italtec

Technical Training Systems

- RLC CIRCUITS
- AMPLIFIERS
- DIODES

IT.0720.32

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RLC CIRCUITS - AMPLIFIERS - DIODES

INSTRUCTION MANUAL

MANUALE D'ISTRUZIONE

CE

COMPANY WITH QUALITY MANAGEMENT SYSTEM CERTIFIED BY DNV = ISO 9001:2015 =

italtec Technical Training Systems srl
Viale Regina Giovanna 35 – 20129 MILANO

Sede operativa: Via M. Idiomi 1/17 - 20090 ASSAGO – MI-
Tel +39 02 90 721 606 Fax +39 02 90 720 227
e-mail italtec@italtec.it http://www.italtec.it

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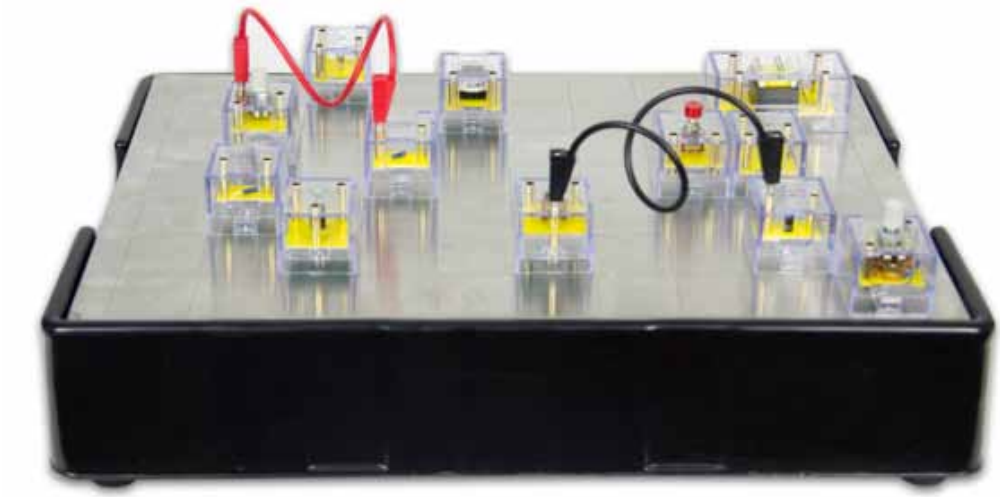


IT.0720.32 RLC CIRCUITS - AMPLIFIERS - DIODES

Composition	Composizione
· - 1 Training kit · - 1 Oscilloscope · - 1 Generator · - 1 Power supply · - 1 Voltmeter · - 1 Ammeter · - 1 Wattmeter	· 1 Kit d'addestramento · 1 Oscilloscopio · 1 Generatore · 1 Alimentatore · 1 Voltmetro · 1 Amperometro · 1 Wattmetro

Content

Experiment 1: Series resistors circuit

Object:

- To study the voltage and current in series resistors circuit.

Experimental device

1. Grid panel and tray with experimental components and leads	1 set
2. DC power supply	1 pc
3. Digital multimeter	2 pcs

Circuit

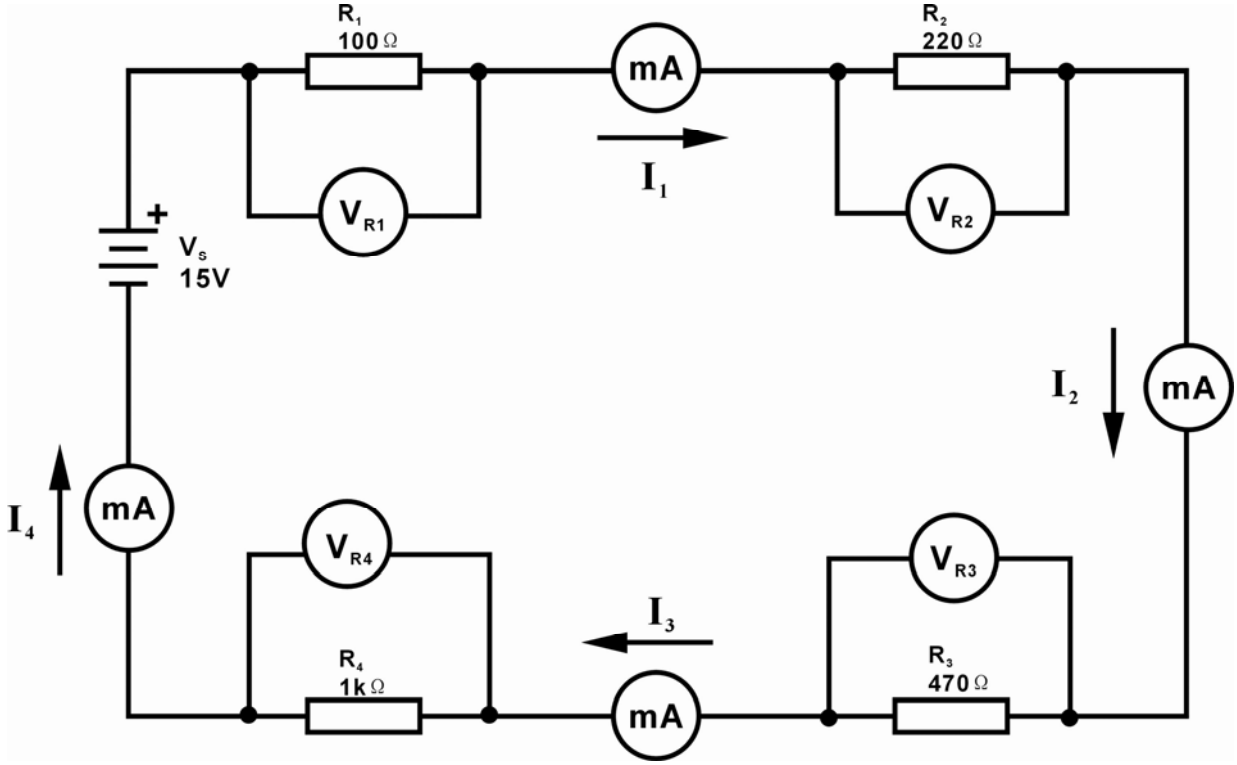


Figure 1

Experimental procedure

1. Set up the circuit as figure 1.
2. Supply a DC voltage V_S = 15V to the circuit.
3. Measure the current at different point and the voltage on every resistor as figure 1 shown and record the results in table 1.

