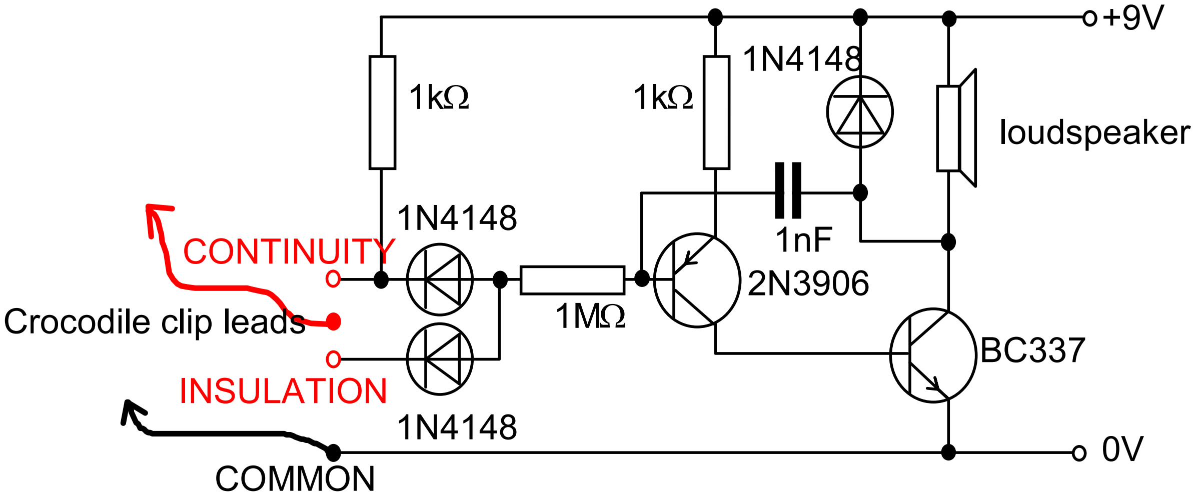
Squeekie.

Specification

Operates from a 9V, PP3 battery. It does not need an ON/OFF switch.
On the CONTINUITY setting, it will indicate resistance up to around 10kΩ.
On the CONTINUITY setting, it supplies a current of up to 9mA.
On the INSULATION setting, it will indicate resistance in excess of 10MΩ.
On the INSULATION setting, it supplies a current of up to 9µA.

