

Εκπαίδευση STEAM

Arduino 2^ο μέρος

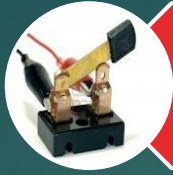
ΚΑΜΟΥΤΣΗΣ ΚΩΝΣΤΑΝΤΙΝΟΣ

Ακαδημαϊκός Υπότροφος, Υποψήφιος Διδάκτορας

Τμήμα Μηχανικών Παραγωγής και Διοίκησης, ΔΙΠΑΕ

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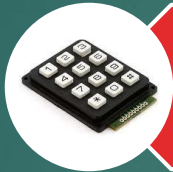
6 ΣΗΜΑΝΤΙΚΕΣ ΕΝΝΟΙΕΣ



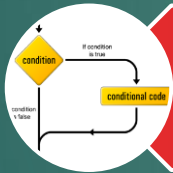
digitalWrite()



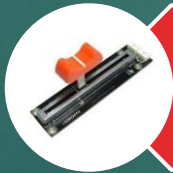
analogWrite()



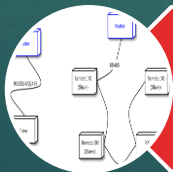
digitalRead()



if() statements / Boolean



analogRead()



Serial communication

Analog Sensors

Παραδείγματα:

Sensors	Μετρούμενο μέγεθος
Mic	Ένταση ήχου
Photoresistor	Ένταση φωτός
Potentiometer	Θέση δρομέα
Temp Sensor	Θερμοκρασία
Flex Sensor	κάμψη
Accelerometer	επιτάχυνση

The screenshot shows the Arduino IDE interface with the following components:

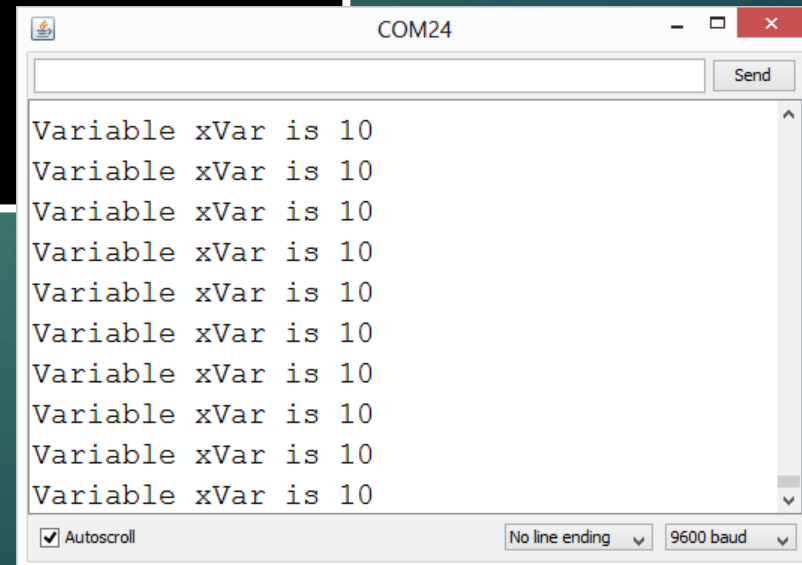
- Window Title:** BareMinimum | Arduino 1.0.5
- Menu Bar:** File Edit Sketch Tools Help
- Code Editor:** Contains C++ code for a sketch named "BareMinimum". Visible code includes:

```
void setup()
{
  // pinMode
  Serial.begin(9600);
}

void loop()
{
  Serial.println("Hands on Learning is Fun!!!");
}
```
- Serial Monitor (COM24):** Displays the output of the sketch, showing the text "Hands on Learning is Fun!!!" repeated multiple times. The monitor includes a "Send" button and settings for "Autoscroll" (checked), "No line ending", and "9600 baud".
- Status Bar:** Shows "Done uploading." and "Binary sketch size: 1,980 bytes (of a 32,256 byte maximum)".
- Bottom Bar:** Displays "3" and "Arduino Uno on COM24".

