Miniboard Series Circuit Trainer

General Information

Each Miniboard comes complete and is fully functional when a 9 volt battery is installed, the green power light will illuminate. The Green light is a reminder that when finished with the simulator the battery should be removed.

Each Miniboard has a "fuse" circuit. When a power circuit is shorted an on-board PTC rated at 400 miliamps(under the amperage rating of most meters), the PTC will open and the red light will come on if multi-meter is hooked up wrong, which will save most multi-meters fuse. When the circuit is shorted the PTC opens and the path is altered to the RED LED which will illuminate as long as the short exists. When the short is removed the RED LED will go out and the circuit resumes normal function.

Each Miniboard, in order to maintain more accuracy, contains an on-board Constant Voltage Regulator which maintains a constant voltage of 5 volts (+ - 5%). The 9 volt battery will maintain a constant 5 volts supply to the rotary switch. When the circuit 1-9 is selected, this will supply voltage to that circuit.

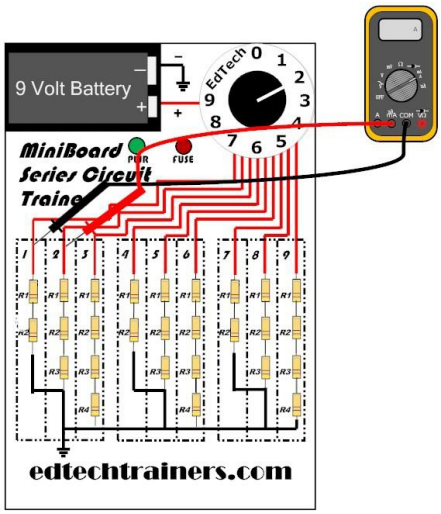
Each Miniboard contains a 10 position switch with positions from 0 to 9. This allows the user to select one of nine practice circuits. The Miniboard is laid out from Left to right with practice circuits numbered 1 through 9. Miniboards come in three different types of circuits S= Series, P= Parallel, and SP= Series-parallel This board is the 'Series' board and the circuits will be referred to practices P1, P2, P3 and so on. When referring to specific resistors R1, R2, R3 and so on.

Two types of resistors are used in the circuits Brown= 5% tolerance and the Blue =1% tolerance. The bands represent the values of each. This can be found by using any resistor color chart or free online software color band calculator. Due to the fact that each circuit contains all tolerance level resistors readings will fall within these tolerance level when measuring. Some boards may contain all the same tolerances and some boards will contain a mixture. All measurements should fall within these tolerances. Readings may vary due to temperature and stacked tolerances but these boards are accurate to approximately plus or minus 3%.

Website support materials are supplied online at www.edtechtrainers.com
PDF files are supplied with the enclosed memory stick which includes all worksheets to print
By clicking on the miniboard series trainer yo will find a wealth of information to help with the worksheets measurements and calculations.

Measuring Series Current:

In order to measure amperage on the Miniboard, an ammeter must be connected in series with the switch and the circuit.
In order to accomplish this input power must be scavenged from another circuit
For example:
To measure the amperage of Circuit P1 power from Circuit P2 must be used. Place the Red lead of the multi-meter on input of Circuit P2, then place the Black lead of the multi-meter on the input of Circuit P2. The meter will show the amperage of Circuit P1. (see Fig 1)



(see Fig 1)

To measure the amperage of Circuit P2 power from Circuit P1 must be used. Place the Red lead of the multi-meter on input of Circuit P1, then place the Black lead of the multi-meter on the input of Circuit P2. The meter will show the amperage of Circuit P2. (see Fig 2). By leaving the Rotary switch to power circuit P1 and moving the Red lead of the multi-meter to the remaining circuits can be easily measured. (see Fig 3, Fig 4)