R (Ω)	100	220	470	1k
I (mA)				
I (mA)*				
V_R(V)				
V_R(V)*				

Table 1

Note: * values are calculated.

4. Take the measured values from table 1 to calculate the voltage and the current of each resistor and record the calculated values in table 1.

5. Describe the characteristics of voltage and current in series resistors circuit.

Experiment 2: Parallel resistors circuit

Object:

- To study the voltage and current in parallel resistors circuit.

Experimental device

1. Grid panel and tray with experimental components and leads	1 set
2. DC power supply	1 pc
3. Digital multimeter	2 pcs

Circuit

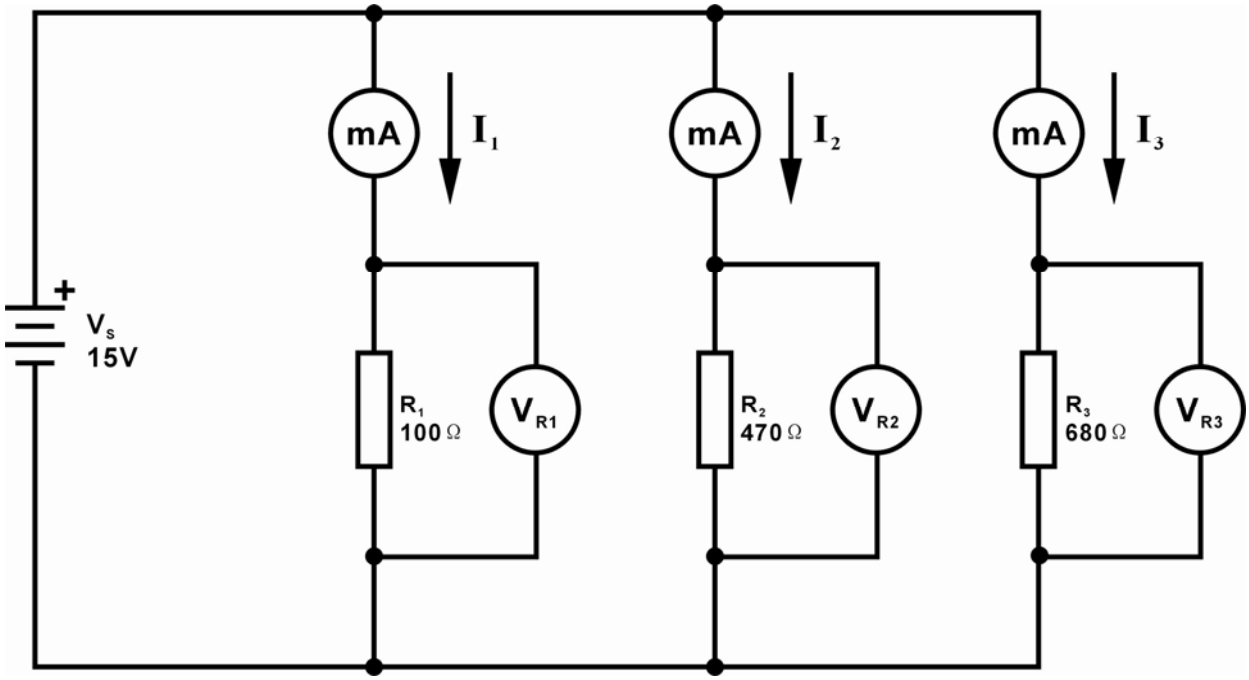


Figure 2

Experimental procedure

1. Set up the circuit as figure 2.
2. Supply a DC voltage V_S = 15V to the circuit.
3. Measure the voltage and the current at different point as figure2 shown and record the results in table 2.

R (Ω)	100	470	680
I (mA)			
I (mA)*			
V_R (V)			
V_R (V)*			

Table 2

Note: * values are calculated.

4. Take the measured values from table 2 to calculate the voltage and the current of each resistor and record the calculated values in table 2.

5. Describe the characteristics of voltage and current in parallel resistors circuit.

Experiment 3: Compound resistors circuit

Object:

- To study the voltage and current in compound resistors circuit.