Circuit Diagram



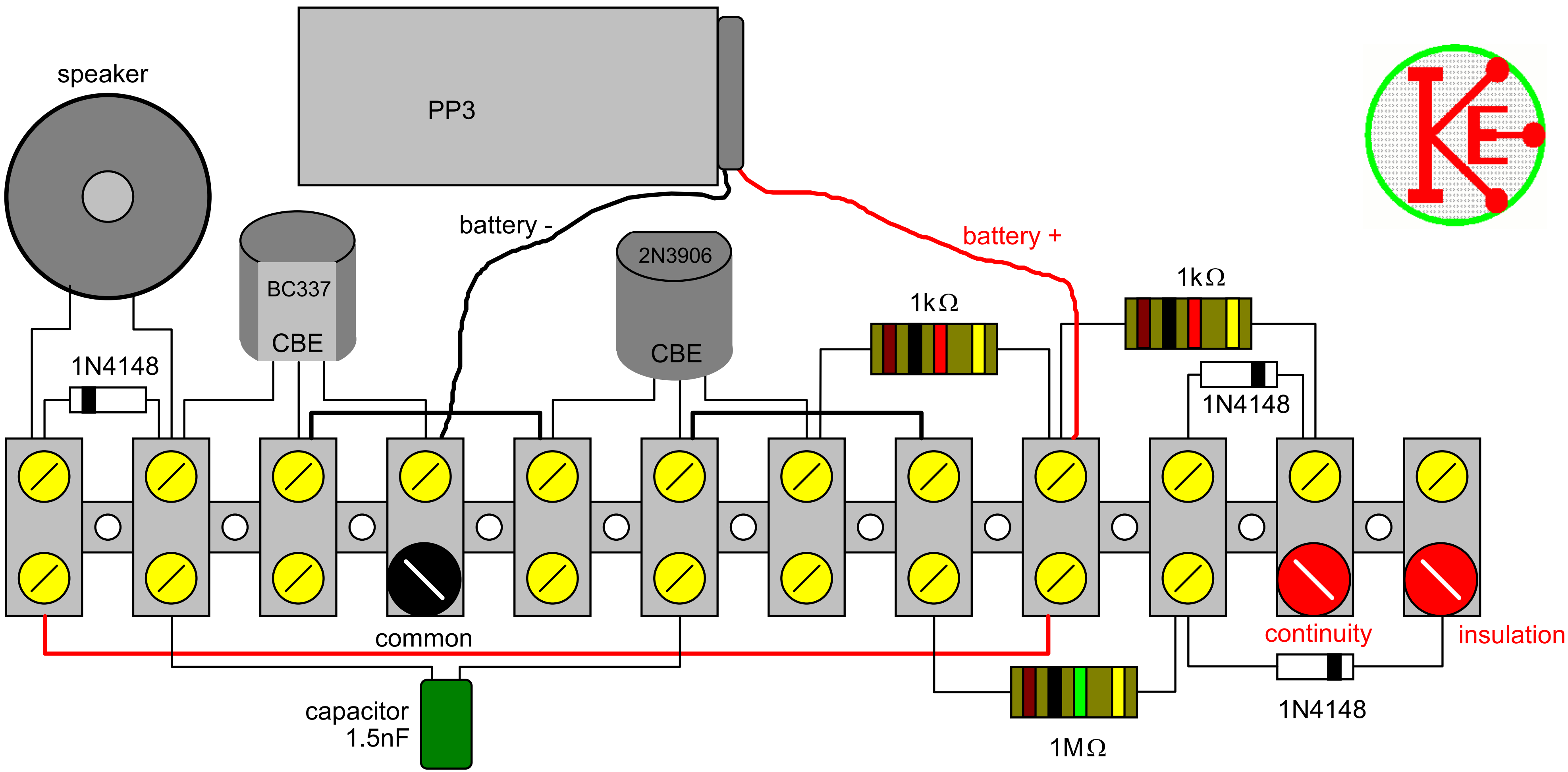
How it works

When there is no connection between Continuity or Insulation and Common terminals, the 1nF capacitor is discharged and both of the transistors are switched off. When there is a connection, a current passes through the 1MΩ resistor, which starts to charge the 1nF capacitor. When the voltage across the 1nF capacitor is greater than approximately 0.7V, the 2N3906 transistor starts to switch on which in turn starts to switches on the BC337 transistor, causing a current to pass through the loudspeaker.
The loudspeaker side of the capacitor is now at 0V and the other side at -0.7V. The capacitor now rapidly continues to charge through the 2N3906 transistor, which keeps both transistors switched on. As the capacitor charges, the current through the base of the 2N3906 transistor decreases.
When this current is no longer sufficient to keep the 2N3906 transistor switched on, this transistor switches off, which in turn switches off the BC337 transistor and the current through the loudspeaker. The loudspeaker side of the capacitor is now at +9V and the other side at around +16V, which ensures that the 2N3906 transistor is switched off.
The 1nF capacitor now starts to charge again through the 1MΩ resistor and the whole process repeats.

What it measures

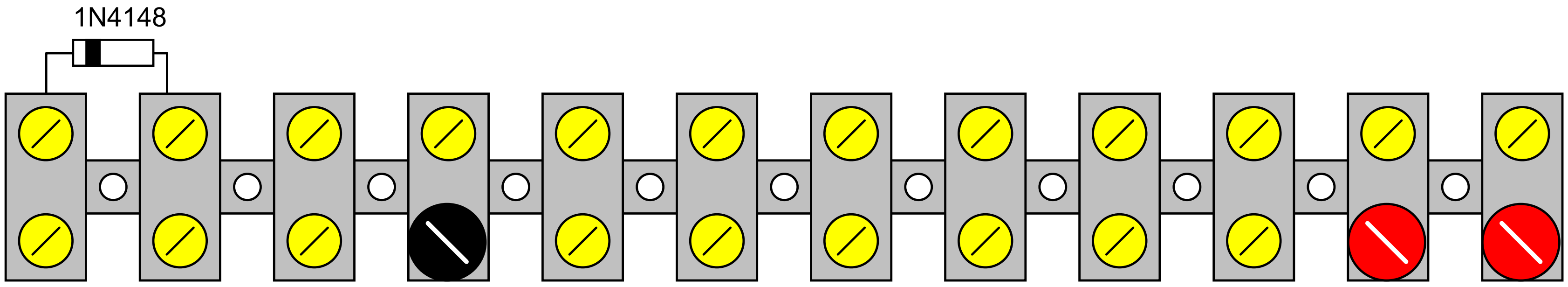
The pitch of the tone produced by Squeekie is determined by the current which can pass through the 1MΩ resistor. This is determined by the resistance of the object connected between the Continuity or Insulation terminals. The larger the resistance, the smaller the current, the longer the 1nF capacitor takes to charge and the lower the pitch of the tone produced. The voltage between the Continuity or Insulation and Common terminals will also determine the pitch - the larger the voltage (up to approximately +8V), the lower the pitch.

