Welcome to EE282 Lab

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Lab -1 Introduction

WICHITA STATE UNIVERSITY

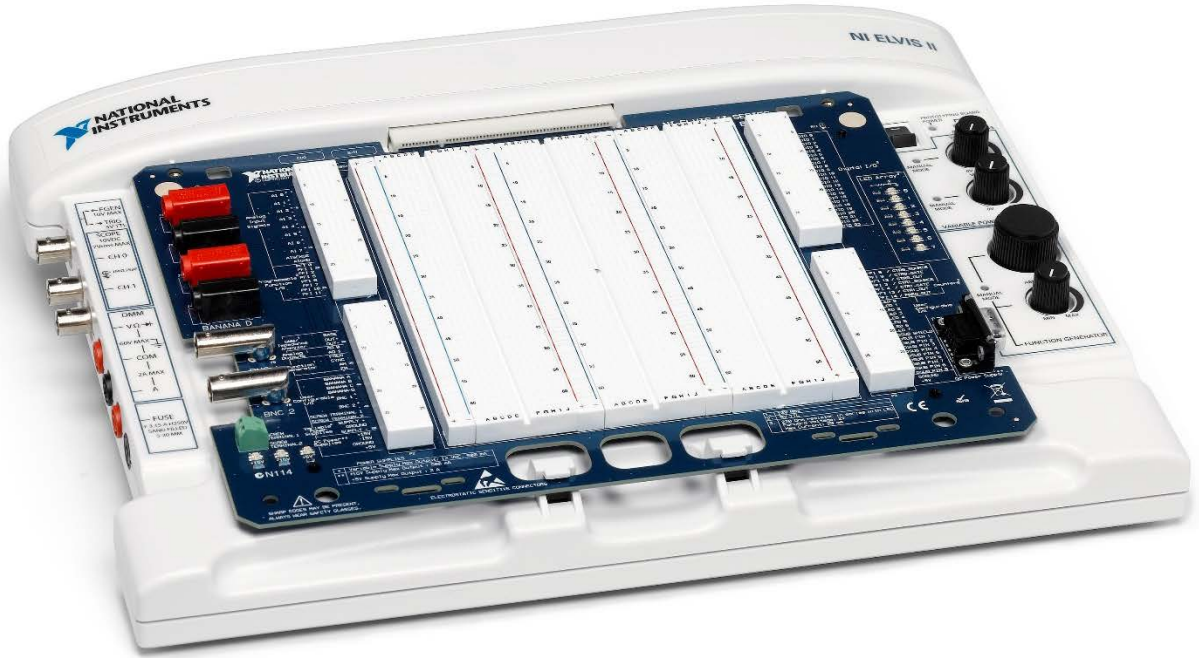
Laboratory Safety

- The major hazards associated with electricity are electrical shock and fire.
  - Electrical shock occurs when the body becomes part of the electric circuit
  - The severity and effects of an electrical shock depend on a number of factors, such as the pathway through the body, the amount of current, the length of time of the exposure.
  - effect of the shock may range from a slight tingle to severe burns to cardiac arrest.

To Avoid Injury in the Circuits I lab

- Avoid contact with energized electrical circuits.
- Do not work alone on energized electrical equipment.
- Always turn the power off to a circuit before working on it, and always verify for yourself that the power is off.
- Never modify a circuit while the power is on.
- Know the location and how to operate shut-off switches and/or circuit breaker panels.
- If an individual comes in contact with a live electrical conductor, do not touch the equipment, cord or person. Disconnect the power source from the circuit breaker or pull out the plug using a leather belt.

Prototype Board



Prototype Board is used for building electrical circuitry and allows connections necessary to access signals for common applications

To use this board we need to understand how it is function
Which is we are going to learn in this lab

NI ELVIS

We also have software which will work with the prototype board which is used to read the measurements from the board as well as to control the board signal.
It is a virtual PC based instruments called the National Instruments Educational Laboratory Virtual Instrumentation Suite (NI ELVIS)

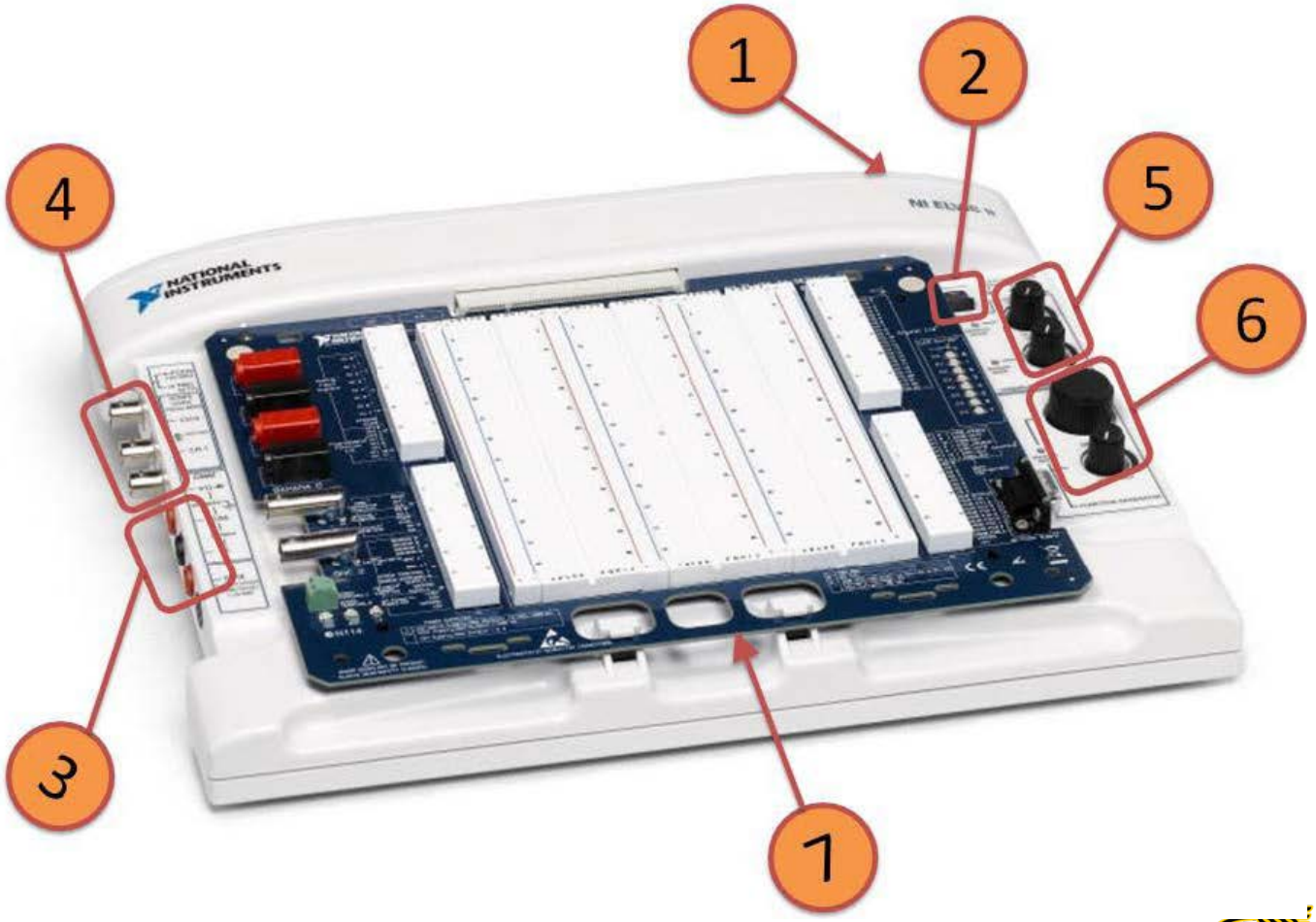
Ni Elvis has the following

1. Digital Multi Meter
2. Oscilloscope
3. Function Generator
4. Variable power supply etc.

To use this software we need to understand how it is function Which is we are going to learn in this lab