Experimental device

1. Grid panel and tray with experimental components and leads	1 set
2. DC power supply	1 pc
3. Digital multimeter	2 pcs

Circuit

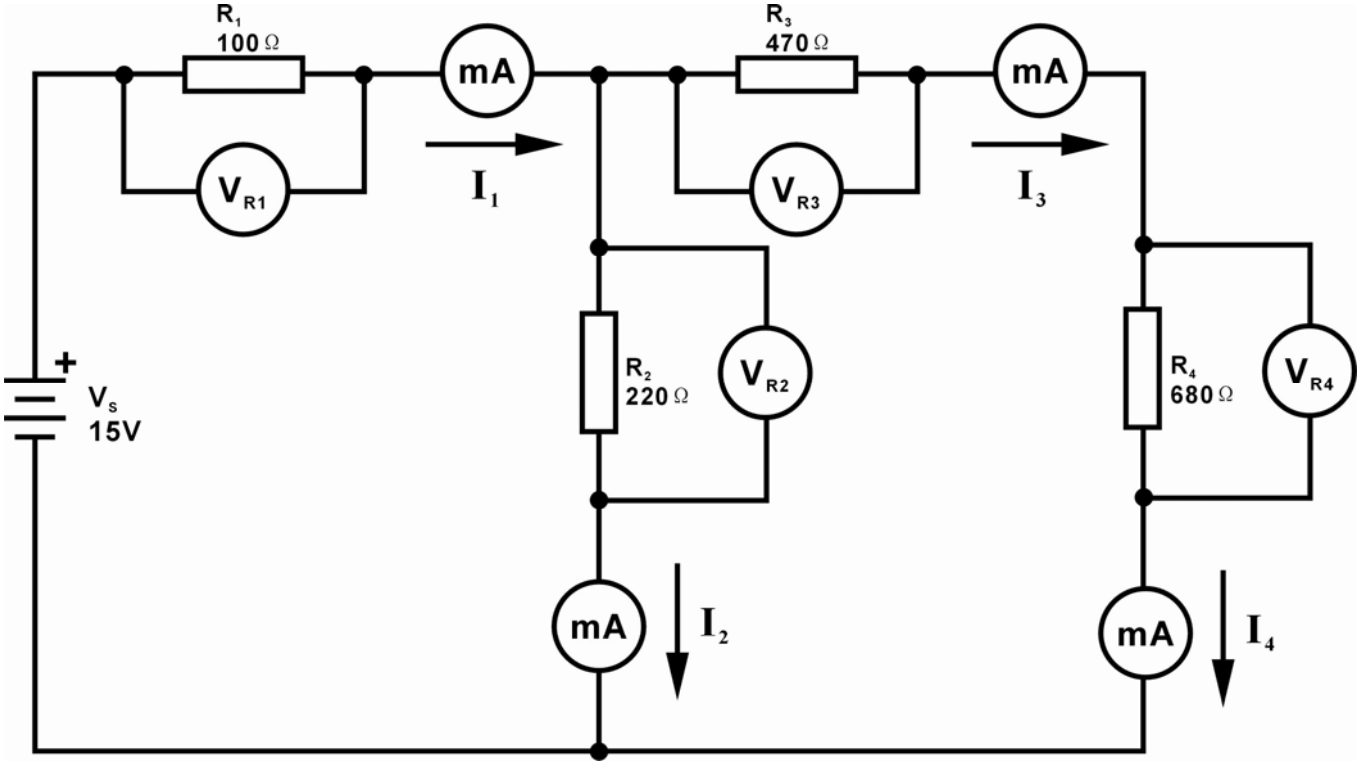


Figure 3

Experimental procedure

1. Set up the circuit as figure 3.
2. Supply a DC voltage V_S = 15V to the circuit.
3. Measure the current and the voltage at different point as figure 3 shown and record the results in table 3.

R (Ω)	100	220	470	680
I (mA)				
I (mA)*				
V_R (V)				
V_R (V)*				

Table 3

Note * values are calculated.

4. Take the measured values from table 3 to calculate the voltage and the current of each resistor and record the calculated values in table 3.

5. Describe the characteristics of voltage and current in compound resistors circuit.

Experiment 4: Ohm's law I = F (V)

Object:

- To find the current that varies with the voltage on the constant resistance.