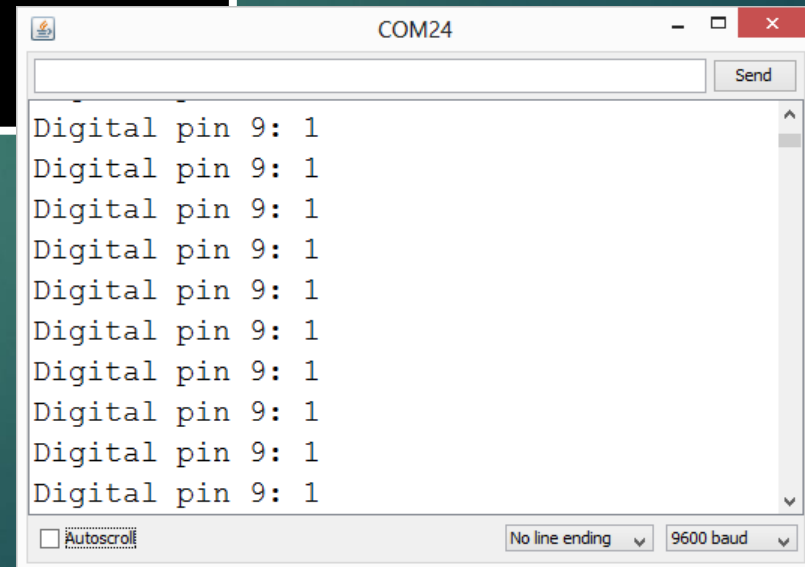
Serial Communication: Serial Debugging - Αποσφαλμάτωση

```
void loop()  
{  
    int xVar = 10;  
    Serial.print ( "Variable xVar is " ) ;  
    Serial.println ( xVar ) ;  
}
```



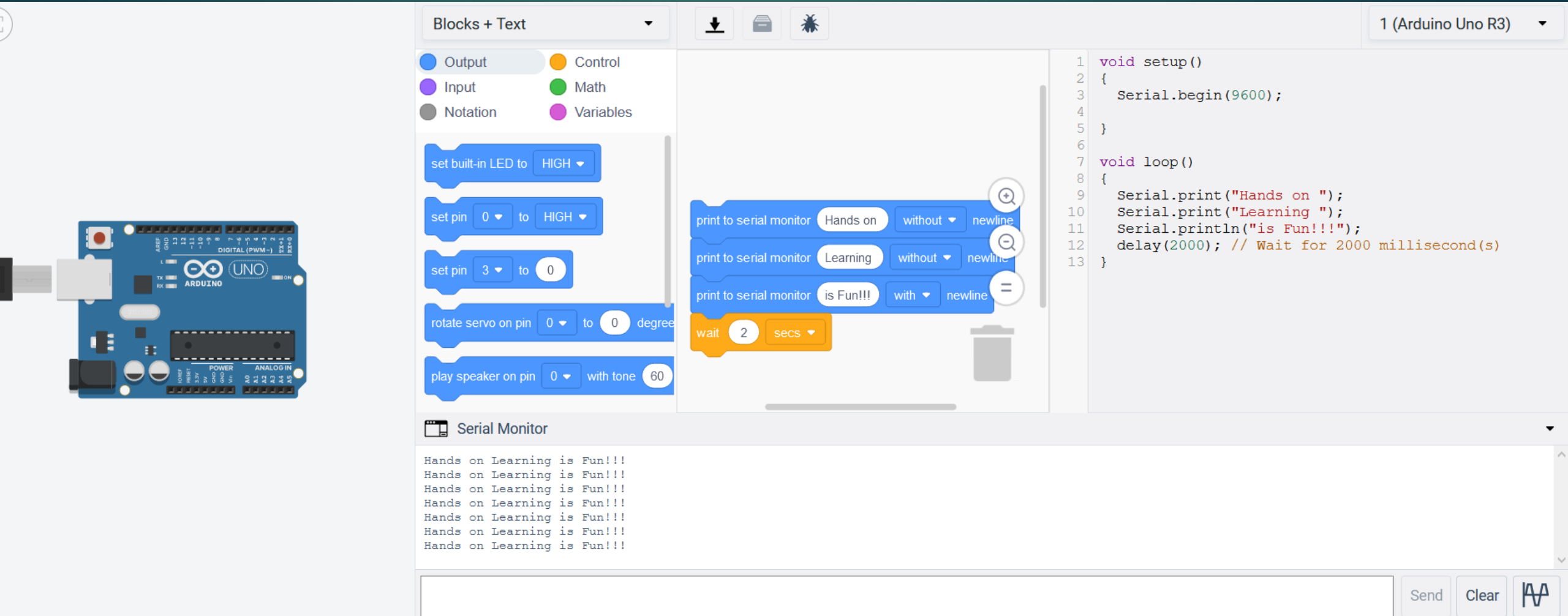
Serial Communication: Serial Troubleshooting - έλεγχος

```
void loop ( )  
{  
  Serial.print ("Digital pin 9: ");  
  Serial.println (digitalRead(9));  
}
```