Terminal Strip Layout

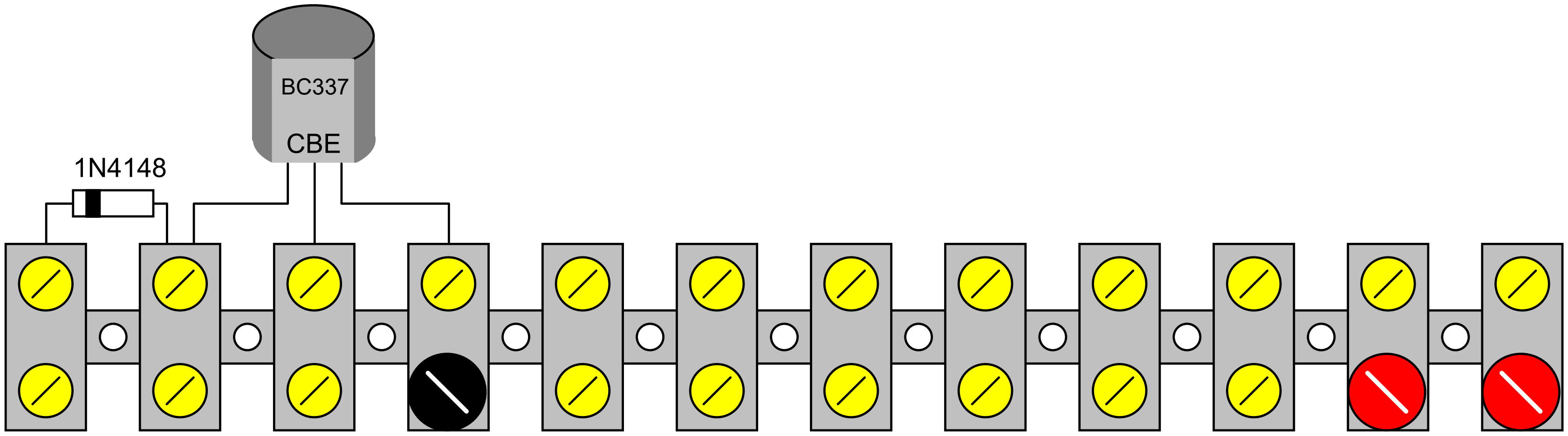


Step by step construction.

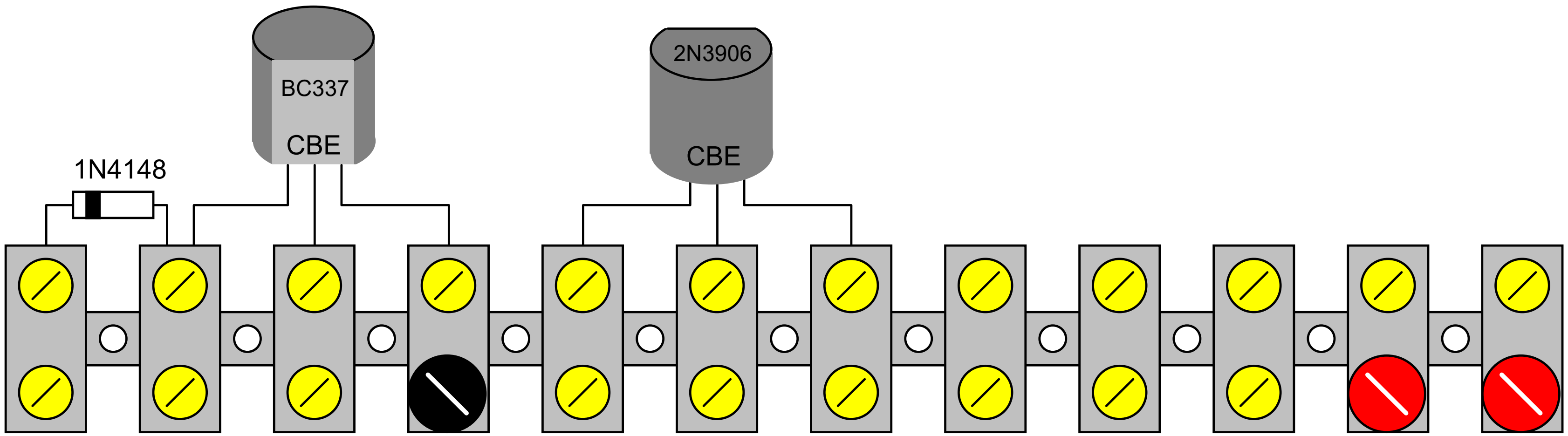
1). Take a 1N4148 diode and carefully bend the leads so that it will fit as in the diagram below. Trim the leads if necessary. Ensure that the black band is on the LEFT.



