Reverse Engineering: Multimeter

Team 7700E

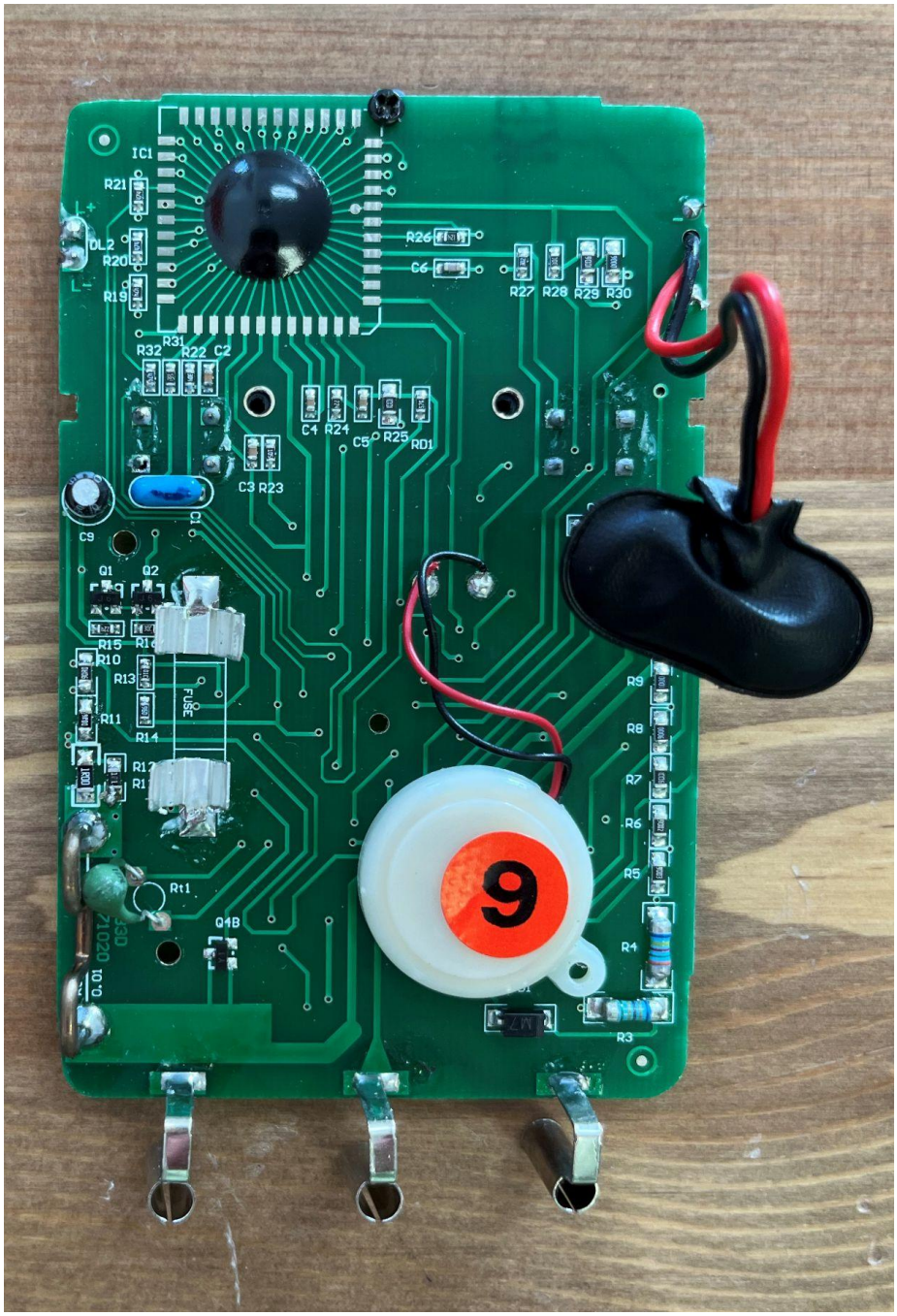
Rolling Robots, Rolling Hills Estates, CA

Video Link:
https://drive.google.com/file/d/1AthNWwdKhlAN6PXuRKwuFAcfAapbZiAJ/view?usp=sharing

When taking apart the multimeter we started by removing the screws on the back of the case and removing the battery. We then removed the rubber along the side of the multimeter and began to pry open the case.