Prototype Board

First we will Identifying the components of the board



Prototype Board

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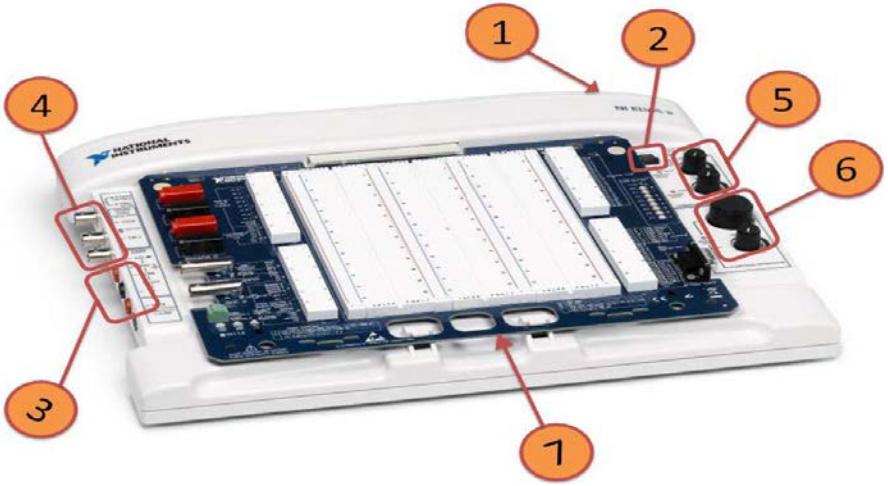
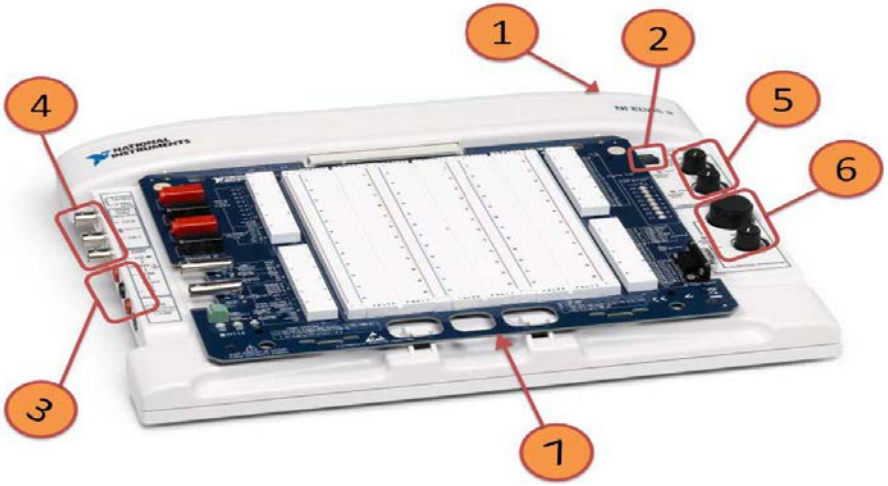


1

Workstation Power Switch: Located in the rear of the workstation. You need to on this switch to supply the power to the board.

Prototype Board

First we will Identifying the components of the board



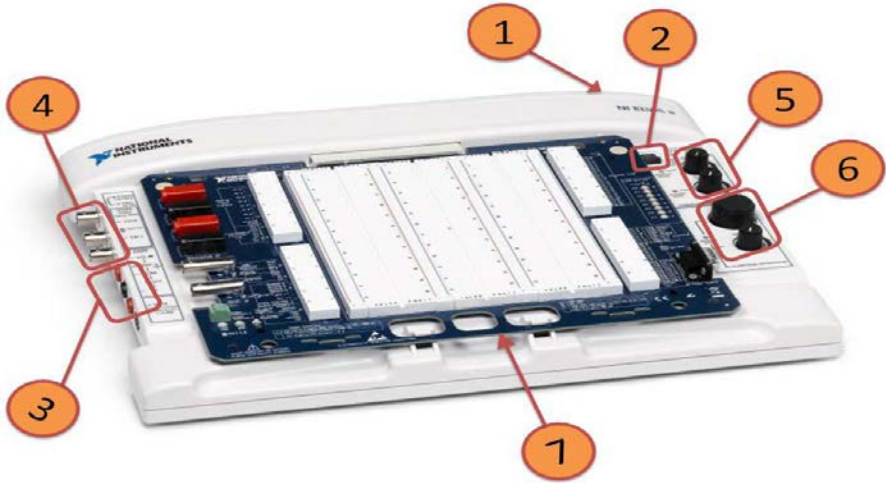
2

Prototyping Board Power Switch: Controls power to NI ELVIS II prototyping board. The power LED lights up when the switch is turned ON. The Ready switch should be green or yellow when connected to host PC.

Prototype Board

First we will Identifying the components of the board

3



Digital Multimeter (DMM) Connectors: These are used to connect the prototyping boards. When the multimeter is used in current mode a different positive terminal is used.

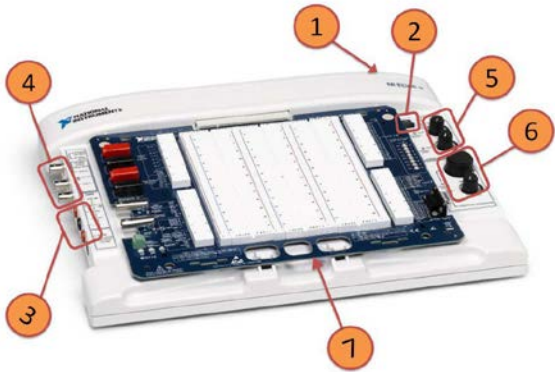
Prototype Board

First we will Identifying the components of the board

3

For voltage, resistance and diode modes

For current mode

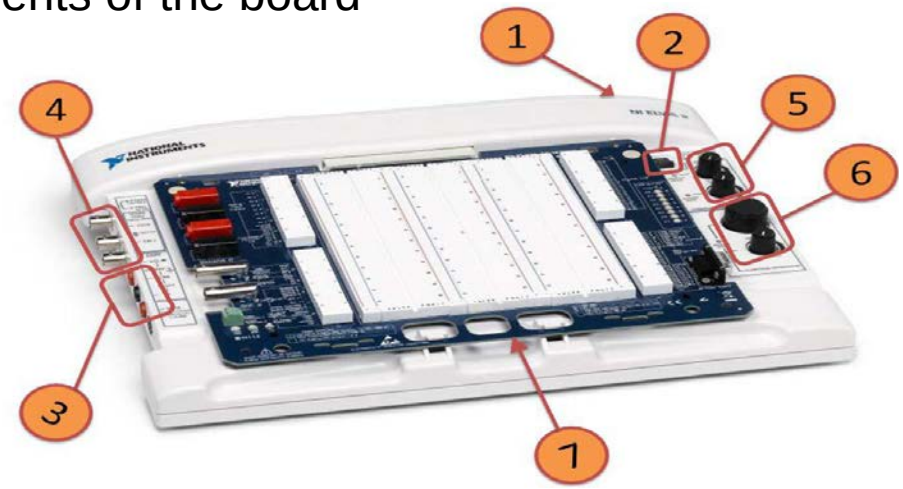


Digital Multimeter (DMM) Connectors: When the multimeter is used in current mode a different positive terminal is used.