Παράδειγμα 1:

8



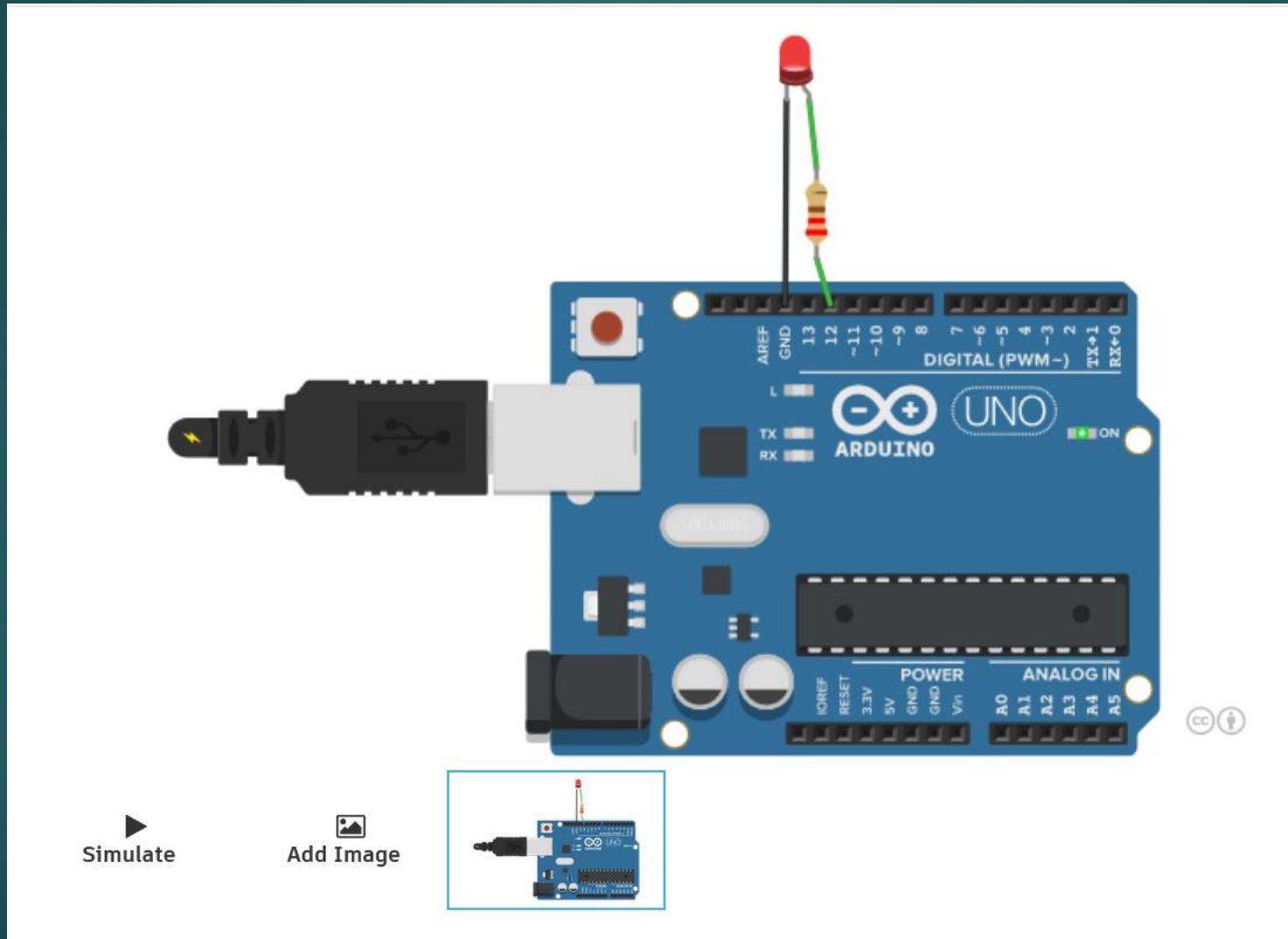
The screenshot displays the Arduino IDE interface. On the left, a blue Arduino Uno R3 board is shown. The main workspace is divided into three sections:

