

BREADBOARD CIRCUITS

THE HISTORY

Modern Electricity experiments make use of a Solderless Breadboard jumper wire and components to create intricate circuits and test electrical properties. The goal of this lab is for each team to show and apply their knowledge of basic parallel and series circuit design, and well as their knowledge of reading resistor values, and using solderless breadboards to design circuits with different parameters.

MATERIALS

Each team is required to bring

- ☉ 1 or 2 Solderless Breadboards (of any size)
- ☉ Package of jumper wires (any amount)

Each team will be GIVEN at the event resistors of the following sizes (in Ohms)

- ☉ 1.0 K, 1.5 K, 2.2 K, 4.7 K, 10 K, 22 K, 47 K, 68 K
- ☉ Along with the Resistor color chart included on the back of this paper.

REGULATIONS/RESTRICTIONS/WHAT YOU CAN HAVE

The only other materials allowed are a pen or pencil for each student, and up to 2 NON-GRAPHING, NON-MEMORY, OLD SCHOOL calculators. The materials may not have any extra notes, formulas, etc on them. Any team that has extra notes or uses a programmable calculator will be disqualified and receive a score of 0.

THE COMPETITION

The event will run for a maximum of 30 minutes. At the beginning each team will be given their resistors, color chart and circuit problem sheet. The problem sheet will ask the team to create circuits that will allow them to get either a voltage across an area, a resistance between two points or a certain current flowing or to design a circuit based on a circuit diagram. Each team is then to design a circuit using only the resistors available and their breadboard, bring the circuit to their designated judging station, hook up their circuit to the 5V power supply and multi-meter at which point the judge will check the reading and see whether it meets the criteria. It is up to the team to hook up everything, the judges cannot tell you where to put the multi-meter or the power supply. They will only check the reading one it is powered up.

An example might be: Generate exactly 2 mA of current. In this case you could connect the 1 k Ω and 1.5 k Ω resistors in series, hook the multi-meter in series with the two resistors, and hook up the power supply across the whole thing. The 5 V across the total of (1.0 + 1.5) 2.5 k Ω equivalent resistance will generate 2 mA of current, within tolerances.

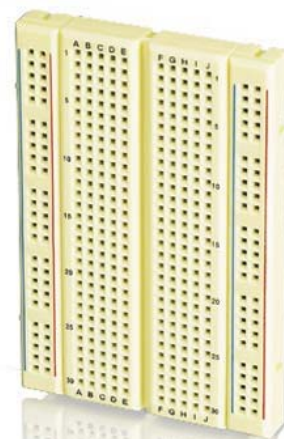
You may hook the multi-meter and power supply to any part of your circuit, but make sure you have leads/jumpers coming out where you would like to hook it up.

SCORING

Once a team has a circuit that they think will work, they will bring it to the designated station and tell the judge what number problem they are set up for. They will get one chance to hook it up and have a reading taken. For every incorrect reading, the team will have 1 minute added to their time. After your reading you must go back to your work area or the back of the line if you think you just made a hookup mistake. You may work on two circuits at a time if you wish, but you may only use the resistors given.

Once 30 minutes have passed, the teams will be ordered according to the following and given typical NSSL normalized points based on their ranking.

- ☉ Most problems solved successfully
- ☉ least time to solve last problem successfully
- ☉ (if tied, least time to solve second to last problem successfully)



First and Second Color		Third Color
BLACK	0	BLACK x 1
BROWN	1	BROWN x 10
RED	2	RED x 100
ORANGE	3	ORANGE x 1k
YELLOW	4	YELLOW x 10k
GREEN	5	GREEN x 100k
BLUE	6	BLUE x 1 meg
VIOLET	7	SILVER \div 100
GRAY	8	GOLD \div 10
WHITE	9	

4th color Tolerance
gold 5%, silver 10%, none 20%