

RLC CIRCUITSAMPLIFIERSDIODESIT.0720.32





IT.0720.32 RLC CIRCUITS - AMPLIFIERS - DIODES

IT.0720.32

RLC CIRCUITS
- AMPLIFIERS
- DIODES

INSTRUCTION MANUAL MANUALE D'ISTRUZIONE ()

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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Composition

- 1 Training kit
- 1 Oscilloscope
- 1 Generator
- 1 Power supply
- 1 Voltmeter
- 1 Ammeter
- · 1 Wattmeter

Composizione

- 1 Kit d'addestramento
- 1 Oscilloscopio
- 1 Generatore
- 1 Alimentatore
- 1 Voltmetro
- 1 Amperometro
- 1 Wattmetro

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Experiment 1: Series resistors circuit

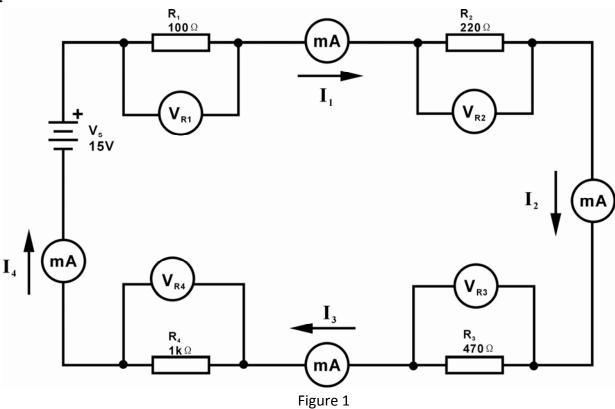
Object:

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

Experimental device

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

Circuit



- 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.

$R(\Omega)$	100	220	470	1k
I (mA)				
I (mA)*				
V _R (V) 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

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

Circuit

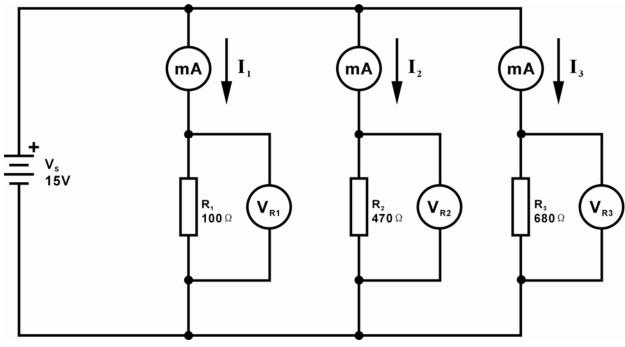


Figure 2

- 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 figure 2 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