Experimental device

1. Grid panel and tray with experimental components and leads	1 set
2. DC power supply	1 pc
3. Digital multimeter	2 pcs

Circuit

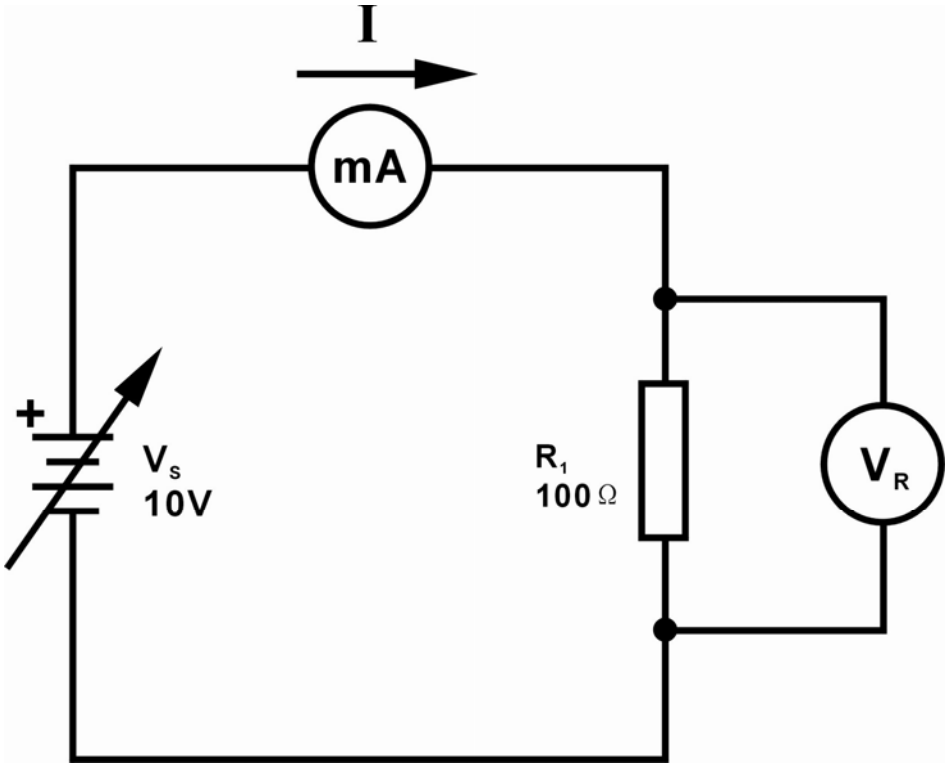


Figure 4

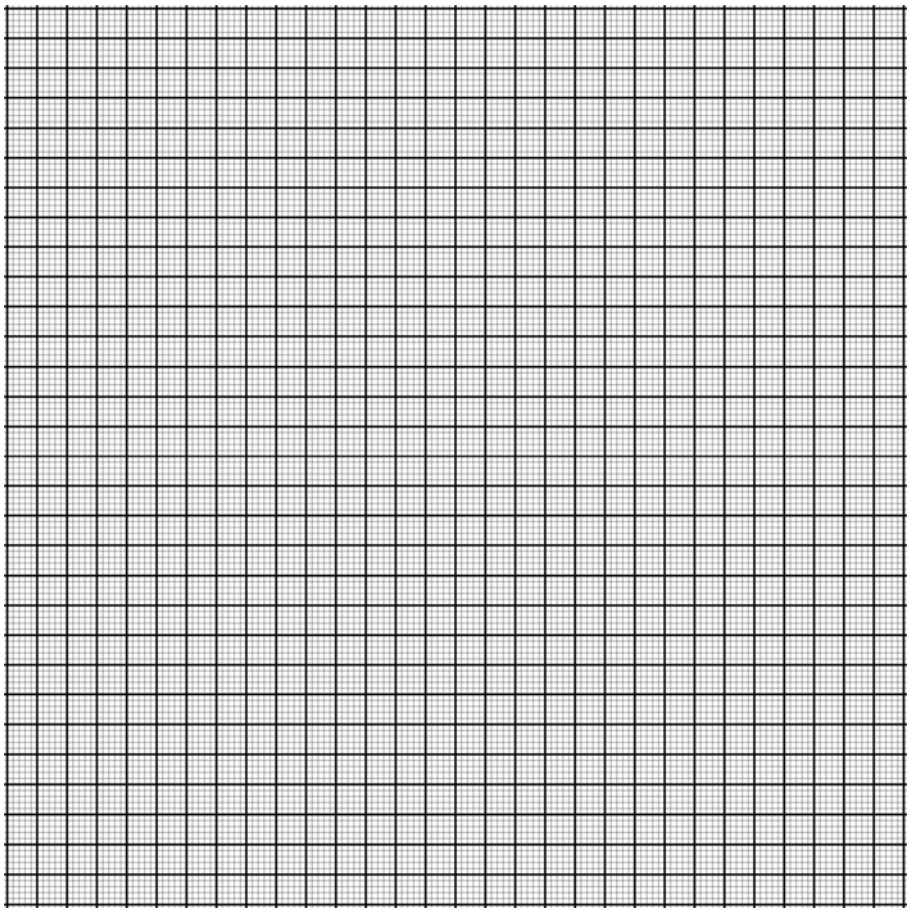
Experimental procedure

1. Set up the circuit as figure 4 and let the R_1 = 100Ω.
2. Supply a DC voltage V_S to the circuit.
3. Adjust the DC voltage V_S to get V_R values as shown in table 4 and then measure and record the current values in table 4.
4. Change the resistor R_1 as 470 Ω and 1kΩ, respectively repeat as section 2 and 3, record the values in table 4.

	V_R (V)	1	2	4	6	8	10
R_1=100 Ω	I (mA)						
R_2=470 Ω	I (mA)						
R_3=1k Ω	I (mA)						

Table 4

5. Take the current values from the table 4 to draw a graph and determine the relationship I = f (V_R) on the constant resistance.



Graph 4

6. Describe the results from table 4 and graph 4.

Experiment 5: Ohm's law I = F(R)

Objective

- To find the current that varies with the resistance on the constant voltage.