- Voltage, Resistance, and Diode Banana Jack (red): The positive input for digital multimeter in voltage resistance and diode modes.
- Common Banana Jack (black): The common reference connection for digital multimeter voltage, current, resistance, and diode modes.
- Current Banana Jack (red): The positive input for digital multimeter current modes.

Prototype Board

First we will Identifying the components of the board



4

Oscilloscope Connectors and Function Generator Outputs/Digital Trigger Input: Out of the three BNC connectors (Bayonet Neill–Concelman) one is used for triggering.

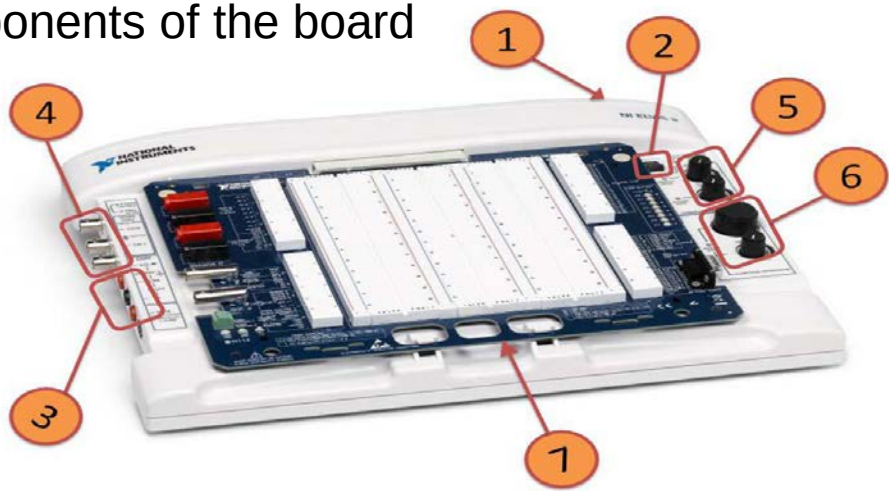
Oscilloscope (Scope) Connectors (Input)

- CH 0 BNC Connector: The input for channel 0 of the oscilloscope.
- CH 1 BNC Connector: The input for channel 1 of the oscilloscope.

Prototype Board

First we will Identifying the components of the board

5

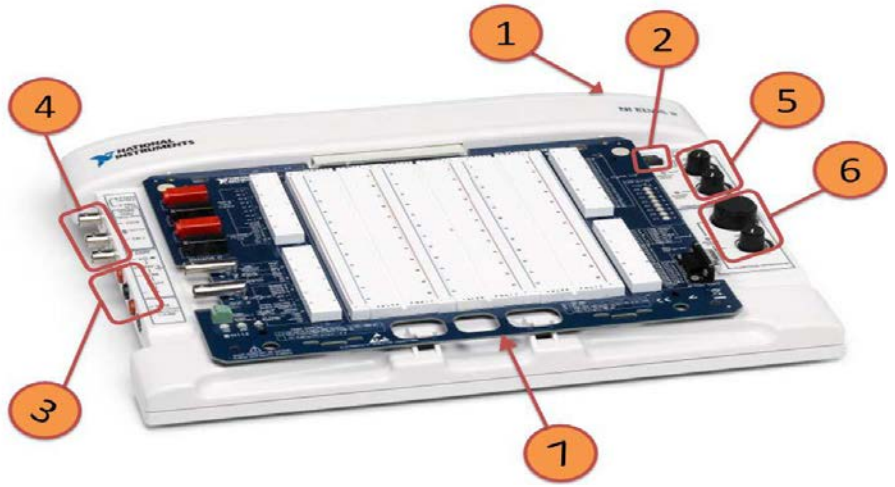


Variable Power Supply Manual Controls: This allows the user to set the voltage from the power supply to the required level.

- *Supply*+ can supply between 0 and +12V
- *Supply*– can supply between 0 and -12V
- Knobs are active only when the associated power supply is in manual mode.
- LED next to each knob lights up when associated power supply is in manual mode.

Prototype Board

First we will Identifying the components of the board

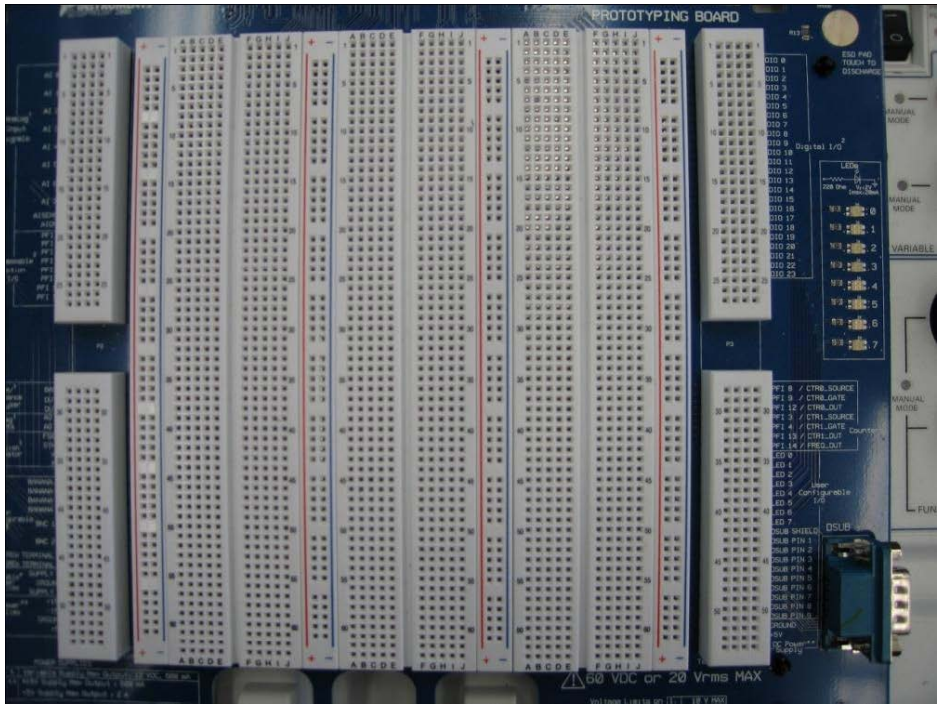


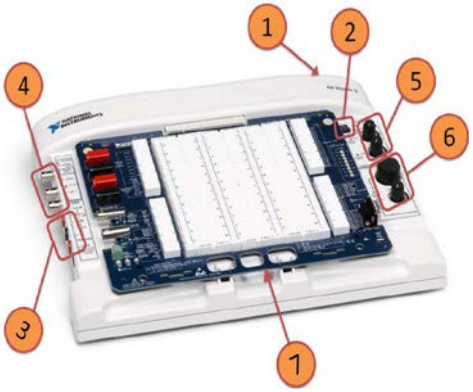
Function Generator Manual Control: These knobs allow the user to manually adjust the frequency and amplitude for a function generator output waveform. The Manual Mode LED lights up when the function generator is in manual mode.