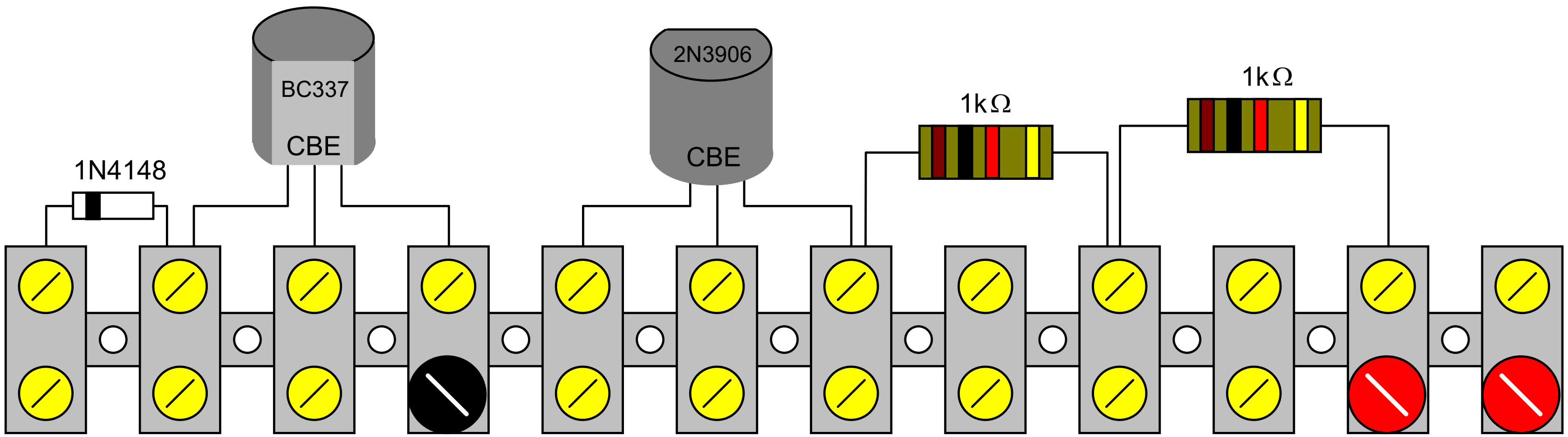
2). Take the BC 337 transistor - carefully spread out the leads so that it will fit as in the diagram below. Trim the leads if necessary. Ensure that the writing on the transistor is facing you.