Experimental device

1. Grid panel and tray with experimental components and leads	1 set
2. DC power supply	1 pc
3. Digital multimeter	2 pcs

Circuit

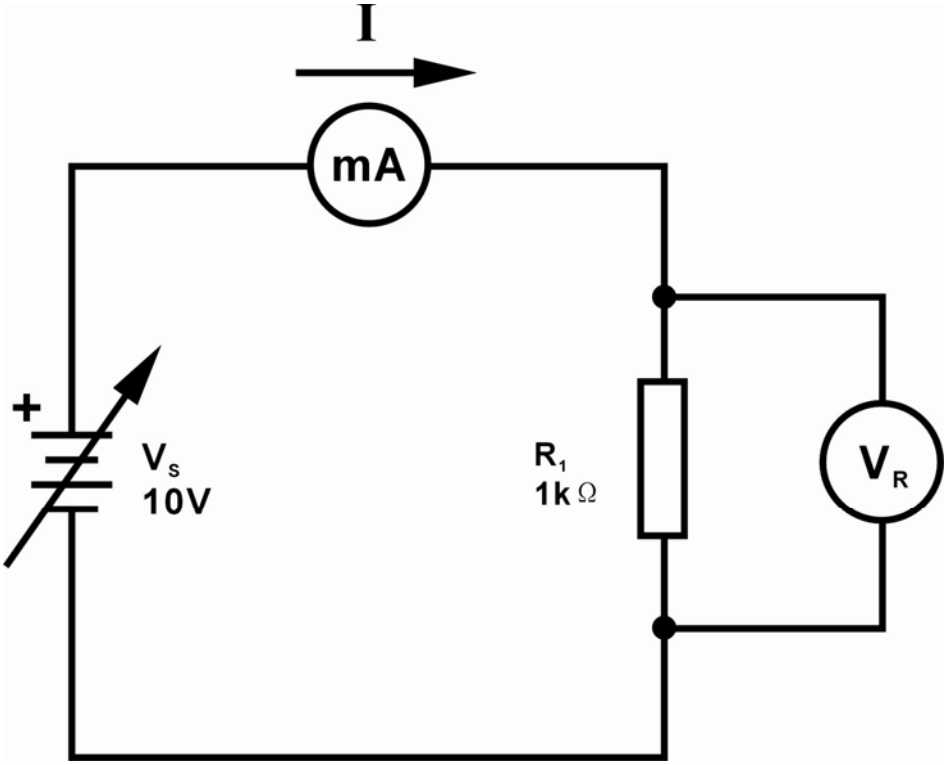


Figure 5

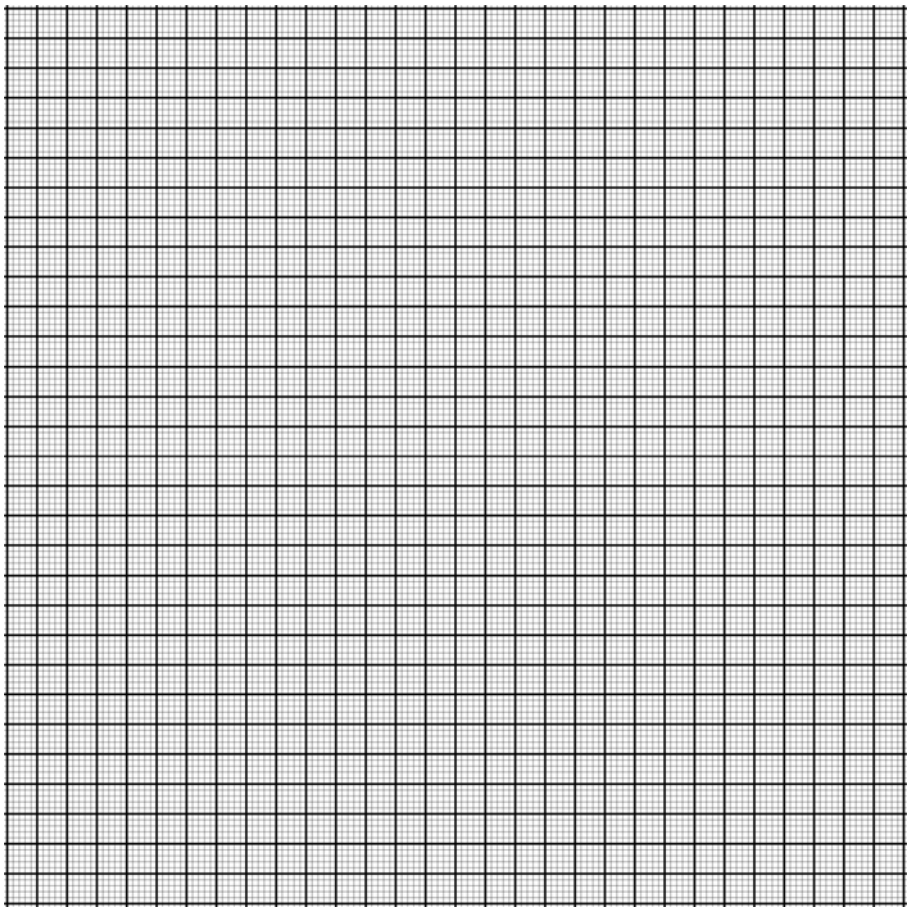
Experimental procedure

1. Set up the circuit as figure 5 and let the R_1 = 100Ω.
2. Supply a DC voltage V_S to the circuit.
3. Adjust the DC voltage V_S to get the V_R is 4 V, measure and record the current values in table 5.
4. Change the value of the resistor R_1 and repeat the experiment as section 3 and record the values in table 5.
5. Adjust the voltage V_R to 8 V and 12 V, do the experiment as section 4 and record the values in table 5.

	R (Ω)	100	200	470	680	1k	2.2k
V_R=4V	I (mA)						
V_R=8V	I (mA)						
V_R=12V	I (mA)						

Table 5

6. Take the current values from table 5 to draw a graph and determine the relationship I = f (R) on the constant voltage.



Graph 5

7. Describe the results from table 5 and graph 5.

Experiment 6: Kirchhoff's Laws on voltage

Objective:

- To find the voltage of the circuit by Kirchhoff's laws.

Experimental device

1. Grid panel and tray with experimental components and leads — 1 set
2. DC power supply — 1 pc
3. Digital multimeter — 2 pcs

Circuit

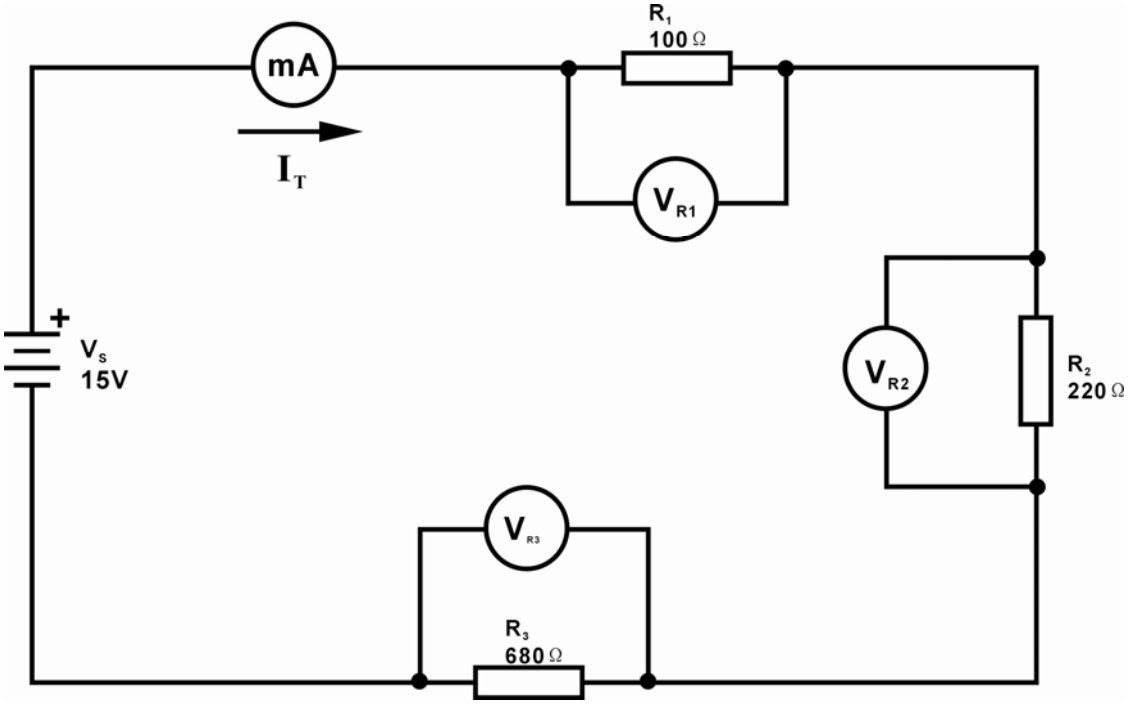


Figure 6

Experimental procedure

1. Set up the circuit as figure 6.
2. Supply a DC voltage V_S = 15V to the circuit.
3. Measure the voltage on the resistors R_1, R_2 and R_3 as figure 6 shown and record the values in table 6.
4. Measure the total current of the circuit I_T as figure 6 shown and record the values in table 6.
5. Calculate the voltage V_{R1}*, V_{R2}* and V_{R3}* by the total current value I_T and record the voltage values in table 6.

R_1=100 Ω	I_T=……A	V_{R1}=……V	V_{R1}*=……V
R_2=220 Ω	I_T=……A	V_{R2}=……V	V_{R2}*=……V
R_3=680 Ω	I_T=……A	V_{R3}=……V	V_{R3}*=……V

Table 6

Note * values are calculated.

6. Compare the values from the experiment with calculated values by Kirchhoff's laws.

Experiment 7: Kirchhoff's Laws on current

Objective:

- To find the current of the circuit by Kirchhoff's laws.