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

Circuit

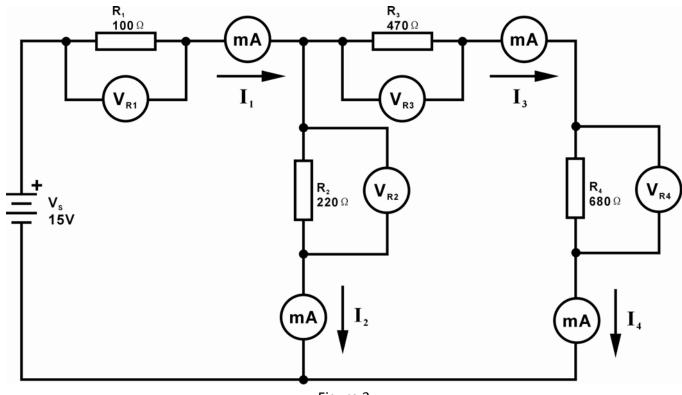


Figure 3

- 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

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

Circuit

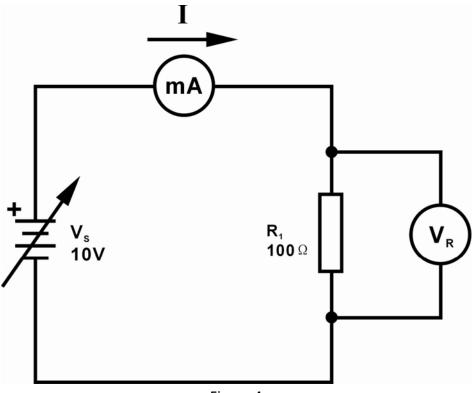


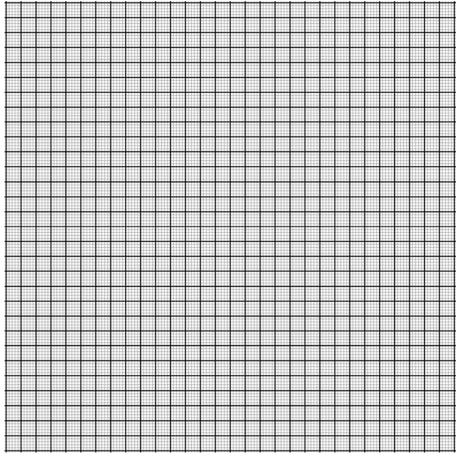
Figure 4

- 1. Set up the circuit as figure 4 and let the R_1 = 100 Ω .
- 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 $1k\Omega$, respectively repeat as section 2 and 3, record the values in table 4.

	V _R (V)	1	2	4	6	8	10
$R_1 = 100 \Omega$	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)

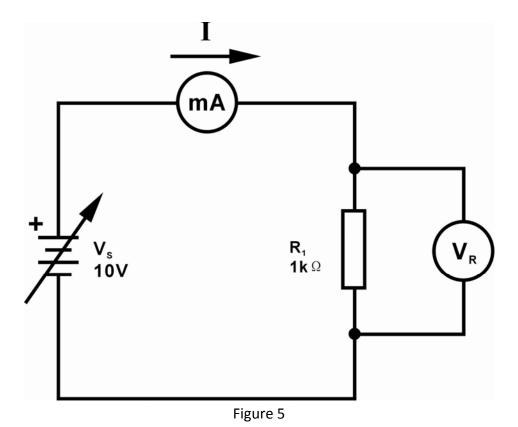
Objective

- 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

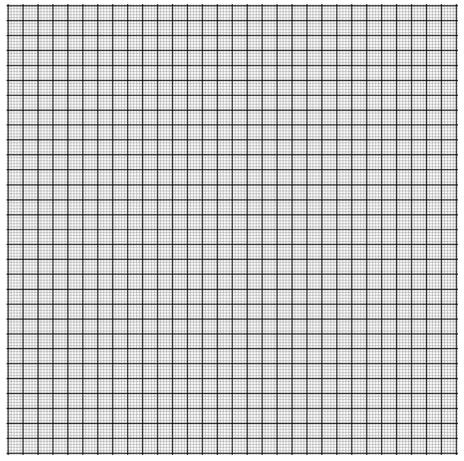


- 1. Set up the circuit as figure 5 and let the R_1 = 100 Ω .
- 2. Supply a DC voltage V_S to the circuit.
- 3. Adjust the DC voltage V_S to get the V_R is 4 V, measure and record the current values in table 5.
- 4. Change the value of the resistor R₁ and repeat the experiment as section 3 and record 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

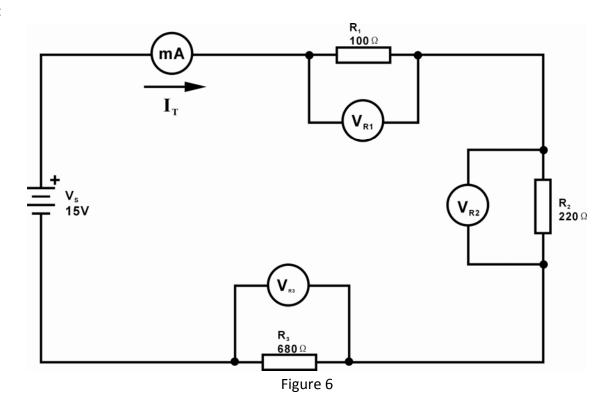
Objective:

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

Experimental device

Grid panel and tray with experimental components and leads
 DC power supply
 Digital multimeter
 pc

Circuit



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 leads1 set2. DC power supply1 pc