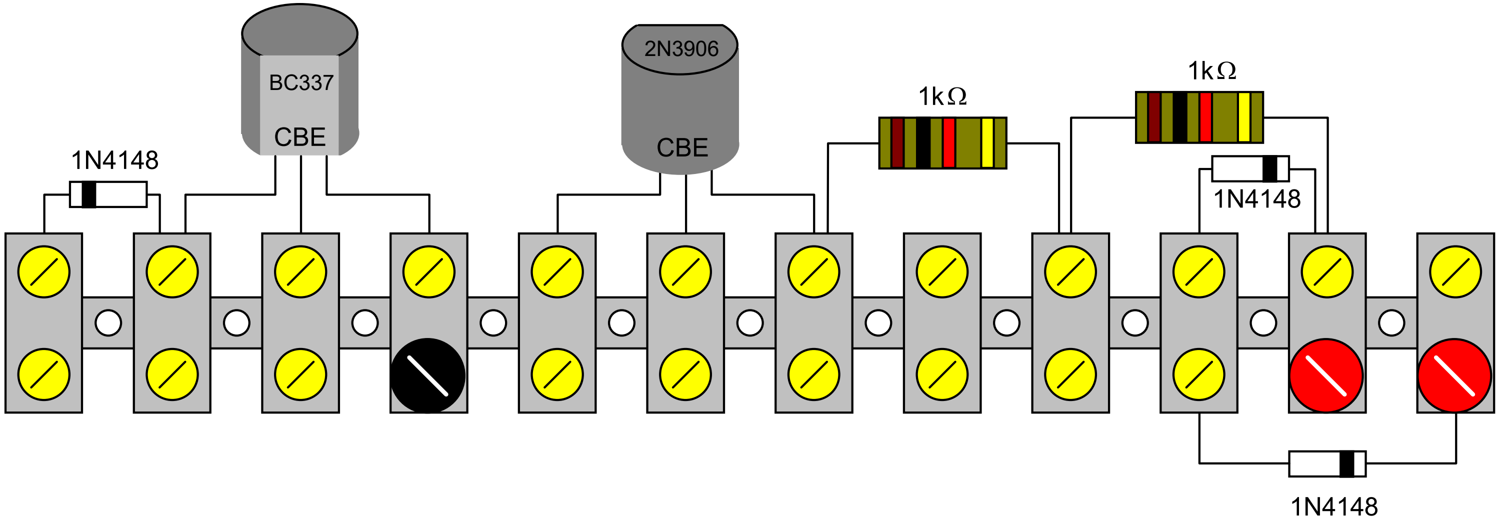
3). Take the 2N3906 transistor - carefully spread out the leads so that it will fit as in the diagram below. Trim the leads if necessary. Ensure that the writing on the transistor is facing AWAY from you.



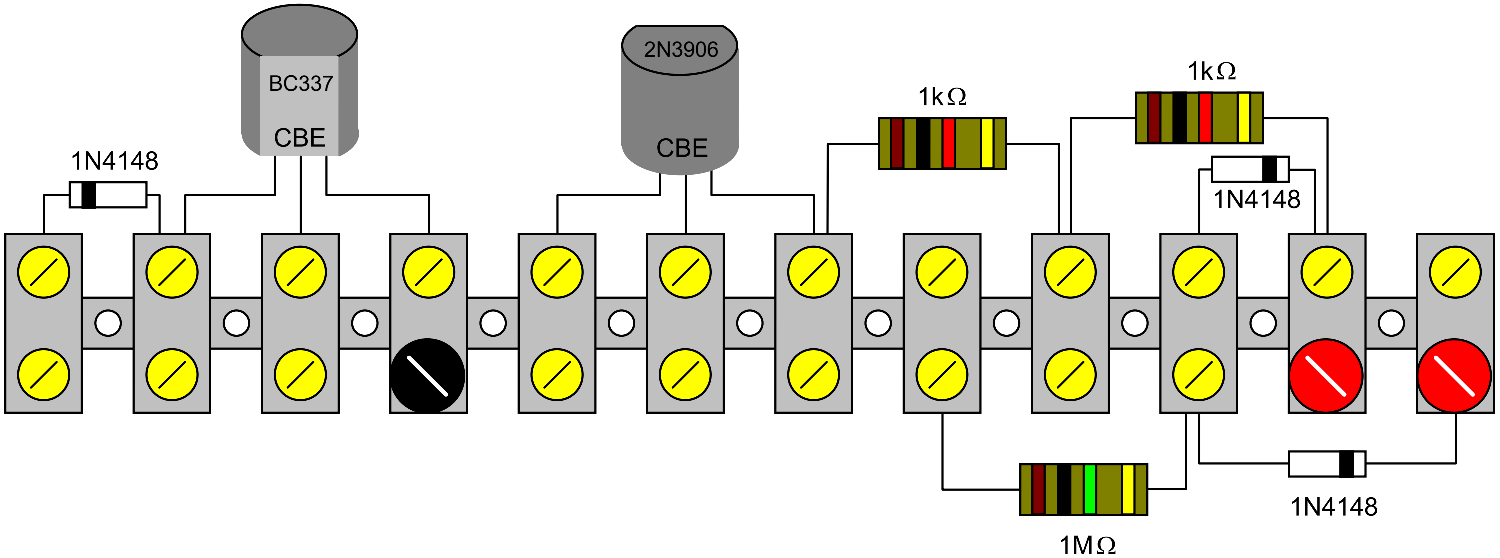
4). Take the two 1kΩ resistors (brown, black, red and gold). Carefully bend the leads so that they will fit as in the diagram below. Trim the leads if necessary. It does not matter which way round they are connected.



