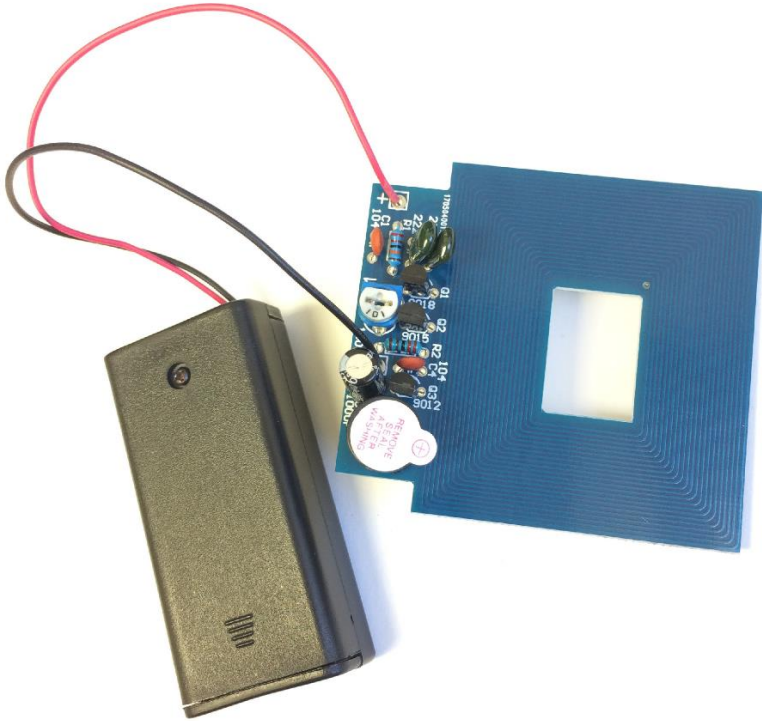
***Pay close attention to the pinout orientation.**



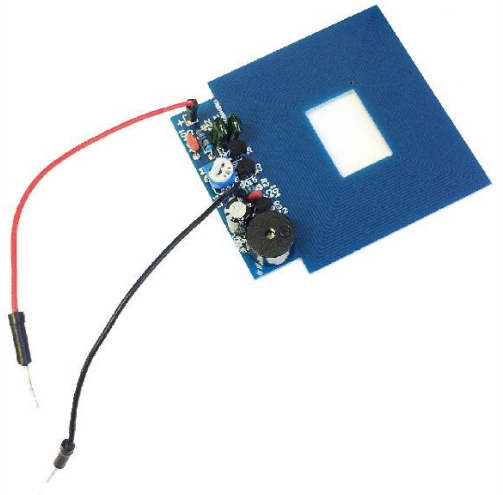
6. Solder the 222 capacitors (C2 and C3) and proceed to the final step.



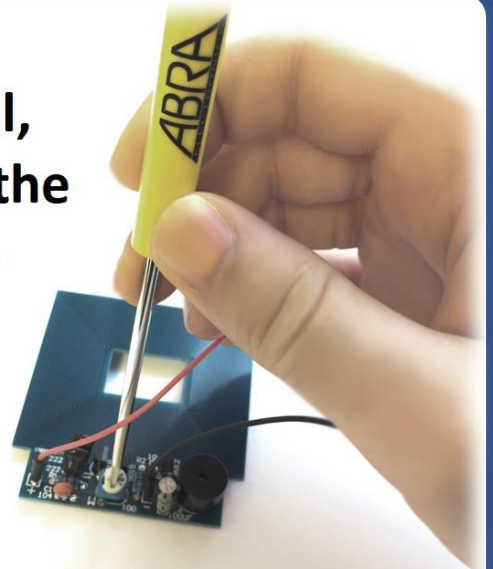
7. Take the provided 2xAA battery holder and solder the positive (red) and the negative (black) wires onto the board.



8. If you are using an external power supply, you can add two jumper wires.



9. Once the batteries are inserted and the device is rendered functional, use a flat head screwdriver to adjust the sensitivity via the potentiometer (W).



For more Educational D.I.Y. Kits visit
<https://abra-electronics.com/educational-kits-trainers/>