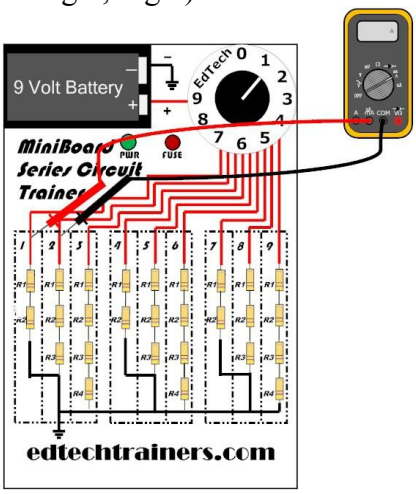


Fig 2

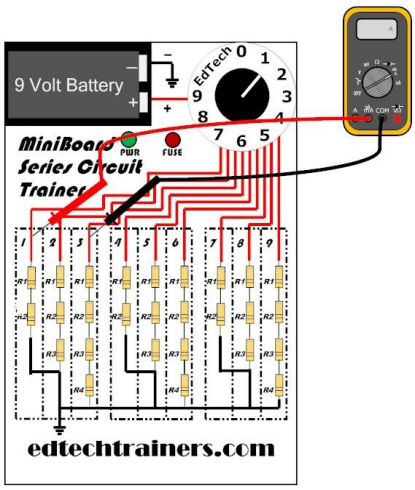


Fig 3

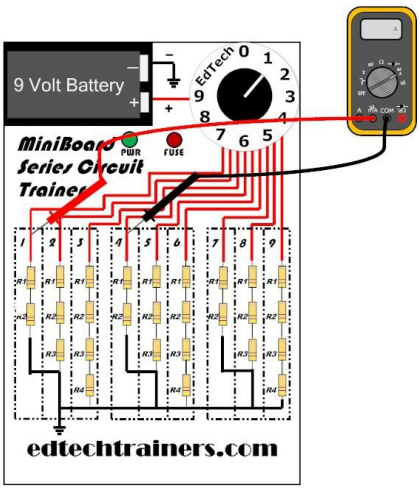


Fig 4

Continue through the remaining circuits in this method.

Measuring Series Resistance

Measurements are taken with the Rotary Switch in the 0 position for all practice readings. In a series circuit that has been disconnected from the power source, each resistor value can be read individually or as a total.DMM settings should be set to ohms, and Miniboards Rotary circuit switched to off, or 0 in order to obtain readings. Specific to a Series circuit, each resistor can be measured individually and totaled to obtain Resistance Total which can also be measured. These readings are obtained by placing one lead of the DMM to the top of one resistor and the other lead to the bottom of that resistor. It doesn't matter which lead is placed at each position because polarity does not matter with resistance measurement. In the series circuit Rt= sum total of all resistors in the circuit.

In order to measure Resistance Total (Rt), place one lead of the DMM to top of R1 and the bottom of R2 This can be repeated in order to obtain total resistance and individual resistor values of circuits P1 through P9. See figures 5, 6, and 7 below.

Measuring P1, R1 Resistance

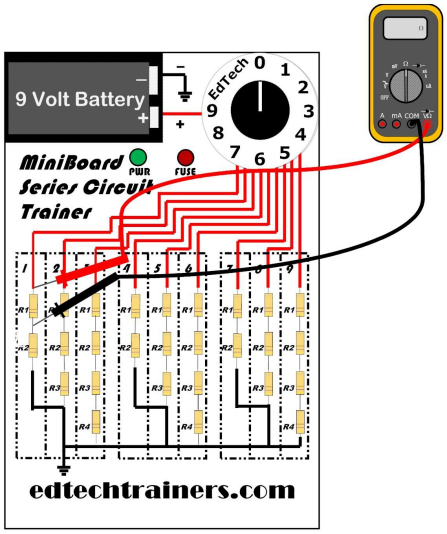


Fig 5

Measuring P1, R2 Resistance

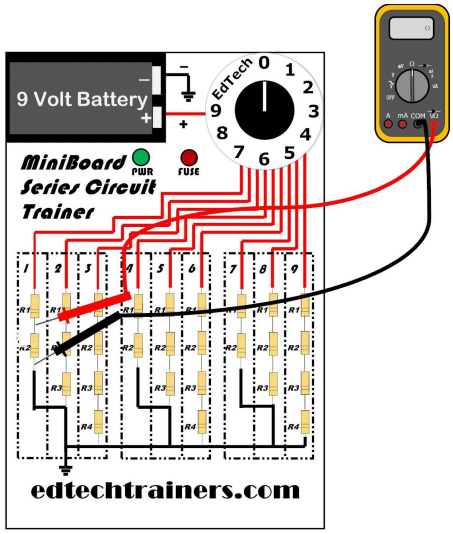
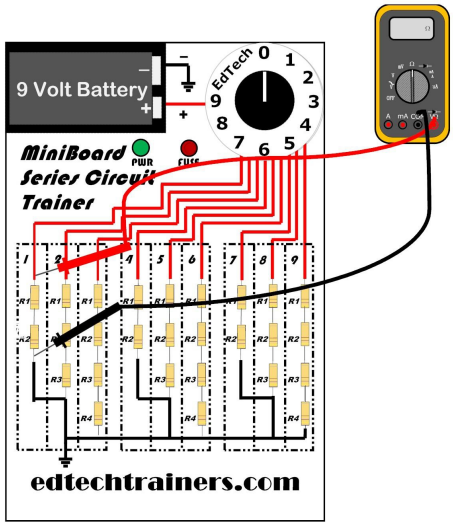


Fig 6

Measuring P1 Resistance Total



Fig, 7

Measuring Voltage

Each miniboard has an on-board 9 volt battery with an internal 5 Volt Constant Voltage Regulator, which supplies 5 volts, plus or minus 5%, to each selected circuit. In order to take voltage measurements it is necessary to power up each individual circuit using the Rotary switch, which applies 5 volt to the selected circuit.

