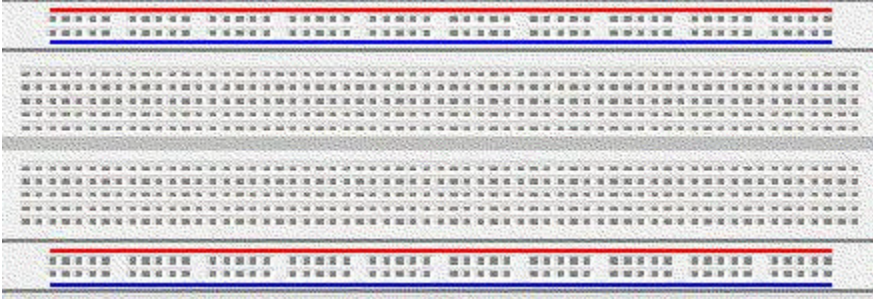
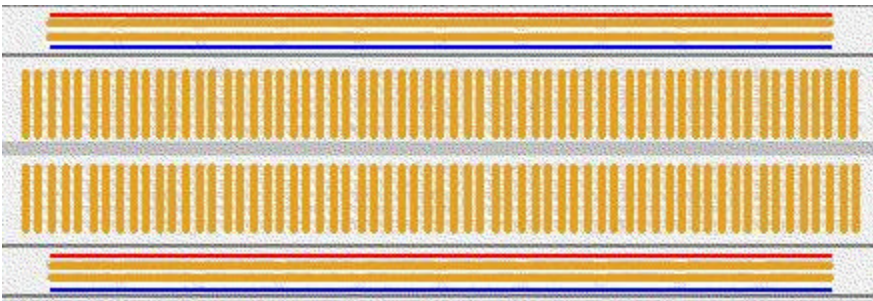


What is a breadboard?

A breadboard is used to build and test circuits quickly before finalizing any circuit design. The breadboard has many holes into which circuit components like ICs and resistors can be inserted. A typical breadboard is shown below:



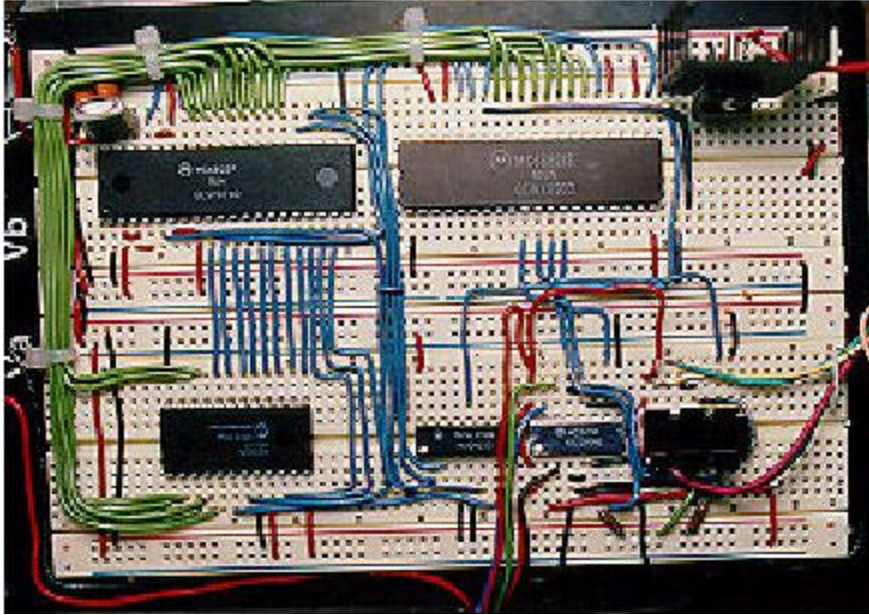
The bread board has strips of metal which run underneath the board and connect the holes on the top of the board. The metal strips are laid out as shown below. Note that the top and bottom rows of holes are connected horizontally while the remaining holes are connected vertically.



To use the bread board, the legs of components are placed in the holes. Each set of holes connected by a metal strip underneath forms a *node*. A node is a point in a circuit where two components are connected. Connections between different components are formed by putting their legs in a common node.

The long top and bottom row of holes are usually used for power supply connections. The rest of the circuit is built by placing components and connecting them together with jumper wires. ICs are placed in the middle of the board so that half of the legs are on one side of the middle line and half on the other.

A completed circuit might look like the following.



Breadboarding tips:

It is important to breadboard a circuit neatly and systematically, so that one can debug it and get it running easily and quickly. It also helps when someone else needs to understand and inspect the circuit. Here are some tips:

1. Always use the side-lines for power supply connections. Power the chips from the side-lines and not directly from the power supply.
2. Use black wires for ground connections (0V), and red for other power connections.
3. Keep the jumper wires on the board flat, so that the board does not look cluttered.
4. Route jumper wires around the chips and not over the chips. This makes changing the chips when needed easier.
5. You could trim the legs of components like resistors, transistors and LEDs, so that they fit in snugly and do not get pulled out by accident.