- Blocks + Text:** A palette on the left lists block categories: Output (blue), Input (purple), Notation (grey), Control (orange), Math (green), and Variables (pink). The workspace contains a sequence of blocks: 'set built-in LED to HIGH', 'set pin 0 to HIGH', 'set pin 3 to 0', 'rotate servo on pin 0 to 0 degrees', and 'play speaker on pin 0 with tone 60'. The main workspace shows a block-based program with three 'print to serial monitor' blocks (outputting 'Hands on', 'Learning', and 'is Fun!!!' on separate lines) followed by a 'wait 2 secs' block.
- Code Editor:** The right side shows the C++ code corresponding to the blocks:

```
1 void setup()
2 {
3   Serial.begin(9600);
4 }
5
6
7 void loop()
8 {
9   Serial.print("Hands on ");
10  Serial.print("Learning ");
11  Serial.println("is Fun!!!");
12  delay(2000); // Wait for 2000 millisecond(s)
13 }
```
- Serial Monitor:** The bottom section shows the output of the program, displaying the text 'Hands on Learning is Fun!!!' repeated six times.

At the bottom right, there are buttons for 'Send', 'Clear', and a waveform icon.

Παράδειγμα 2:



Παράδειγμα 2:

10

Blocks + Text

1 (Arduino Uno R3)