Experimental device

1. Grid panel and tray with experimental components and leads	1 set
2. DC power supply	1 pc
3. Digital multimeter	2 pcs

Circuit

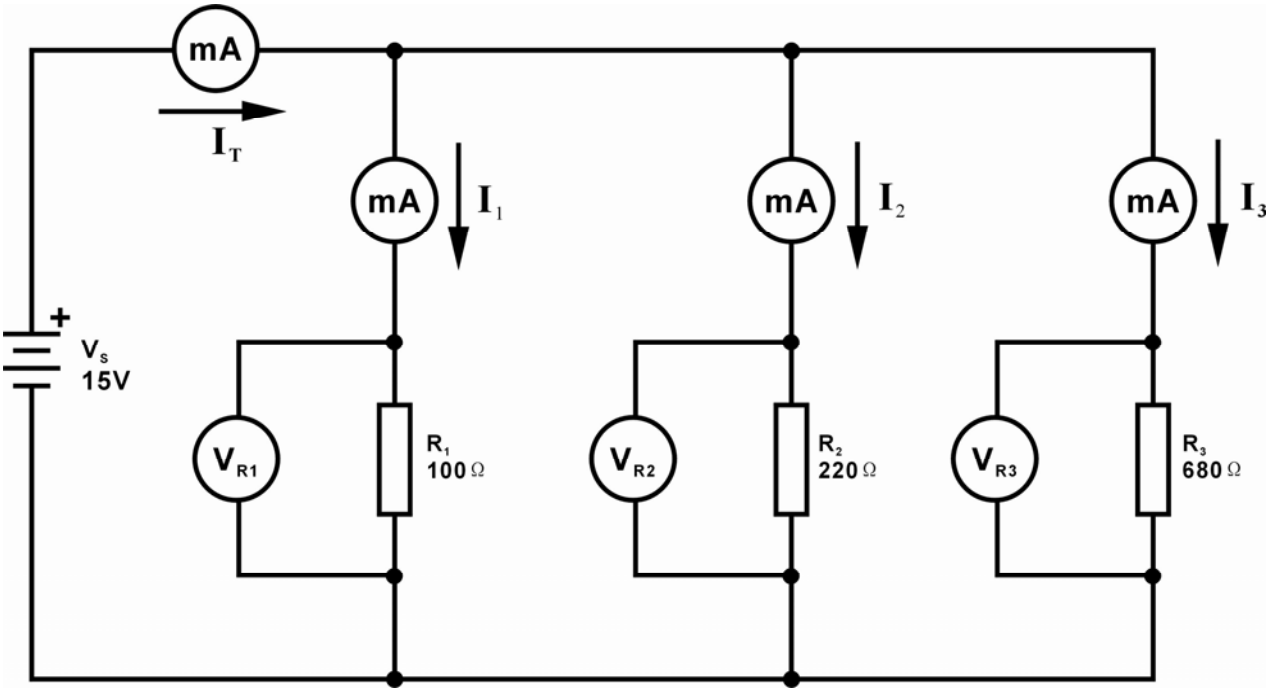


Figure 7

Experimental procedure

1. Set up the circuit as figure7.
2. Supply a DC voltage V_S = 15V to the circuit.
3. Measure the voltage on the V_{R1}, V_{R2} and V_{R3} as figure 7 shown and record the values in table 7.
4. Measure the current I_1, I_2 and I_3 as figure 7 shown and record the values in table 7.
5. Calculate the current I_1*, I_2* and I_3* and record the values in table 7.

R_1=100 Ω	V_{R1}=.....V	I_1=.....A	I_1*=.....A
R_2=220 Ω	V_{R2}=.....V	I_2=.....A	I_2*=.....A
R_3=680 Ω	V_{R3}=.....V	I_3=.....A	I_3*=.....A

Table 7

Note * values are calculated.

6. Compare the values from the experiment with calculated values by Kirchhoff's laws.

Experiment 8: Superposition theorem

Objective:

- To find the current of the circuit by superposition theorem.

Experimental device

1. Grid panel and tray with experimental components and leads — 1 set
2. DC power supply — 2 pcs
3. Digital multimeter — 2 pcs

Circuit

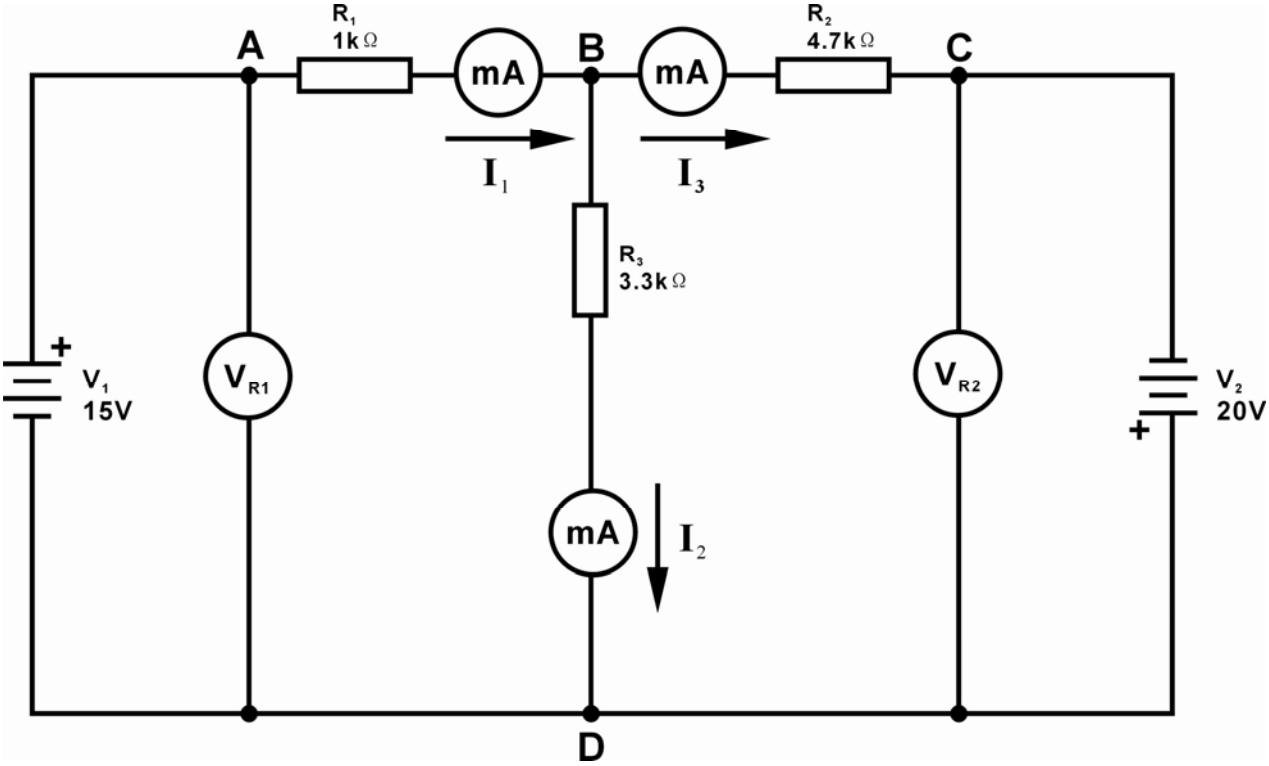


Figure 8

Experimental procedure

1. Set up the circuit as figure 8.
2. Supply a DC voltage V_1 = 15V and V_2 = 20V to the circuit.
3. Measure the current as figure 8 shown. Determine the direction of the current.

