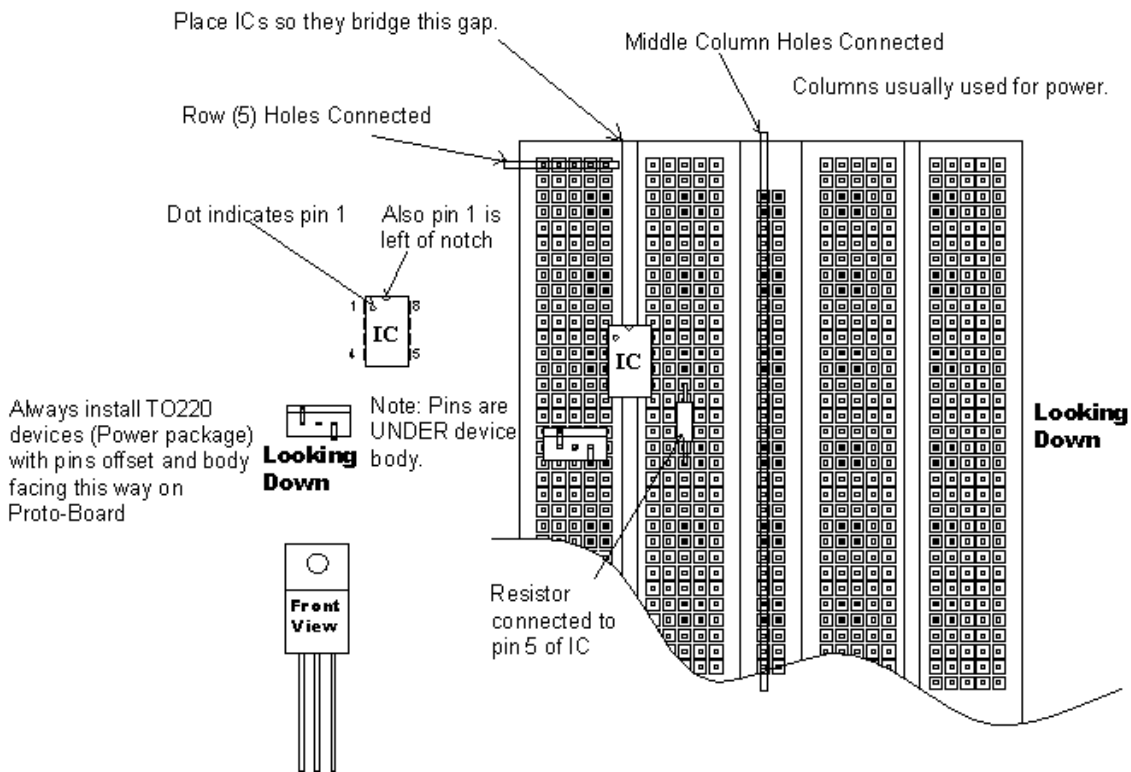


Building Circuits On White Proto-boards

1) White Proto-board:



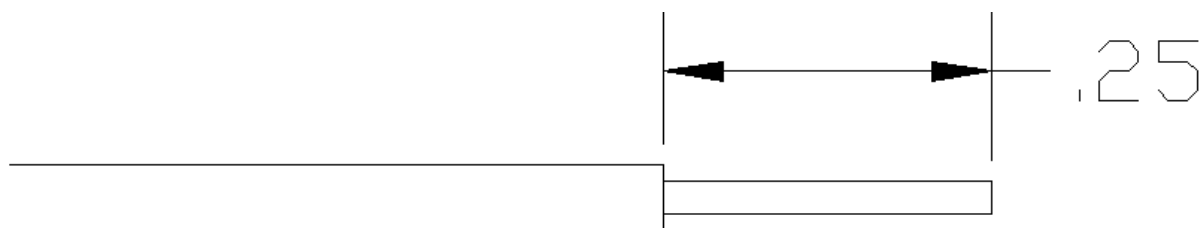
The White Proto-board is an array of interconnected holes that are designed to accept common electrical components and solid 22 gauge wire stripped of insulation at its ends. The rows of 5 holes are horizontally connected but not vertically. The holes in each center column are vertically connected but not horizontally to each other. Usually the columns are used for power (Red) and ground (Blue).

When placing an IC, make sure that each row of the IC pins is on either side of the center divider. Any wire or component inserted in the row that an IC pin is on is connected to that IC pin.

When using TO220 package devices (*see diagram*), be sure the body of the device is parallel to the rows with the pins offset from each other by (.1"). This will prevent damage to the Proto-board as the pins are too wide on this device to insert 90° from this position.

2) Wire:

Pre-stripped wire kits can be used to wire the components together. Also, insulated 22AWG solid conductor wires can be cut to the desired length. (**DO NOT USE STRANDED WIRE**) Each wire end must be stripped of insulation to about 1/4 inch. Stripping back more than this can cause the wires to short and/or become stuck in the white board holes. By sticking the stripped ends into the Proto-board holes electrical connections are made.



Stripped insulated wire end

3) Layout and hints:

Always start with a drawn schematic of your circuit. It will help in laying out the components on the Proto-board so wires are not excessively long or disorganized.

Place components on the Proto-board as the schematic flows with connecting ICs next to each other. This is the time to move things around to make the best use of the space. When you have your best layout, you can start to wire.

As you make connections it is a good idea to highlight the wires on the schematic with a yellow highlighter so you know which ones are finished. This will help you determine that you have made all of the connections. It also allows you to take a break and continue without forgetting what you have done.

Components like resistors and capacitors may be inserted directly into a row connected to an IC pin (*see diagrams and text above*). Be careful not to short the bare resistor and capacitor leads together. You can trim component leads with a wire cutter to minimize the chance of electrical shorts.

Depending on the complexity of the circuit, you may want to divide your design into subsystems. Then you can wire and test them individually. For example, you could build a clock generator and test the signals with an Oscilloscope. When that part is working turn off the power and add more circuitry such as the counter stage, etc. This technique can save you from troubleshooting a tangle of wires.

NEVER wire with power on the circuit.

Remember the key to prototyping is **neatness**. This will make debugging and circuit changes much easier and faster.

4) Components:

The Integrated Circuit pin numbering convention is indicated above. Always look for the dot on pin 1 or the notch in the case. (*Sometimes both are used*) The pin numbers increase in a CCW pattern. Some capacitors are polarized and must be connected as indicated on the device. Usually the negative terminal is indicated.