After we removed those the circuit board was exposed, so we unscrewed it to see what it looked like on the other side and what was under it. When we removed it, we could see what was behind the digital multimeter dial. You can also see two different buttons and the LCD screen that lets the user of this multimeter know their result. You can also see the wire that connects to the battery. The three metal “prongs” that emerge from the circuit board are what is behind the multimeter jacks. The multimeter jack furthest to your right hand side represents COM, the black test lead input used for all measurements. The jack in the middle is used for the red test lead input and for measurements of μA and the jack on the far left is used for the red test lead input as well. It is used for measurements up to ten amps.

When turned around, the circuit board should look something like this.



There are many different components on this circuit board and when you turn it around you can really tell. There are many resistors mounted on this circuit board, everything here that is next to a letter “R” is a resistor. There is a difference in the resistors though. The resistors used here are of two different kinds called SMD resistors and Fixed Resistors. SMD stands for Surface

Mount Device. SMD resistors are much smaller than the classic Fixed Resistors making them much easier to use in circuit boards and small spaces. Using a SMD resistor instead of a classic resistor has no different effect as long as they have the same power. Fixed resistors are more commonly used but take up more space. Their power can be defined by the colorful stripes painted onto the resistors.

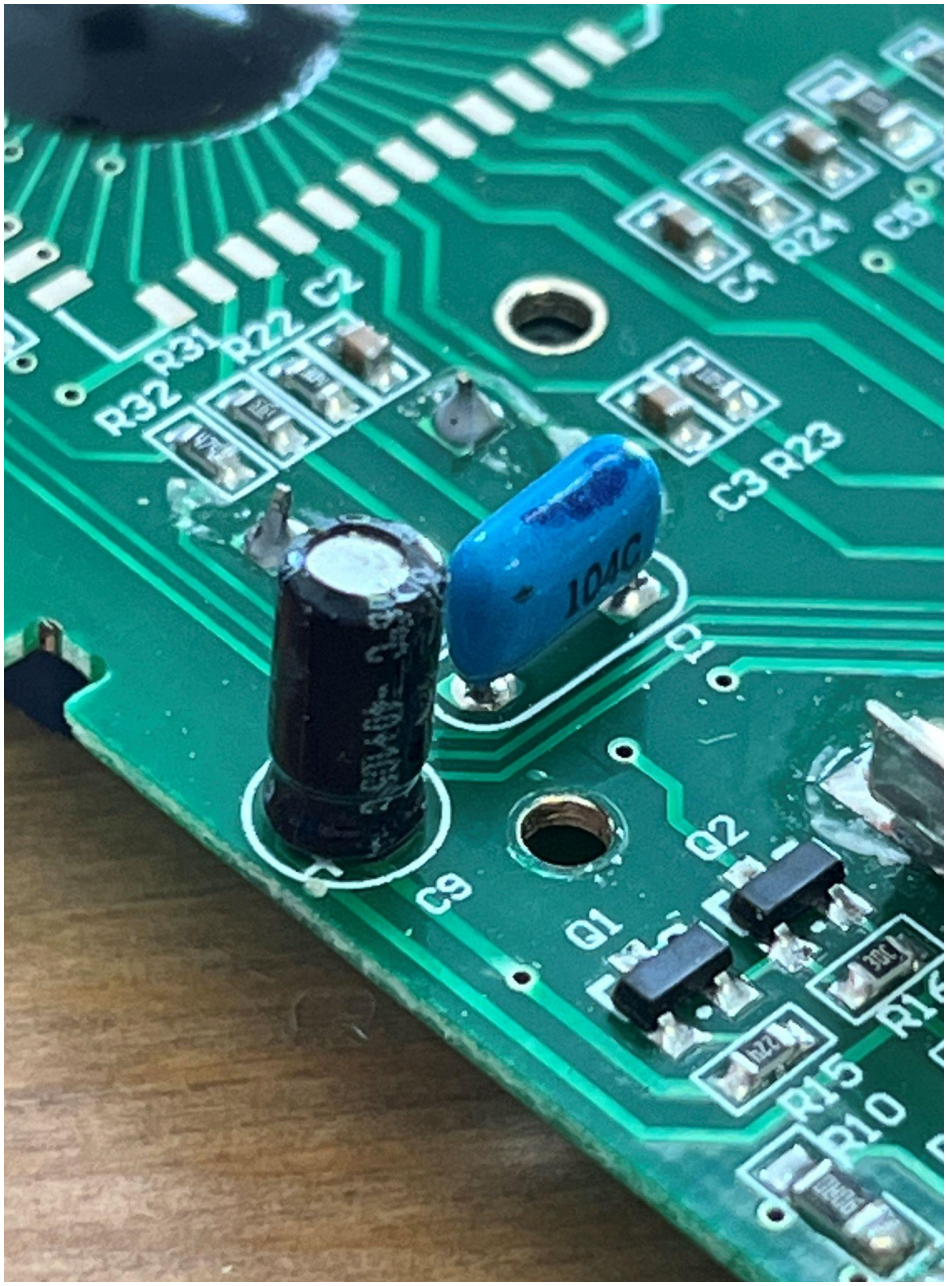
There is a speaker mounted in the circuit board as well, it's connected by a red and black wire which represent negative and positive. This is powered by the battery on the battery in the multimeter.

