EK307 Tutorial – The Solderless Breadboard

Introduction

The *solderless breadboard* is a tool used for the rapid prototyping of circuits. The breadboard contained in your kit is typical of most versions. Skill in its use is essential for the practicing engineer. As you can see in Fig. 1, the surface of board is covered by small holes, each of which accommodates the insertion of a single wire, pin, or component lead. Beneath the plastic cover, the holes are connected into various groups by a network of metal pathways. Specifically, each of the five holes in the short rows is interconnected, as are each of holes in the long rows on the edges of the board. This interconnection pattern is shown in Fig. 1. The short rows serve as the nodes of a circuit where component terminals are connected together. The long, outer rows are usually used to distribute power, ground, and sometimes signals to the various sections of the circuit. The layouts of some typical circuits that include integrated circuit "chips" are shown in Figs. 1 - 3. Note that wires and components are connected in a neat, orderly manner. A good layout makes the circuit easy to test and debug.

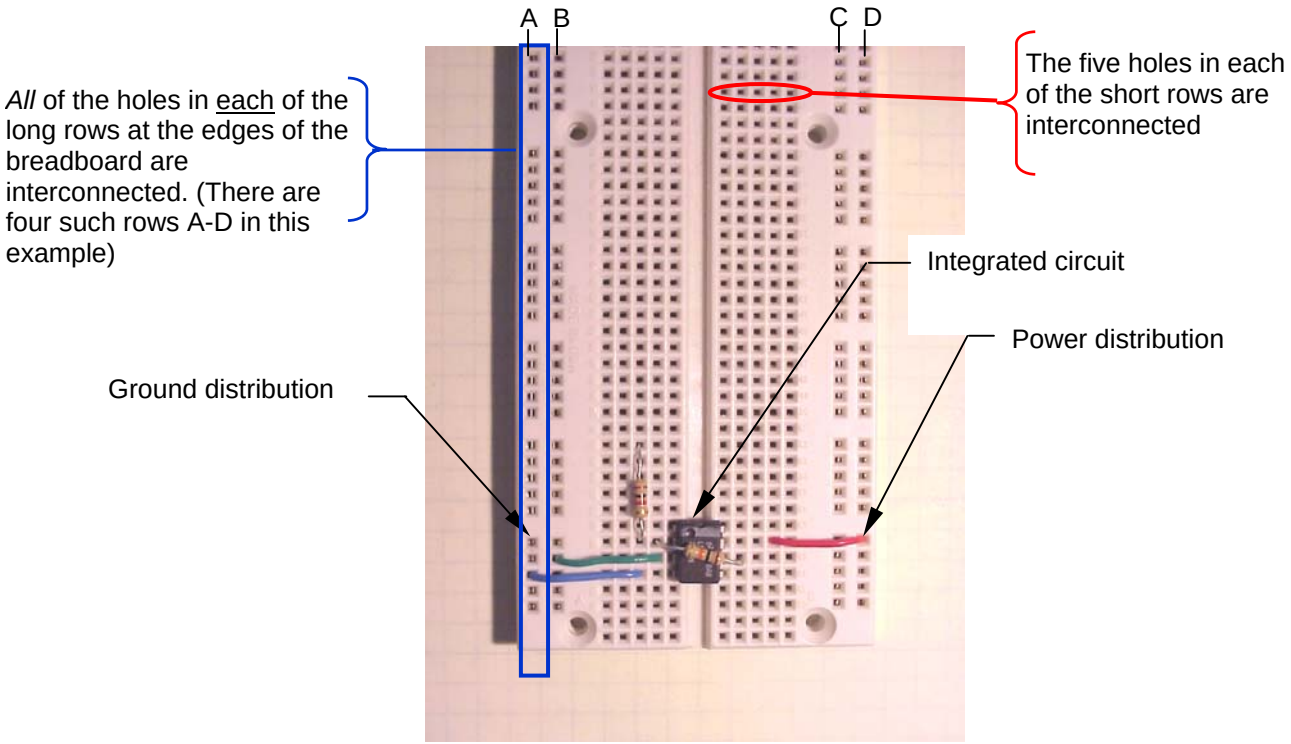


Figure 1

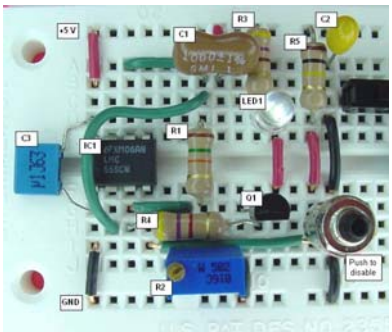


Figure 2

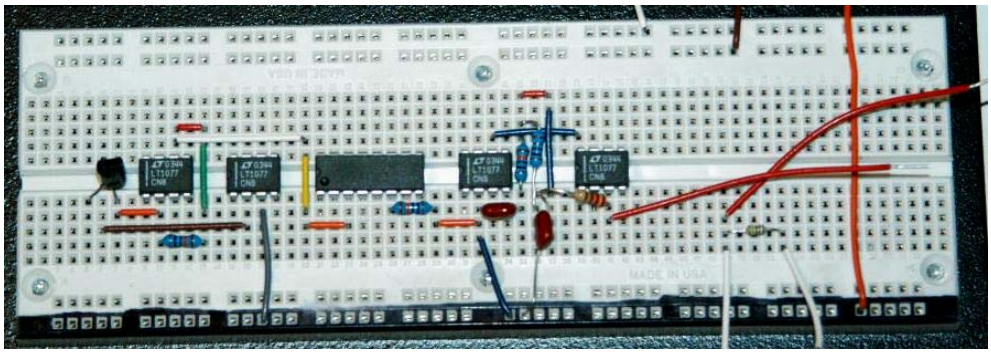
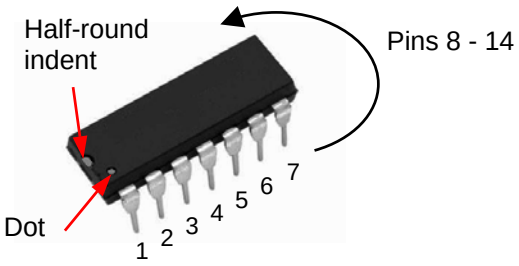


Figure 3

Integrated Circuit Packages



Your EK307 parts kit contains a variety of integrated circuits in the form the *dual-inline package* , or “DIP chip”. This standard configuration can have anywhere from 6 to 20 pins. (The op-amps in your kit have 8 pins.)

