"One Million Ohms" Microcontroller Project Kit

***Where to buy it:* tinyurl.com/BuyMohms**

Amuse your friends and confuse your enemies! Keep the uninitiated away from your workbench or desk and out of your lab!

- Great conversation piece or gag gift
- Big, scary 1,000,000 Ω resistor in the middle of the board
- Pre-programmed AVR microcontroller (ATtiny85)
- Arduino-compatible, hackable open-source hardware and software
- Can be re-programmed with an ICSP programmer, using either the Arduino integrated development environment or WinAVR.

This soldering kit is an electronic version of an old joke known to physicists and engineers. Pressing the SELECT button turns the circuit on and causes the red LEDs to flash. To change the flashing speed and pattern, press SELECT again. Hold SELECT down to turn the circuit off, or it will automatically turn itself off after five minutes.

Assembly Tips

1. Even though this is a simple kit that a beginner should be able to complete with little difficulty, these instructions are general in nature and assume that you know how to solder and can determine where to place the components on the board. If you need to learn how to solder, there are several good tutorials on the web. Check out SparkFun Electronics' tutorial (*tinyurl.com/3f4dpxj*), and Adafruit Industries also has several good links (*tinyurl.com/3ooo2fj*).

2. Be sure to observe polarity when installing the following components. Observe the outlines on the board (also see Parts Placement on the last page of these instructions.)

    a. LEDs may have a longer lead denoting positive (+) and/or a flat on the side denoting negative (-). See picture at tinyurl.com/d2bwtec

    b. The microcontroller may have a notch on one end, and/or a small dot near pin 1.

    c. Connect the red wire (positive) from the battery holder to the terminal block screw nearest the bottom of the board (+) and the black wire (negative) to the (-) screw. Observe polarity when installing batteries as marked on the battery holder.

3. The microcontroller is sensitive to static electricity and is shipped in conductive foam for protection. Normally a lot of fancy precautions aren't necessary, but don't scuff across the carpet and then touch the chip. Touch some metal object or appliance before handling the chip. Once soldered onto the board, the chip is safe.

4. As shipped from the factory, the leads on the microcontroller are spread out a bit and need to be bent in to fit into the board. One way to do this is to *carefully* press each side of the chip against a table top. Bend the four pins on each side just a bit so that they are parallel. See picture at tinyurl.com/9dahxr5

5. Double check the small resistors before soldering them. There is one 10,000 Ω (10 KΩ) resistor and four 100 Ω resistors. They only differ by one color-code band (see parts list below). If unsure, use a magnifying glass or an ohmmeter to check the values.

6. Positioning of the terminal block and battery holder is flexible depending on your intended use and installation of the board. To allow the board to stand at a slight angle on a desk, etc., put the terminal block and the battery holder on the back side of the circuit board. Use a one-inch square of double-stick foam tape to fasten the battery holder about 0.2 inch (4mm or 5mm) from the bottom of the board.

7. There are four small holes in the circuit board near the terminal block. These can be used as strain reliefs for the battery wires by threading the wires through the holes. See the pictures at *tinyurl.com/MohmsPics*. Where you locate the battery holder, whether you use the strain relief holes, and how long you leave the wires from the battery holder all depend on your personal preference and installation.

8. A reset button and an ICSP header are not normally required and are not included in the kit. These are left to be added by the user if desired, e.g. if they intend to reprogram the unit with an ICSP programmer.

Parts List

C1	2.2uF ceramic
IC1*	Atmel microcontroller, ATtiny85V-10PU (or ATtiny45V-10PU)
ICSP	Programming header, 0.1" pitch, 2x3 (Optional, not included in kit)
LED1-4*	5mm LED
R1-4	100Ω, 1/8W or 1/6W, ±5% (brown, black, brown, gold)
R5	10KΩ, 1/8W or 1/6W, ±5% (brown, black, orange, gold)
R6	1MΩ, 2W, ±5% (brown, black, green, gold)
SELECT	6mm tactile button switch
RESET	6mm tactile button switch (Optional, not included in kit)
TB1	Terminal block, 3.5mm pitch, two position
	Battery holder, 2xAA with cover
	Double-stick foam tape
	Printed circuit board

*Observe polarity when installing.