Prototype Board

First we will Identifying the components of the board

7



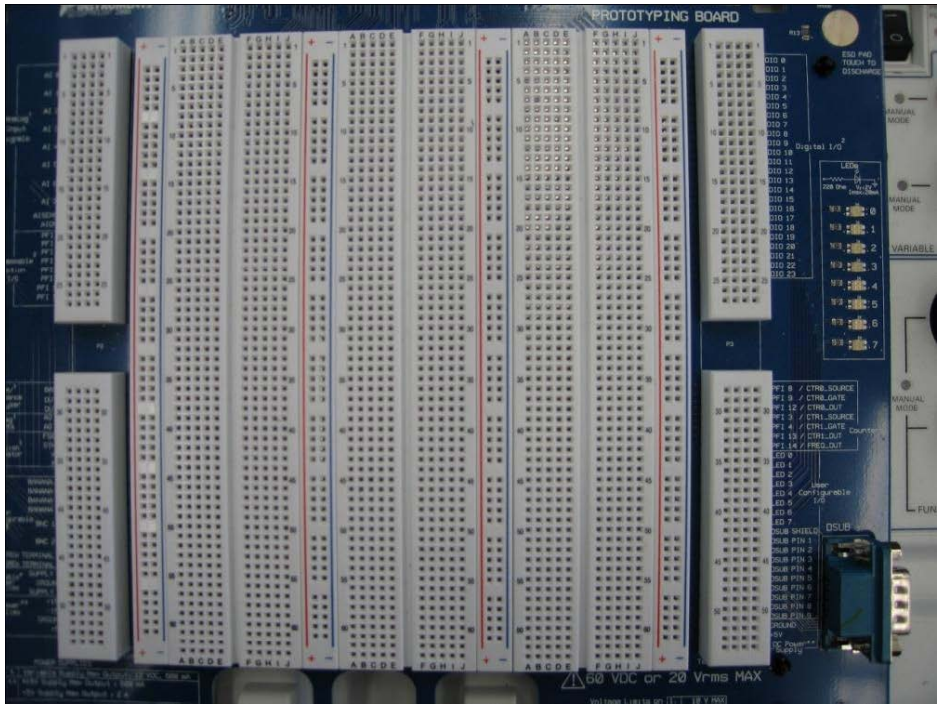


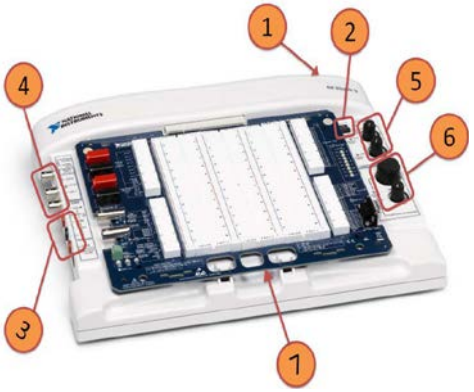
Provides an area for building circuitry and has necessary connections to access signals for common applications.

Prototype Board

Now we need to understand how this board is built

7



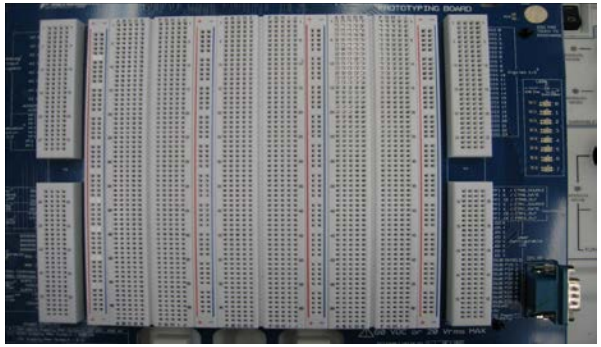


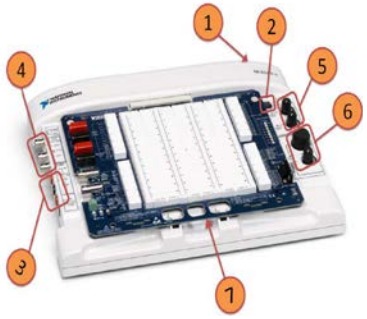
Why do we have these many holes?
How these holes are connected internally?