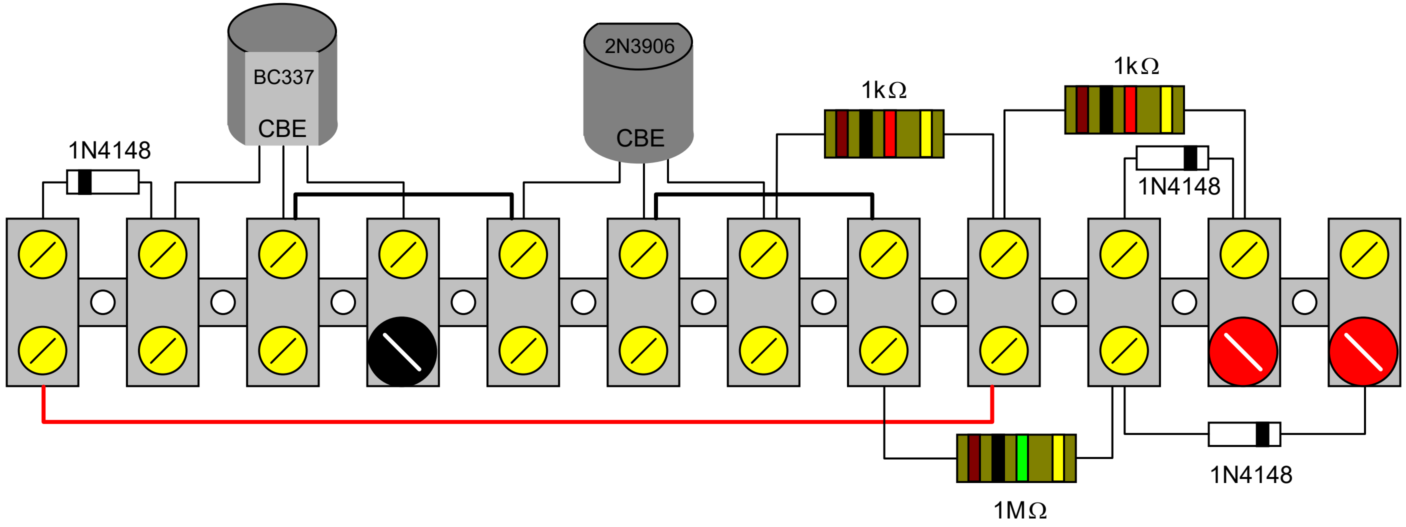
5). Take the other two 1N4148 diodes and carefully bend the leads so that they will fit as in the diagram below. Trim the leads if necessary. Ensure that the black band is on the RIGHT.



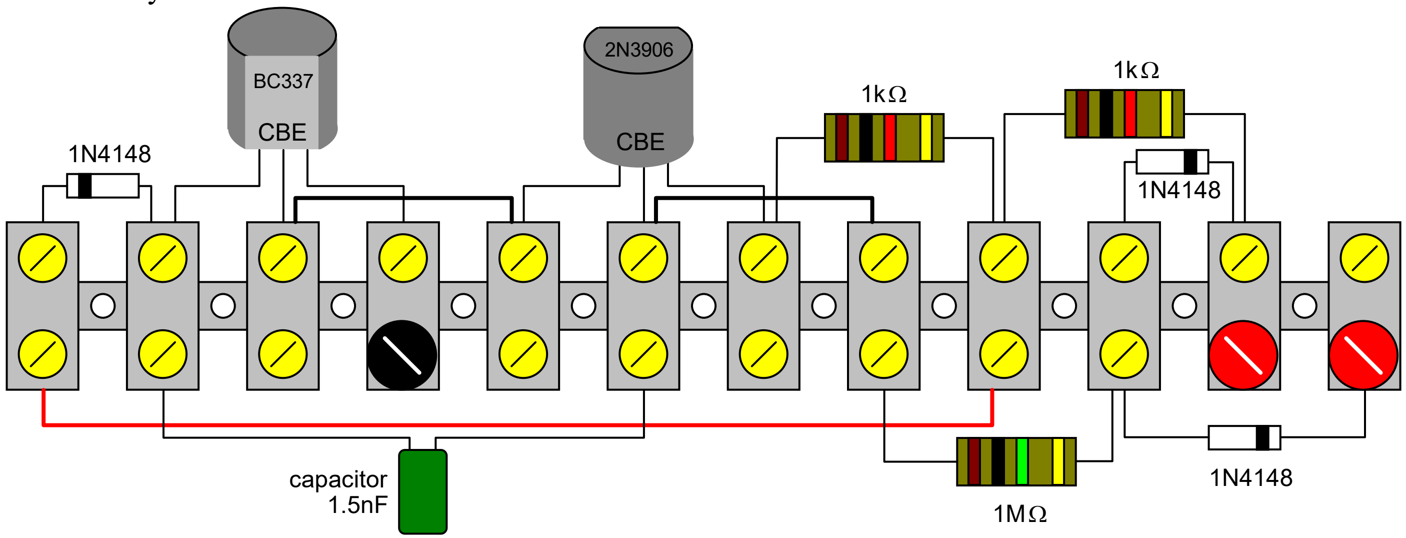
6). Take the 1MΩ resistors (brown, black, green and gold). Carefully bend the leads so that they will fit as in the diagram below. Trim the leads if necessary. It does not matter which way round it is connected.