A typical 14-pin variety is shown to the right. The half-round indent at one end of the chip, or sometimes a single dot, serves as a reference point for pin identification. Pins are numbered counter-clockwise around the chip beginning at pin 1 located to the left of the indent or at the dot.

Datasheets for most common logic gates in DIP packages can be found on the Internet. One of your tasks in a given lab may be to find the datasheet for the parts you wish to use and apply the information to your design.

Avoiding the "Bird's Nest" Pitfall.

Good wiring practice requires that a breadboard circuit be compact, neat, and orderly, with all leads cut as short as possible. As shown in the above figures, component bodies should physically rest on or just above the board surface, and wires should be easy to trace and touch with a probe. The "bird's nest" approach of Figs. 4 and 5, in which wires dangle and go haphazardly in every direction, should be avoided at all costs. Such a disorderly tangle of wires can cause component leads to short together causing wiring errors. Circuit testing also becomes extremely difficult when a circuit is messy, as one can easily become lost in a chaotic circuit. A sloppy circuit also affects the attitude of the engineer, who is likely to take the design or analysis task less seriously if work on the circuit is difficult. The wise engineer produces circuits that are neat, compact, tidy, and easily accessible.

Examples of “Bird’s Nest” layouts (bad).
Can you figure out what is connected to what?

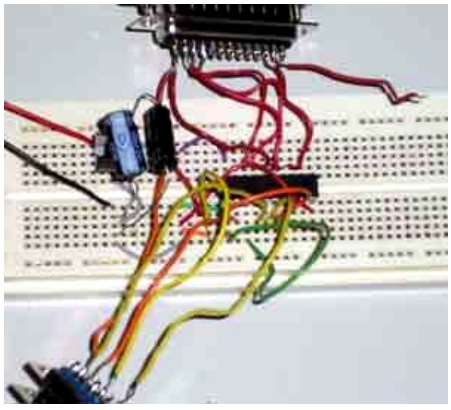


Figure 4

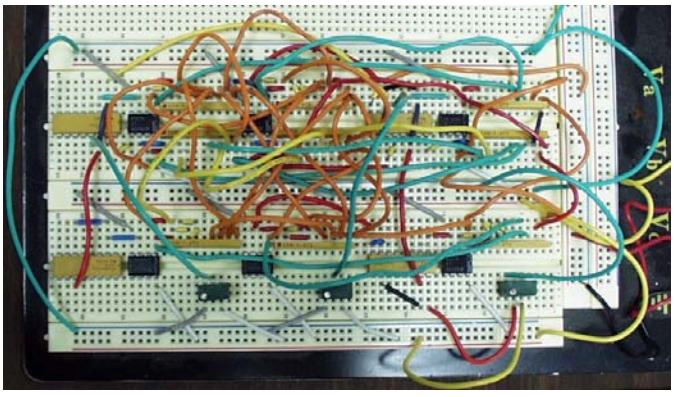


Figure 5