	I_1 (mA)	I_2 (mA)	I_3 (mA)
Experimental			
Calculate			
Direction			

Table 8.1

Note: Direction of current in a circuit: to determine the current flows from the beginning to the end point. As the current flows from point A to point B, write as A → B.

4. Calculate the current in each resistor and record the values in table 8.1.
5. Disconnect the power supply voltage V_2 and short circuit at the point of C and D.

6. Measure the current in each resistor and determine the direction of current. Record the values in table 8.2.

7. Disconnect the short circuit at point of C and D and supply a DC voltage to V_2 again. And then disconnect V_1 from the circuit and short circuit at point A and D.

8. Measure the current in each resistor and determine the direction of current. Record the values in table 8.2.

		I_1(mA)	I_2(mA)	I_3(mA)
Disconnect V2	Experimental			
	Calculate			
	Direction			
Disconnect V1	Experimental			
	Calculate			
	Direction			

Table 8.2

9. Calculate the current in each resistor and record the values in table8.2.

10. Describe the results from table 8.1 and table 8.2.

Experiment 9: Thevenin's theorem

Objective:

- To calculate the voltage and the resistance in the circuit by Thevenin's theorem.

Experimental device

1. Grid panel and tray with experimental components and leads — 1 set
2. DC power supply — 1 pc
3. Digital multimeter — 1 pcs

Circuit

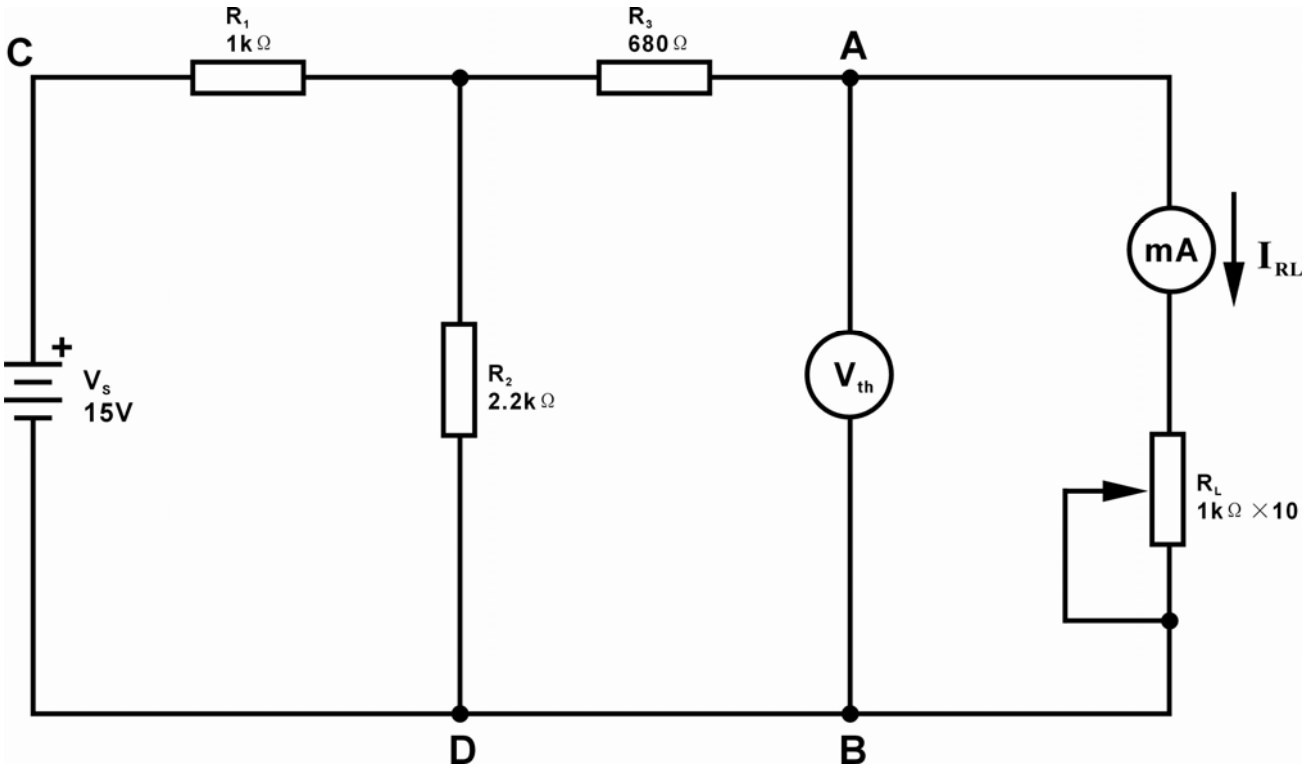


Figure 9.1

Experimental procedure

1. Set up the circuit as figure 9.1.
2. Supply a DC voltage V_S = 15V to the circuit.
3. Measure the current in the resistor R_L with different values shown in table 9.1 and record the results in table 9.1.

R_L (kΩ)	1	2	3
I_{RL} (mA)			
*I_{RL} (mA)			

Table 9.1

Note * values are calculated.

4. Calculate the current in the resistor R_L with different values shown in table 9.1 and record the values in table 9.1.
5. Disconnect the resistor R_L from point A and B and measure the voltage between point A and B as figure9.1.

V_{AB} =..... V (Thevenin's voltage: V_{th}).