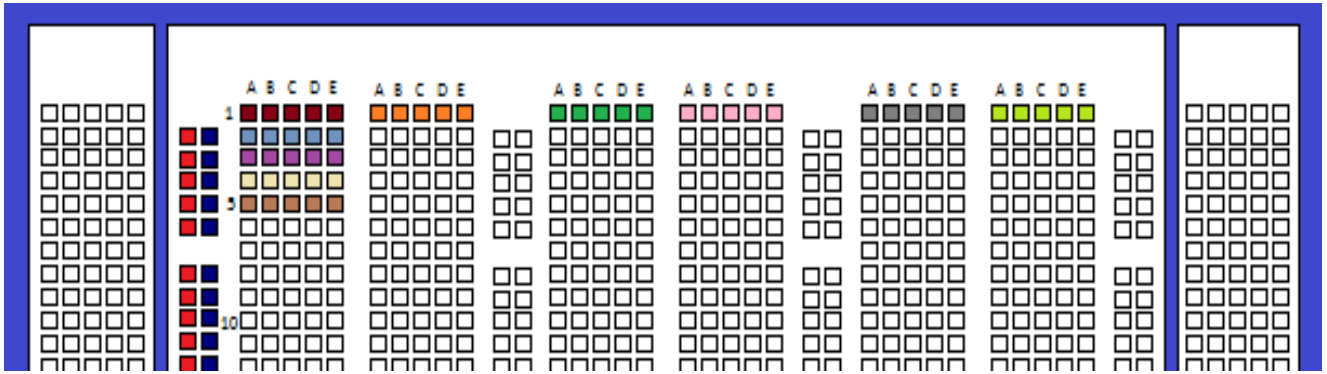
Prototype Board

Let see a close view

7



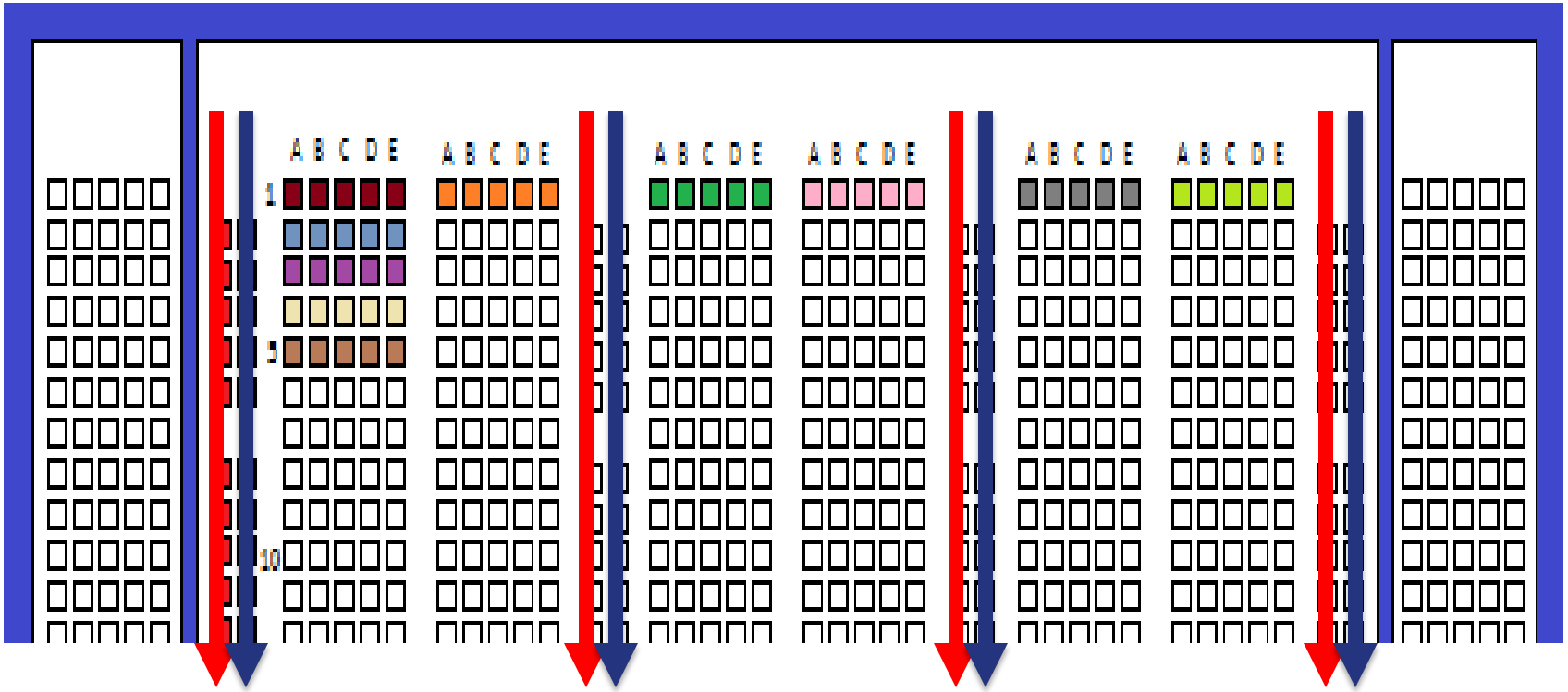




Do we have a pattern in arrangement of this holes? Yes

Prototype Board

How these holes internally connected?

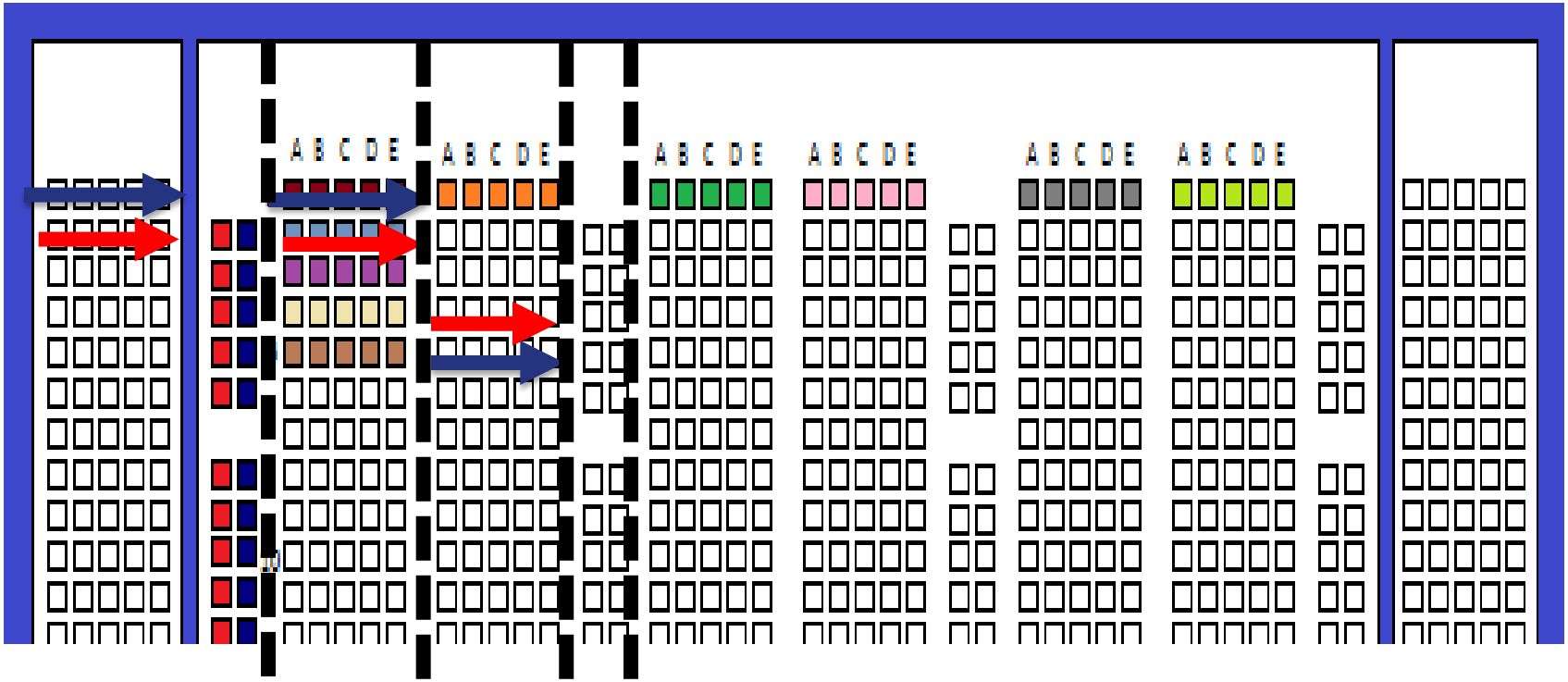


These are connected along the line (Vertically)

There is no connection between red and blue holes (no connection between columns)

Prototype Board

How these holes internally connected?



These are connected along the line (Horizontally)

There is no connection between next two parallel rows.

Vertical gaps are dividing the circuits and there is now connection between two groups