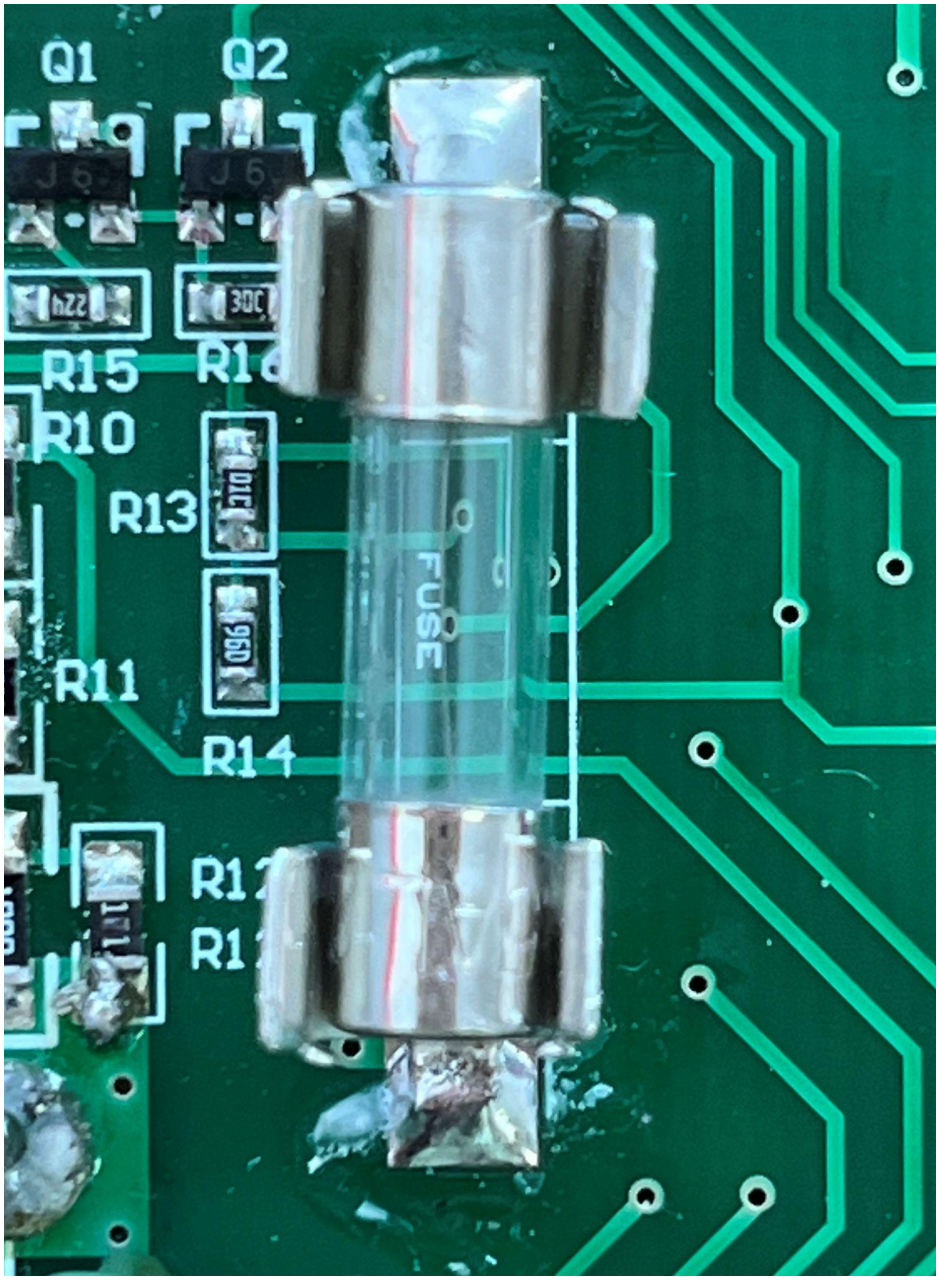
The items mounted next to the letter “C” are capacitors, they store electrical energy for the circuit. They are made up of two capacitors close together and insulated very closely. The capacitors used here are radial ceramic capacitors and aluminum capacitors.