6. Disconnect V_S from the circuit and short-circuit at the point C and D. Measure the resistance at point A and B. (keep R_L away from the circuit)

R_{AB} = ...kΩ (Thevenin's resistance: R_{th})

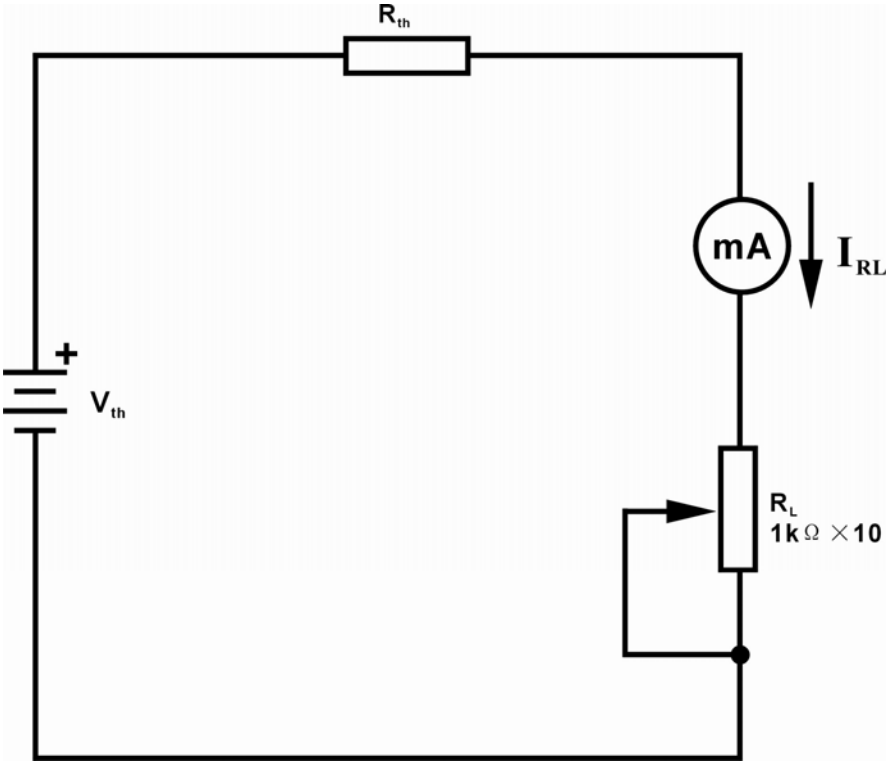


Figure 9.2

7. Set up the circuit as figure 9.2 by using the V_{th} and R_{th} of the experiment in section 5 and 6.

8. Measure the current in the resistor R_L with different values shown in table 9.2 and record the results in table 9.2.

R_L (kΩ)	1	2	3
I_{RL} (mA)			
*I_{RL} (mA)			

Table 9.2

Note * values are calculated.

9. Calculate the current in the resistor R_L with different values shown in table 9.2 and record the values in table 9.2.

10. Describe the results from table 9.1 and table 9.2.

Experiment 10: Norton's theorem

Objective:

- To calculate the current in the circuit by Norton's theorem

Experimental device

1. Grid panel and tray with experimental components and leads 1 set
2. DC power supply (CV & CC) 1 pc
3. Digital multimeter 1 pc

Circuit

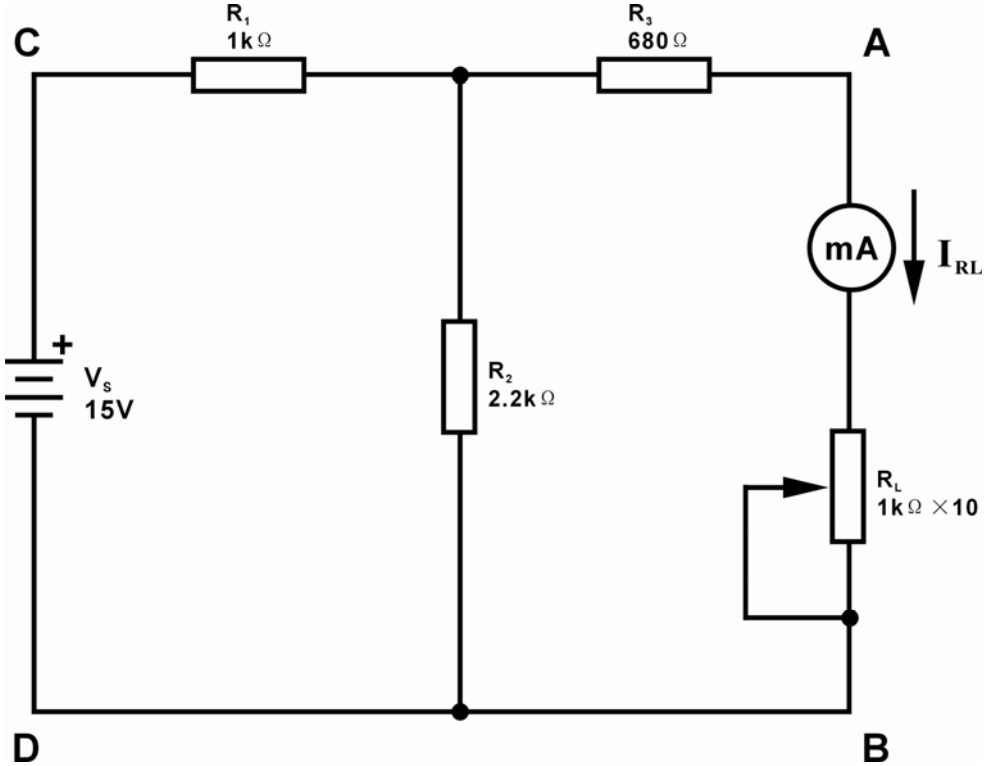


Figure 10.1

Experimental procedure

1. Set up the circuit as figure10.1.
2. Supply a DC voltage V_S = 15V to the circuit.
3. Measure the current in the resistor R_L with different values shown in table 10.1 and record values in table 10.1.

R_L (kΩ)	1	2	3
I_{RL} (mA)			
*I_{RL} (mA)			

Table 10.1

Note * values are calculated.

4. Calculate the current in the resistor R_L with different values shown in table 10.1 and record the results in table10.1.

5. Disconnect the resistor R_L from point A and B and take an ammeter to replace the resistor R_L. Measure the Norton's current (I_N)

I_N =..... mA (Norton's current: I_N).

italtec Technical Training Systems S.r.L.
20129 – MILANO – ITALIA – Viale Regina Giovanna, 35
Tel. +39 02 90 721 606
www.italtec.it