3. Digital multimeter 2 pcs

Circuit

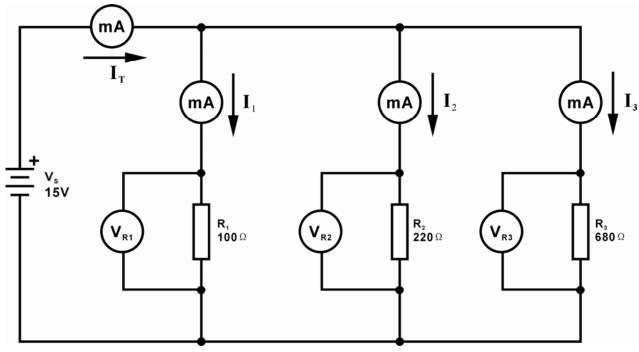


Figure 7

Experimental procedure

- 1. Set up the circuit as figure 7.
- 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

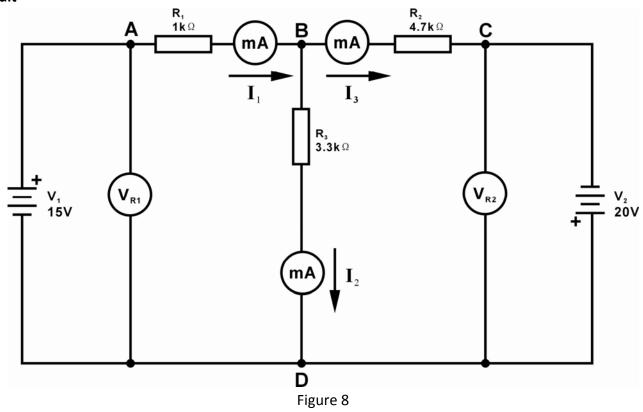
Objective:

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

Experimental device

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

Circuit



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.

	I₁ (mA)	I ₂ (mA)	I₃ (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 $A \rightarrow B$.

- 4. Calculate the current in each resistor and record the values in table 8.1.
- 5. Disconnect the power supply voltage V₂ 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)	I₃(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

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

Circuit

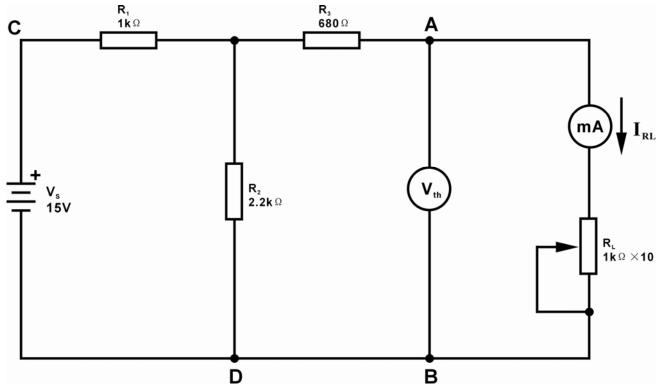


Figure 9.1

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.

$R_L(k\Omega)$	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 figure 9.1.

 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)

 $R_{AB} = \dots k\Omega$ (Thevenin's resistance: R_{th})

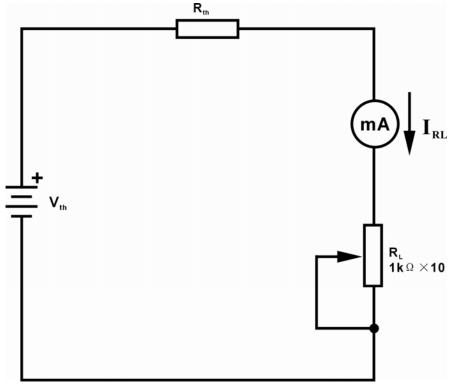


Figure 9.2

- 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.

$R_L(k\Omega)$	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

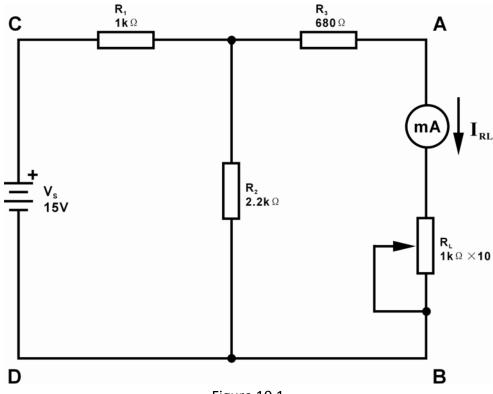


Figure 10.1

Experimental procedure

- 1. Set up the circuit as figure 10.1.
- 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.

$R_L(k\Omega)$	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)

$$I_N = \dots mA$$
 (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 www.italtec.it