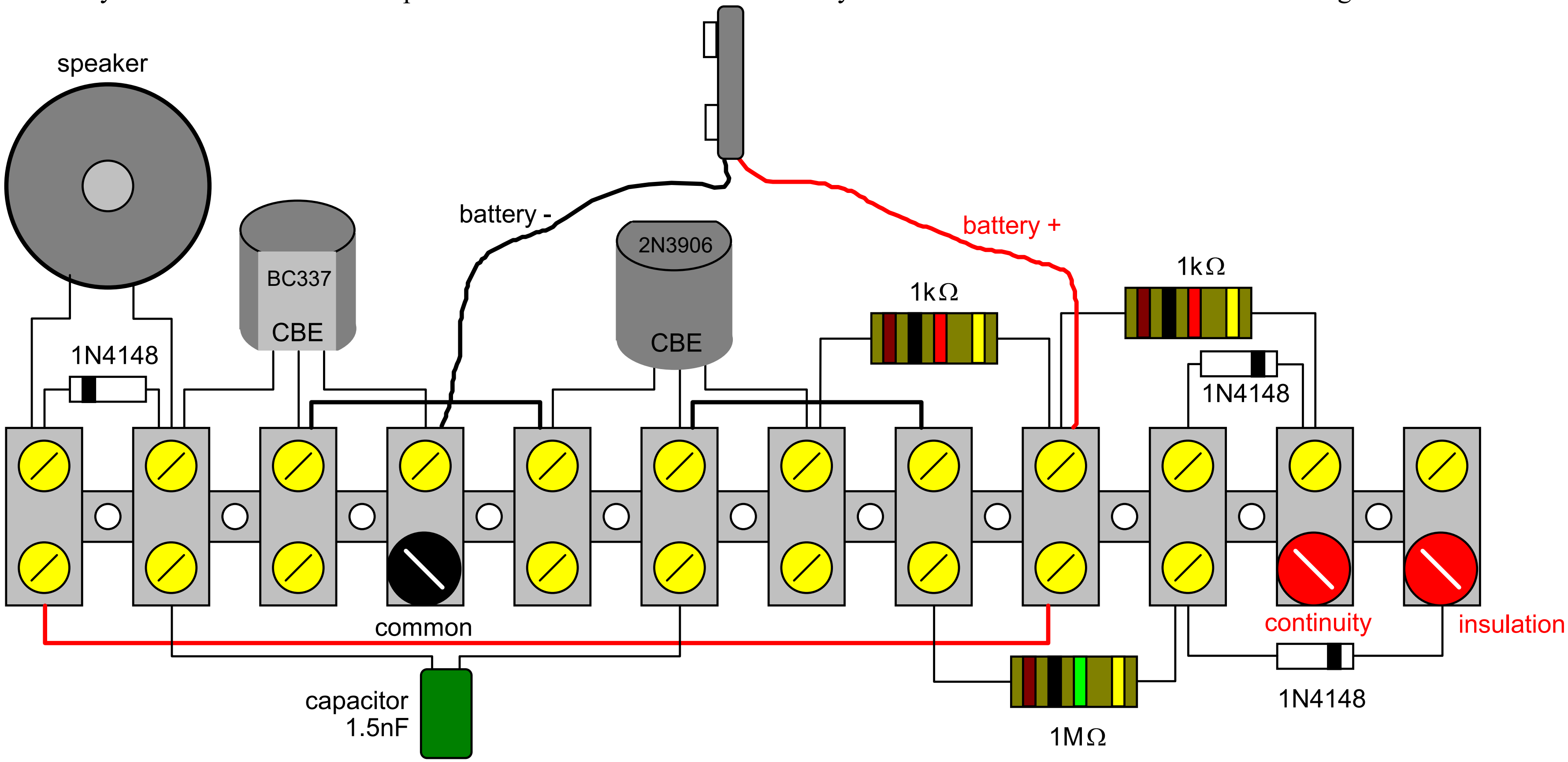
7). Now make the two black connecting wires and the red connecting wire as in the diagram below. Strip the insulation from the ends of the wires before putting them into the terminals.