Battery Voltage, Supply voltage, and Voltage drop measurements can be obtained in each circuit. Using P1 as an example place leads as shown below.

Measuring Battery Voltage: Place Negative lead on the battery negative terminal, and the positive lead on the positive post of the battery (see Fig. 8)

Measuring Battery Voltage

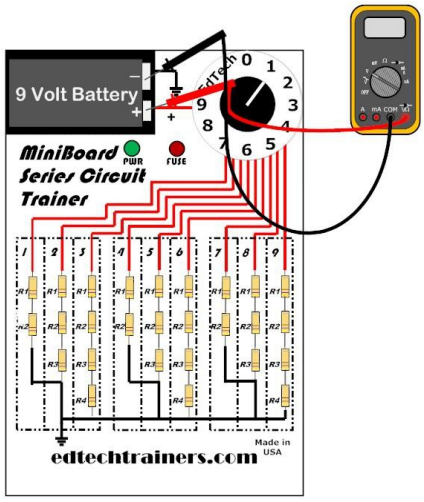


Fig. 8

Measuring Circuit Supply Voltage.: Place negative lead of DMM to the battery negative terminal, place the positive lead of the DMM to the top of the first resistor in the circuit P1 (see Fig. 9)

Measuring Circuit P1 Supply Voltage

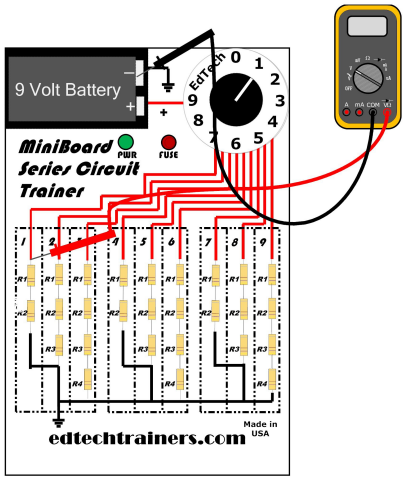


Fig. 9

Measuring R1 voltage drop place the positive lead of the DMM to the top of R1, and place the black lead to the bottom of the R1 resistor. (see Fig 10)

Measuring R1 Voltage Drop

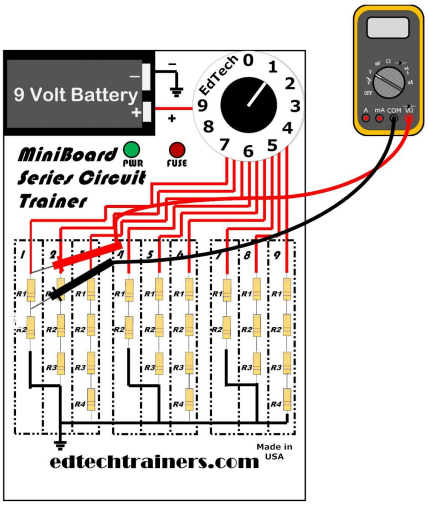


Fig. 10

Measuring R2 voltage drop, place the positive lead of the DMM to top of R2, and place the black lead to the bottom of R2 resistor. (see Fig 11)

Measuring R2 Voltage Drop

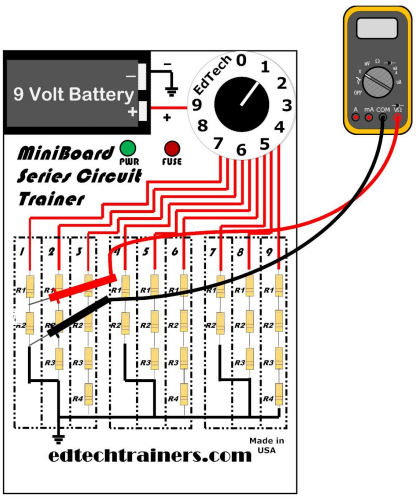


Fig. 11

Measuring P1 circuit Total Voltage Drop, place the red lead of the DMM to the top of Circuit P1 R1, and place the Black lead to the bottom of Circuit P1 R2. (see Fig. 12)

Measuring P1 Total Voltage Drop

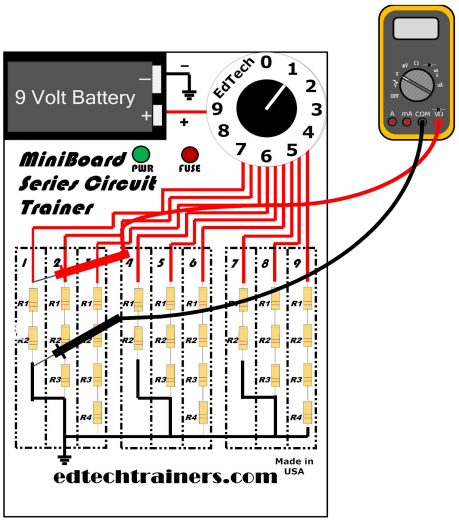


Fig 12