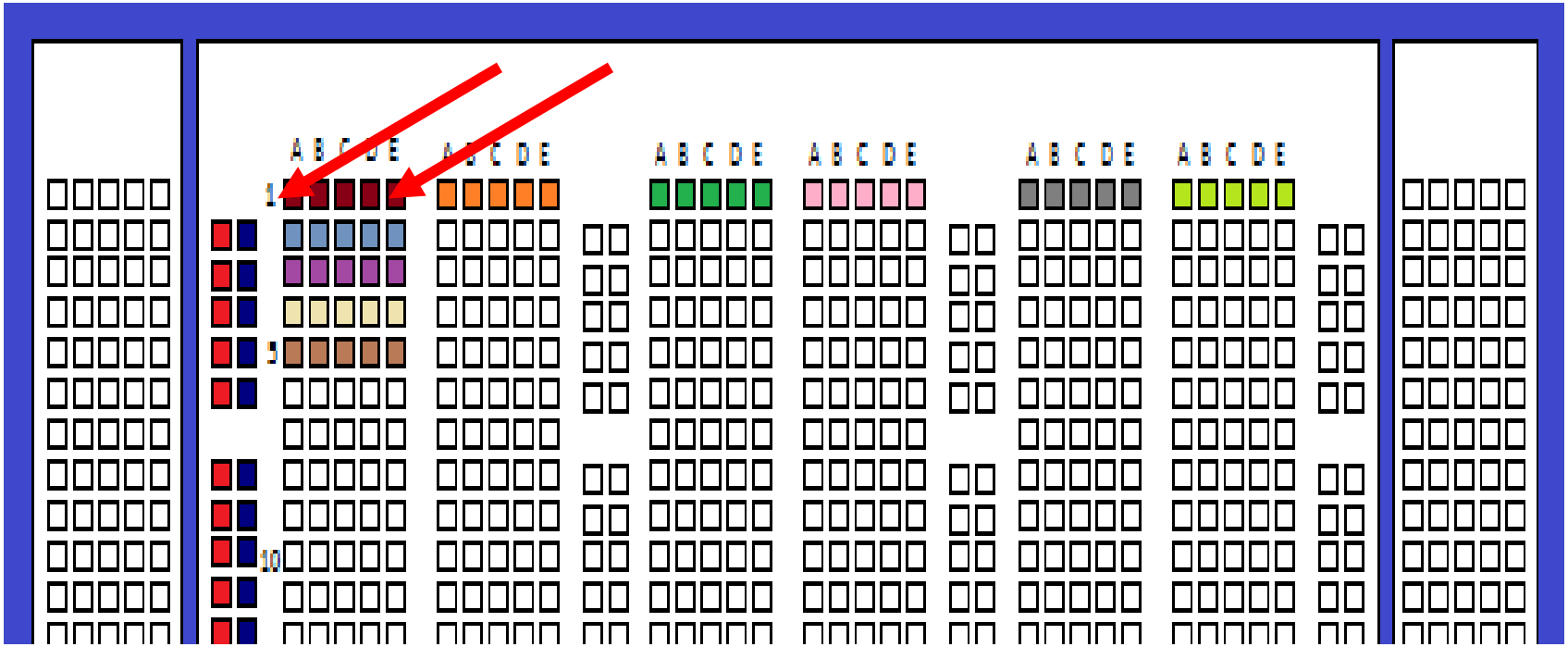
How to check connectivity

- You can use Digital Multi Meter to check the connectivity

Source:http://en-us.fluke.com/

Prototype Board

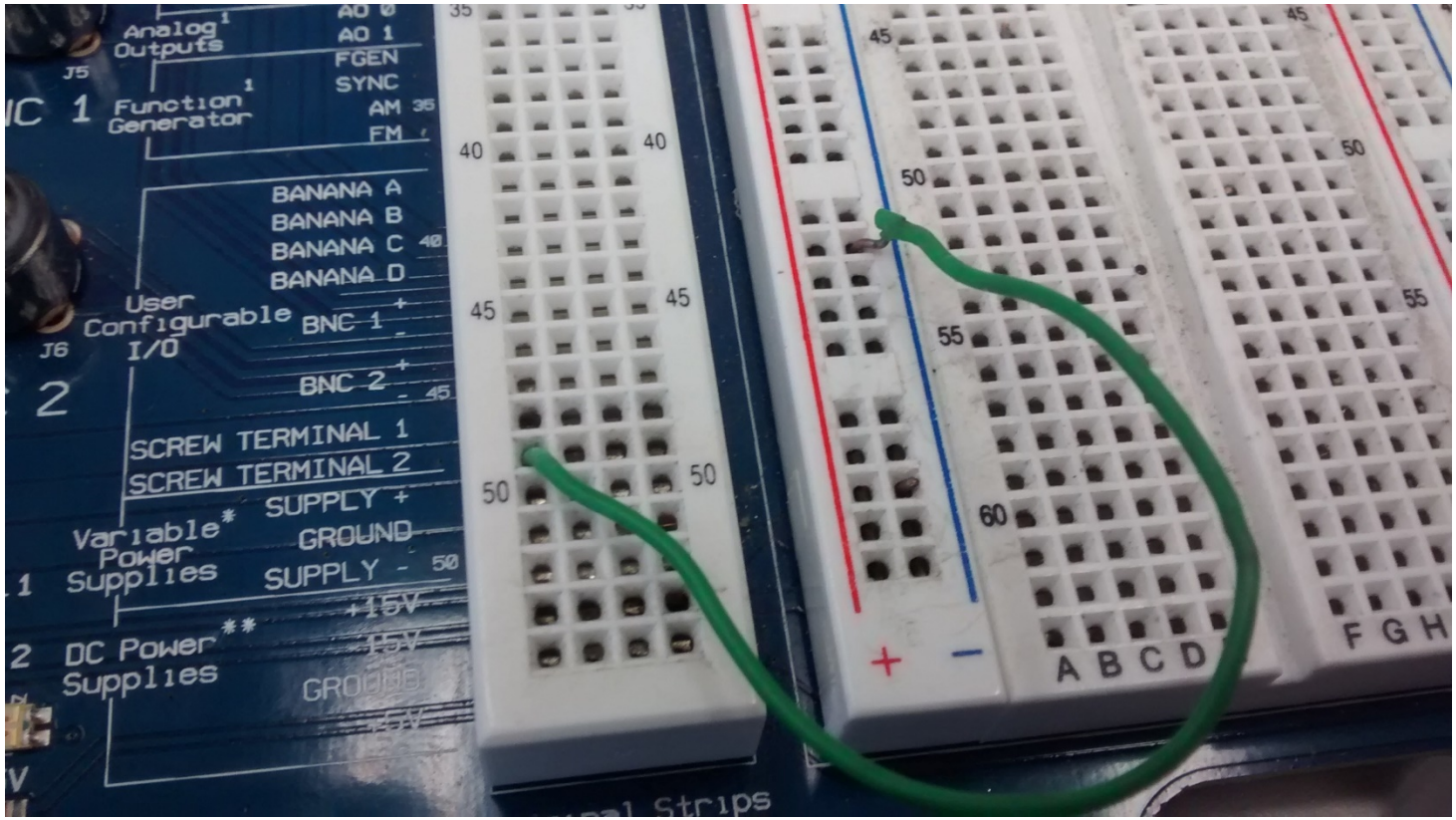
You can use the Multi Meter to check the connection



Insert two wires in the hole as shown in the arrow and check for the connectivity.
Repeat and understand the connection in the board.