- Output
- Input
- Notation
- Control
- Math
- Variables

set built-in LED to HIGH

set pin 0 to HIGH

set pin 3 to 0

rotate servo on pin 0 to 0 degrees

play speaker on pin 0 with tone 60

turn off speaker on pin 0

print to serial monitor hello world with

set RGB LED in pins 3 3 3

set pin 12 to HIGH

wait 1 secs

set pin 12 to LOW

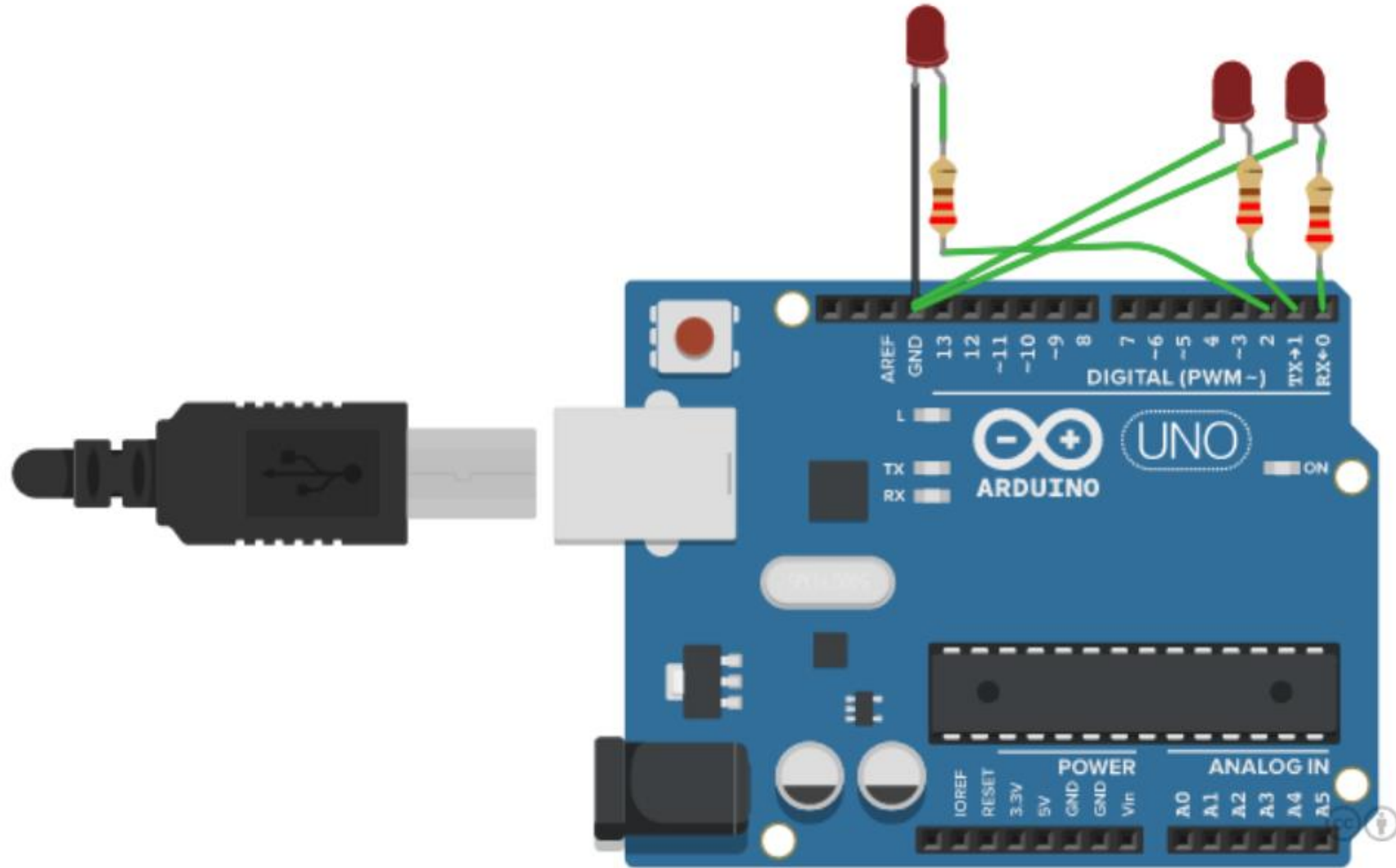
wait 1 secs

```
1 void setup()
2 {
3   pinMode(12, OUTPUT);
4 }
5
6 void loop()
7 {
8   digitalWrite(12, HIGH);
9   delay(1000); // Wait for 1000 millisecond(s)
10  digitalWrite(12, LOW);
11  delay(1000); // Wait for 1000 millisecond(s)
12 }
```