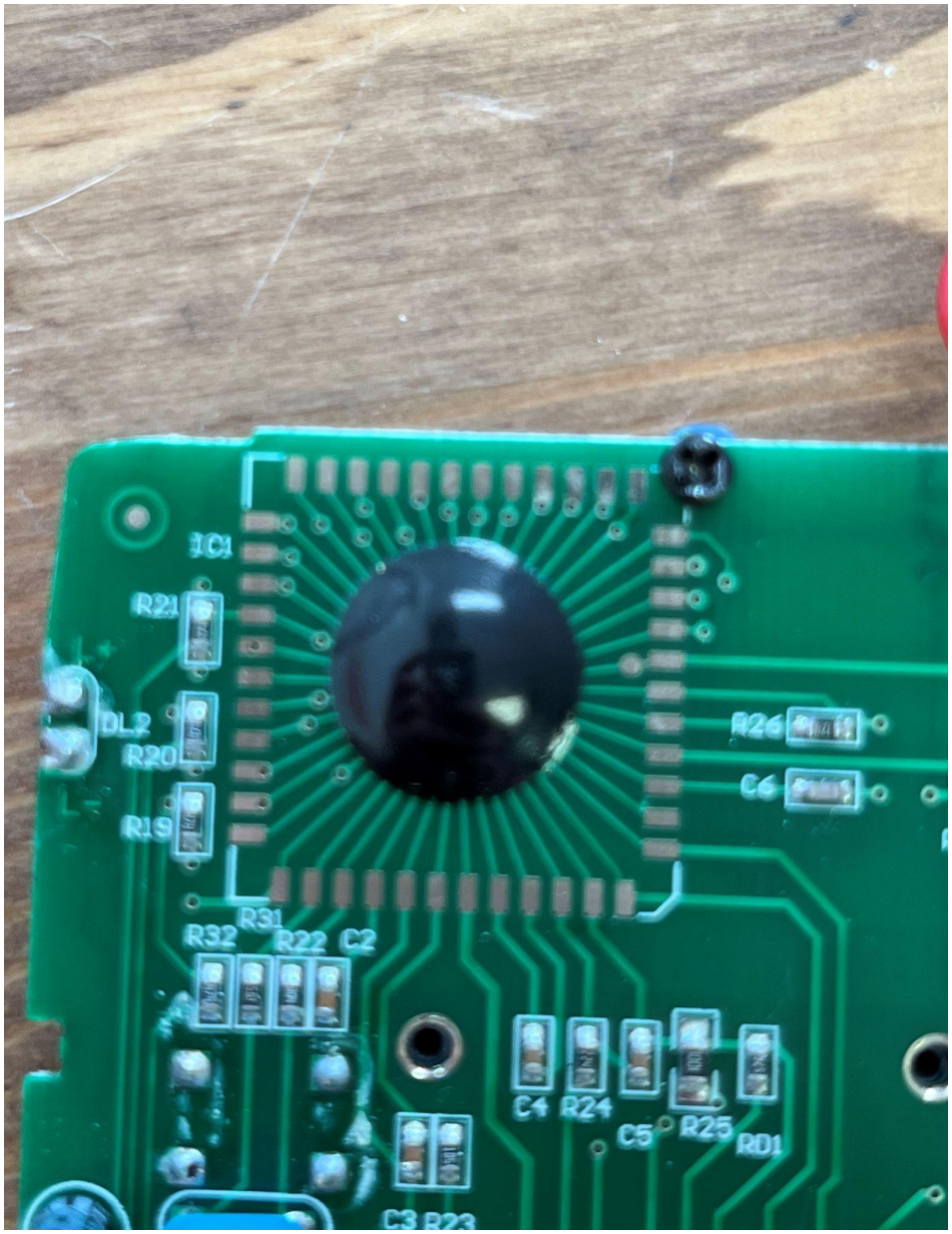
The fuse which is located near the words “fuse” is used to break the electrical current if something happens to go on. It is mounted in the circuit board between two metal prongs.

Photo Album:


C7
VR1
R9
R8
R7
R6
R5
R4
R3
9


R21
C1
C3
R32
R31
R22
C2
C3
R23
104G
Q1
C9
Q2
Q1
R15
R10


Q1
Q2
R15
R10
R13
R11
R14
FUSE


IC1
R21
DL2
R20
R19
R31
R32
R22
C2
R26
C6
C4
R24
C5
R25
RD1
C3
R23