Example

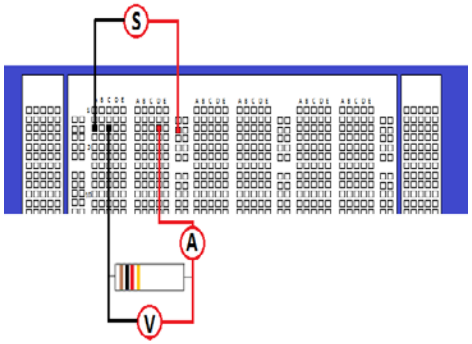
- Get the power supply voltage

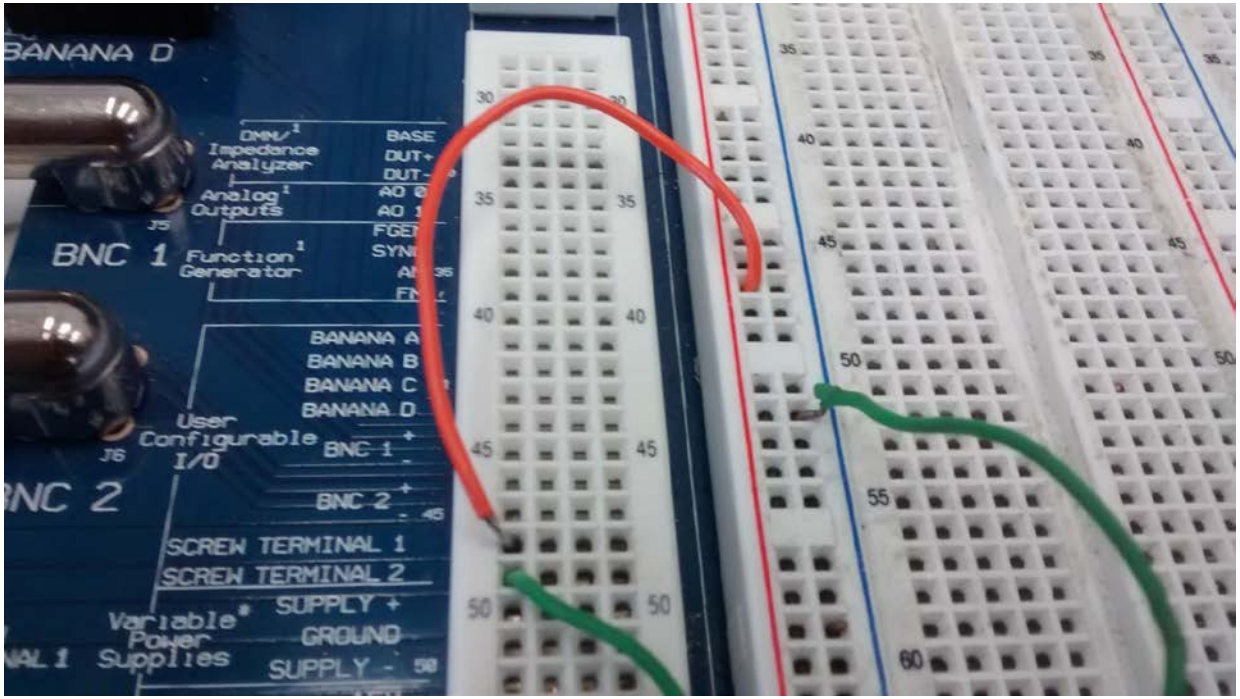


Source:http://en-us.fluke.com/

Get the power supply

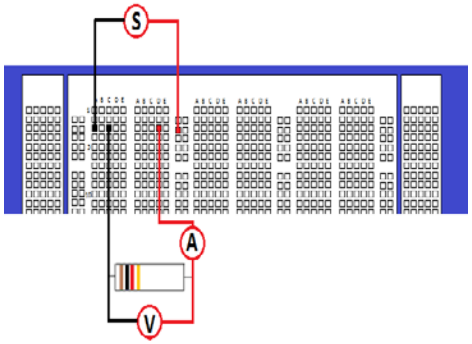
Get the positive voltage connection

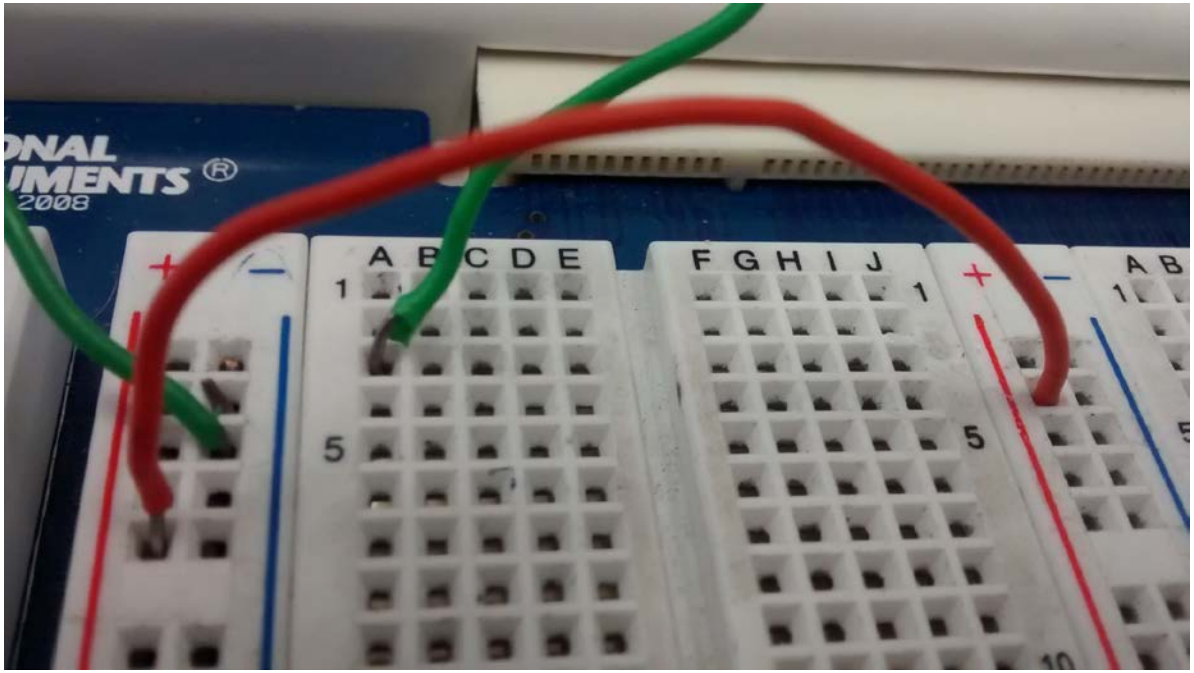




Connect as indicated

Bring the voltage to the board





Introduction to Integrated Circuit

Integrated Circuit

Set of electronic circuits like transistors on one small flat piece of semi conductor material normally silicon.

- Large number of tiny transistors into a small chip.
  - Space.
  - Cheaper.
  - Faster
- Computer, phone and all most all the electronic devices we use in day to day life.

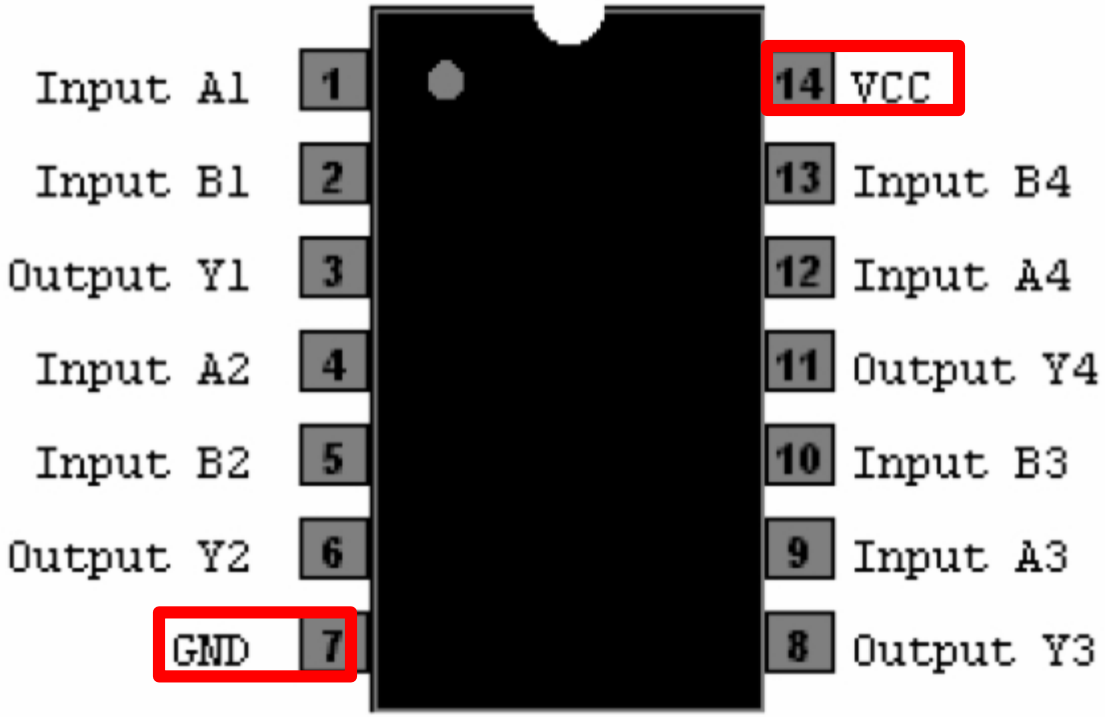
Wikipedia.org

Integrated Circuit (IC)