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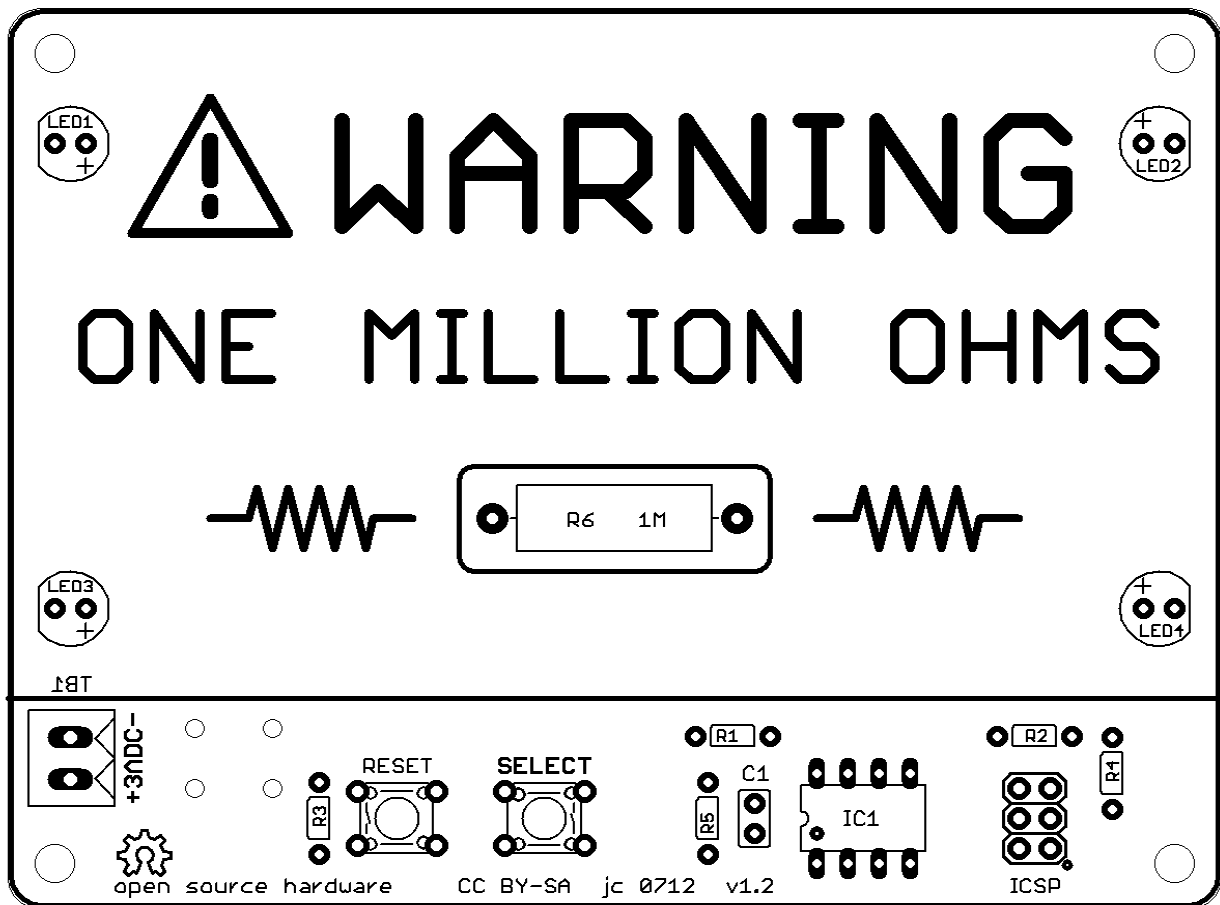*Where to buy it:* **tinyurl.com/BuyMohms**

Links of Interest

Hackable open-source!

- Hardware: *tinyurl.com/MohmsHW*
- Software: *tinyurl.com/MohmsSW*

Assembly pictures: *tinyurl.com/MohmsPics*
These instructions: *tinyurl.com/MakeMohms*

Parts Placement

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