Introduction to the Protoboard

Introduction

Most of the circuits we build in the lab are assembled on a protoboard, which is short for prototyping board. These are also known as solderless breadboards because they allow you to build circuits without soldering. The leads of resistors, capacitors, integrated circuits, and other components can be pushed through the holes in the plastic top of the protoboard. Underneath the holes there are strips of springy metal fingers that grasp the leads and form an electrical connection to them. The metal fingers under certain groups of holes are electrically connected so that any leads plugged into those holes will also be electrically connected. If needed, wires can be used to make connections between the groups of holes to complete a circuit.

Figure 1: Example protoboard circuit[1] and cross-section[2]

Figure 1 shows an example of a typical circuit constructed on a small protoboard. A cross-section through a portion of the protoboard is on the right side of the figure and shows the metal fingers that are normally hidden under the plastic shell. This photograph was taken looking into the ends of two rows of metal strips.

Using the protoboard

1. You must know how the holes on the protoboard are electrically connected to use it properly. Different manufacturers of protoboards sometimes introduce variations in the arrangement of the connections but generally
follow the pattern described here and shown in Figure 2. There are some deep grooves in the board, and on either side of each groove are groups of five holes that are electrically connected (a “short row”). The short rows are at a 90° angle with respect to the groove. Adjacent short rows are not connected to each other. These short rows are used to make the local connections between a few circuit elements and wires.

Notice that there are red and blue stripes along some rows of holes. All of the holes in the long row that runs next to a stripe are connected together, but the holes along the red stripe are not electrically connected to the holes along the blue stripe. There are several stripes of the same color on the protoboard, but the long rows of holes next to the stripes of one color are not electrically connected. The long rows of connected holes are usually used for global connections to many elements, such as the power supply connections.

2. Be careful and neat when constructing circuits. A little extra time spent up front will greatly reduce the time you spend trying to fix your circuit later.

3. When making connections using wires, try to cut the wires so they are just long enough to make the connection plus about an inch. This will make your circuit connections neater and less prone to error.

4. Don’t strip more than about a quarter inch of insulation from your wires to prevent accidental short circuits.

5. If you are using a power supply, connect the test leads from the power supply to the banana jacks of the same color at the top of your protoboard. Unscrew the colored plastic part of the banana jack a few turns and insert the bare end of a wire into the exposed hole. Tighten the plastic part down to hold the wire in place, then plug the free end of the wire into the protoboard.

6. Try to use red and black wires to make connections from your circuit to the banana plugs that connect to the power supply, matching the colors of the banana plugs, test leads, and wires for each connection. Use colors other than red and black for the other connections in your circuit.

7. Avoid nicking the metal when stripping the insulation from the end of a wire, as this will greatly weaken the wire and cause the bare end to break off.

Troubleshooting

1. My circuit doesn’t work.

   (a) Double check your circuit connections, making sure that you understand how the groups of holes are connected.

   (b) If you have connected wires to banana jacks make sure that the bare metal end of the wire is tightened against the metal part of the banana jack.

   (c) When the thin wires are used many times the metal wire will sometimes break inside the plastic insulation. If a wire looks like it has been bent sharply, replace it with a new wire.

1. en.wikipedia.org/wiki/File:Breadboard.JPG
2. en.wikipedia.org/wiki/File:Insidebreadboard_(2).jpg