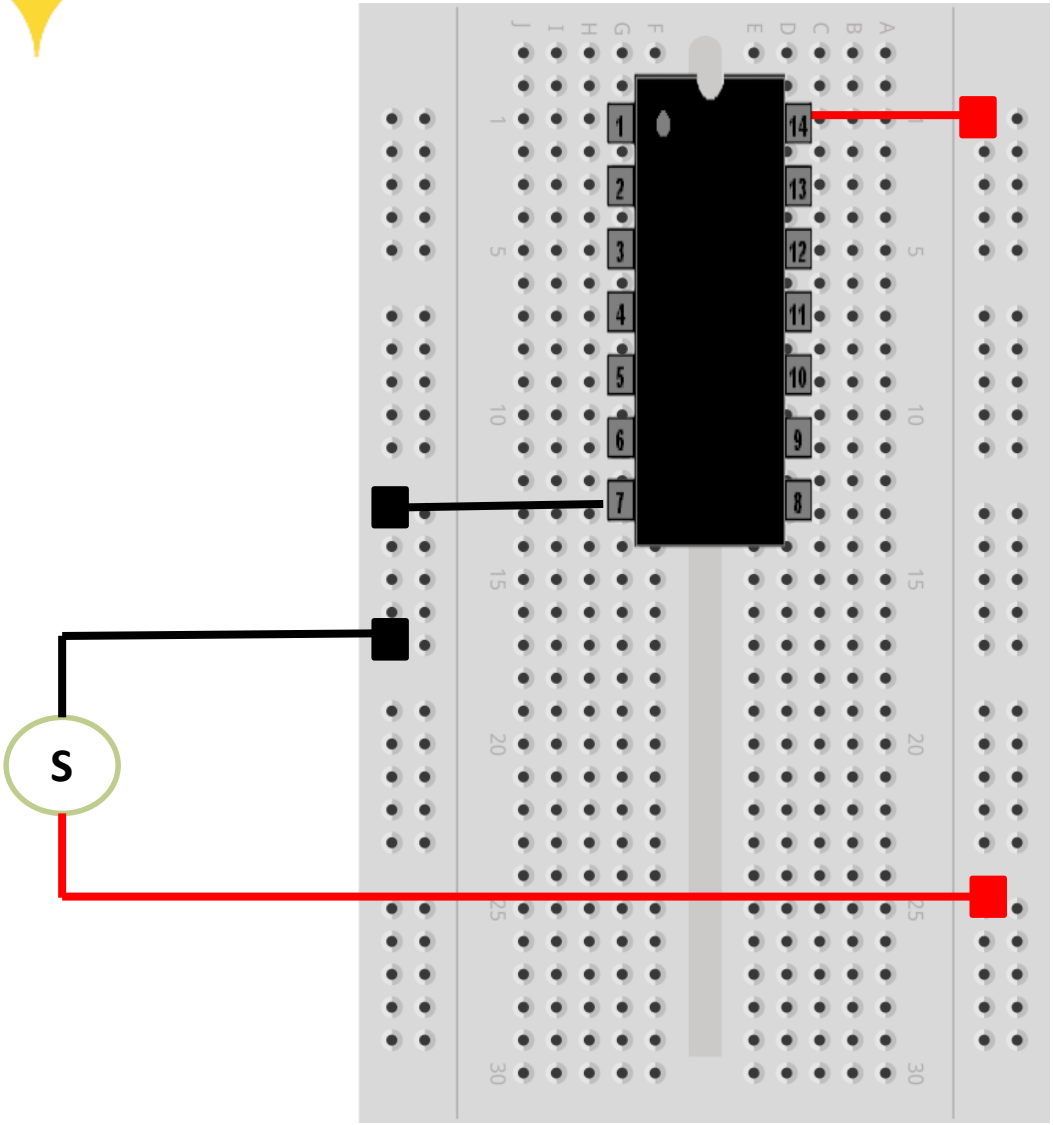
- There are several type of ICs for different purpose.
  - Each IC identified by it's name.
    - Example: **IC 74LS32**.
- Information about particular IC
  - Need to look in to the data sheet.
  - Example: IC 74LS32 data sheet
    - http://www.futurlec.com/74LS/74LS32.shtml

PIN OUT OF IC

- You need to identify the pinouts of IC
  - Data sheet
  - Example 74LS132 pinout



Connecting IC on the Prototype Board



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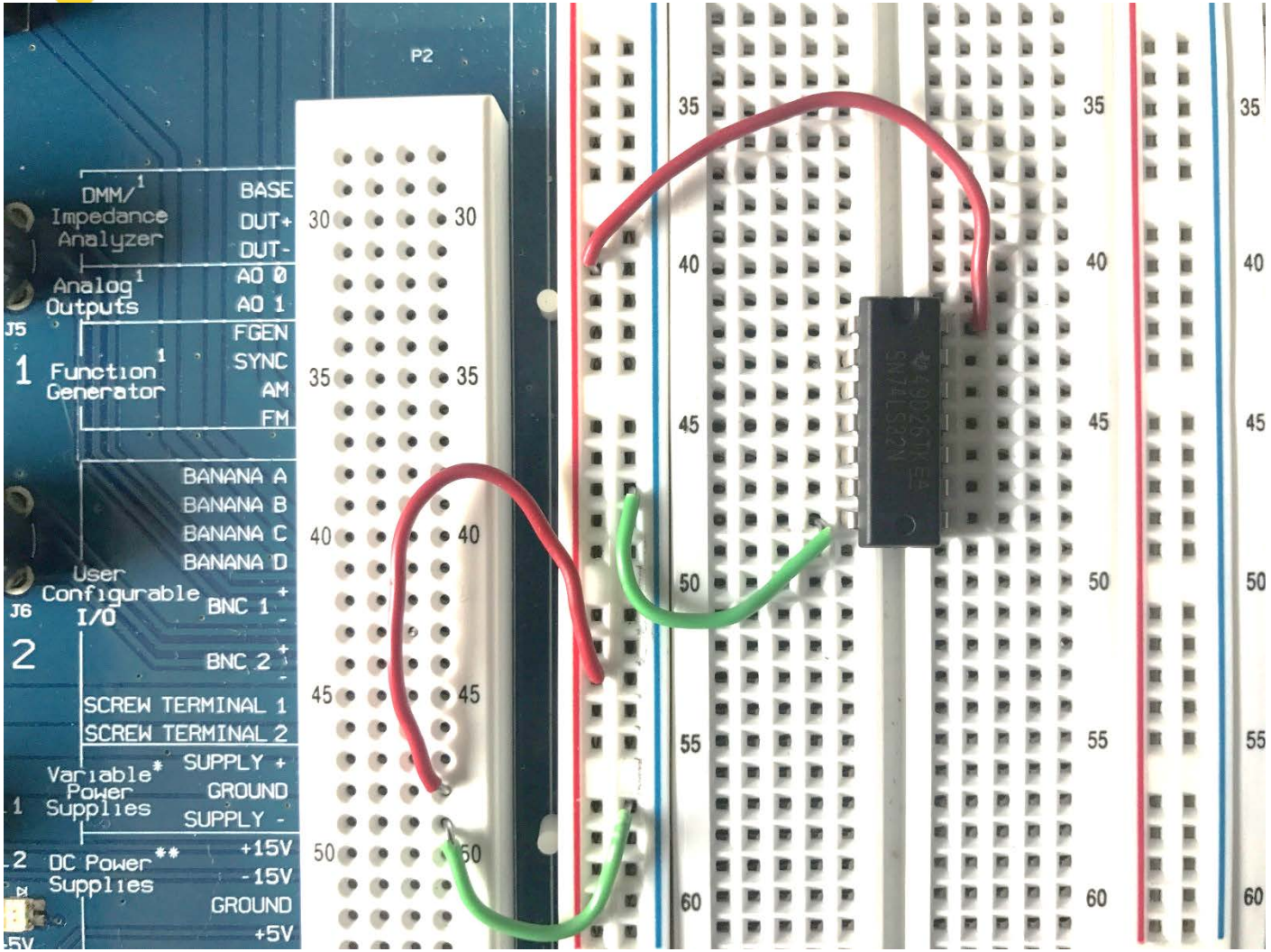

Introduction to Multi sim

- Learn how to use Multisim™ software to analyze electrical circuits.
- Step by step guide is provided in the manual.
- I will do it in the Projector.

We will make this circuit in Multisim