8). Take the 1.5nF capacitor Carefully bend the leads so that they will fit as in the diagram below. Trim the leads if necessary. It does not matter which way round it is connected.



9). Now add the speaker and the battery connector. It does not matter which way the speaker is connected, but it DOES matter which way round the battery leads are connected. Strip insulation from the leads as necessary. Your circuit should now look like the diagram below.



10). Fix your circuit to your base board using "blue/white tac" and add labels for COMMON, CONTINUITY and INSULATION. Connect the battery to your circuit. If all is well, the circuit should "squeek" if you touch the Common and the Insulation terminals.

If it does not "squeek", disconnect the battery and check for wiring errors. Then check that all of the wires are secure in the terminal strip - refit the leads and tighten the screws as necessary. Check that there is no insulation from the leads trapped by the screws in the terminals. Connect the battery and test again by touching the Common and the Insulation terminals.

Using Squeekie.

The following components can all be tested for using Squeekie set to Continuity.

- Fuses,
- Leads,
- Lamps,
- Inductors,
- Transformers,
- Speakers,
- Switches, etc.

The component is connected between the test leads. If the component is not open circuit then there will be a high pitched note emitted from Squeekie. It is also worth testing the leakage on leads, transformers, switches, etc. This is achieved by setting the switch to the **Insulation** setting and connecting the test leads between the different windings on transformers, different leads on multi lead cables or across the terminals of a switch when it is switched off. Any note emitted during these tests indicates poor insulation and the component or cable should be considered suspect.

NOTE. You should not hold the Squeekie leads when making insulation tests since the resistance of your body is much less than the insulation you are testing and so will produce inaccurate results.

CAPACITORS.

To test capacitors use the **Insulation** setting. When first connected there may be a short squeek emitted but this should quickly stop. Any remaining note indicates a "leaky" capacitor. Electrolytic capacitors are naturally leaky and so these should be tested using the **Continuity** setting. Any remaining squeek on this range indicates a very leaky component.

NOTE. Electrolytic capacitors are polarised, i.e. they should be connected the correct way round in the circuit. On "Squeekie" the black lead is negative and the red lead is positive.

A capacitor takes approximately $5 \times R \times C$ (seconds) to fully charge. On Continuity $R = 1k\Omega$ and on Insulation, $R = 1M\Omega$. To find the approximate value for a capacitor, time how long Squeekie 'squeeks' for when connected to a discharged capacitor.

On Continuity $C(\mu F) \approx 200 \times \text{time (s)}$

On Insulation $C(nF) \approx 200 \times \text{time (s)}$

RESISTORS.

For resistors up to approximately 10kΩ use the **Continuity** setting. The larger the value of the resistor the lower the pitch of the note emitted by "Squeekie". As with capacitors, it is possible to obtain the approximate value of the resistor by matching the pitch of the note produced by a resistor of known value with that of the unknown value. For resistors larger than 10kΩ the **Insulation** setting should be used.

DIODES.

Use the **Continuity** setting and connect the diode to the test leads. When the band on the diode is connected to the Black wire, there should be a "Squeek". When the connections are reversed there should be no sound at all. To check the leakage of the diode the **Insulation** setting should be used. The diode should be connected with the band towards the red lead. With a silicon diode there should be no sound produced, but with a germanium diode there may be a low pitched note.

LIGHT EMITTING DIODES AND DISPLAYS.

Use the **Continuity** setting. When connected one way round the LED should light and there should be a squeek. When the connections are reversed there should be no sound or light. If a sound is produced without the LED lighting, the LED is faulty.

TRANSISTORS.

The **Continuity** setting is used to check the various "diode junctions" around the transistor. These are shown in figure 4.

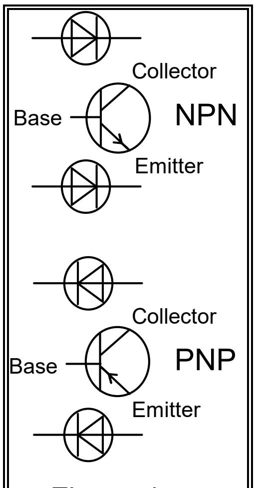


Figure 4