Serial Monitor

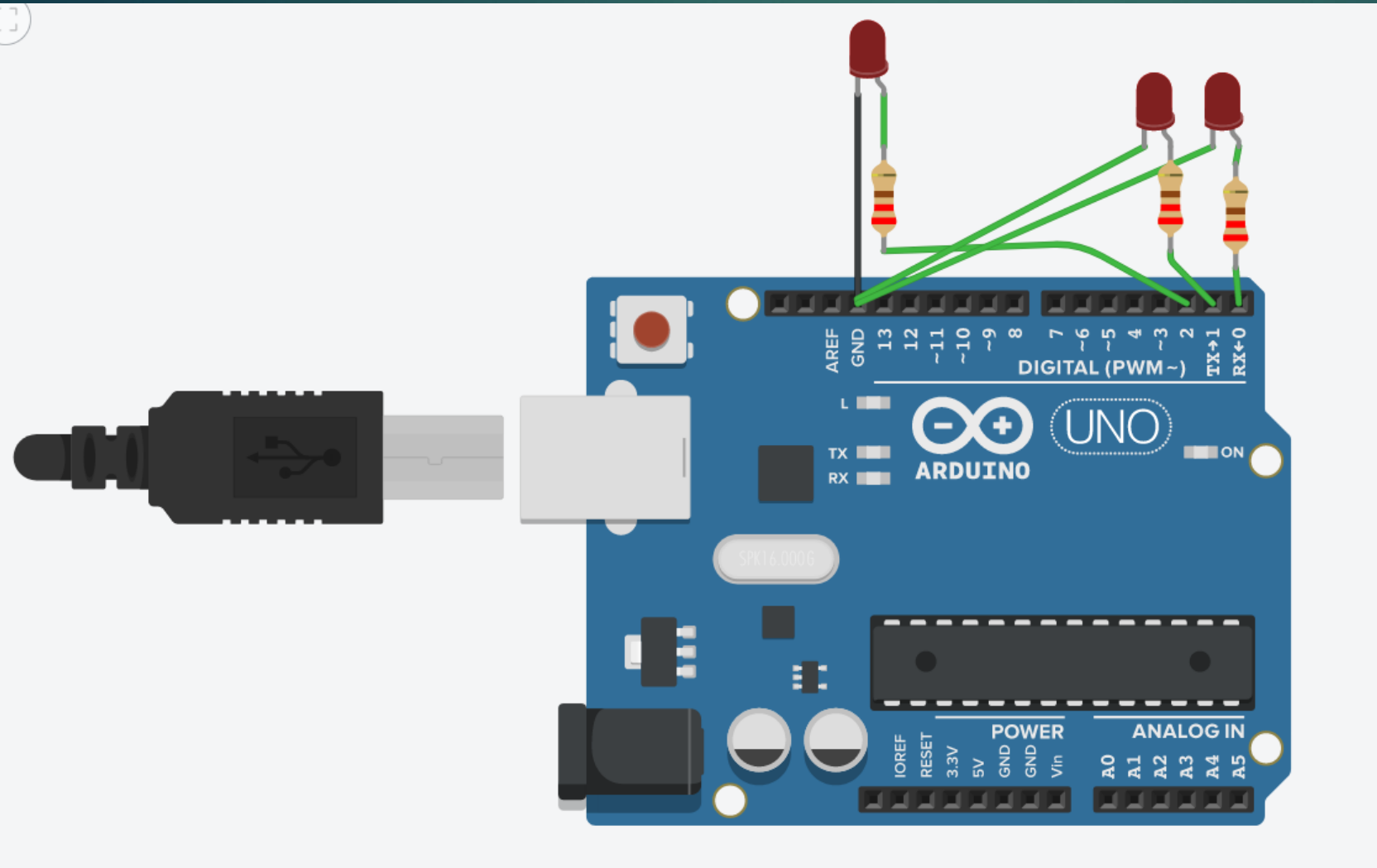
Παράδειγμα 3:

11



Παράδειγμα 3:

12

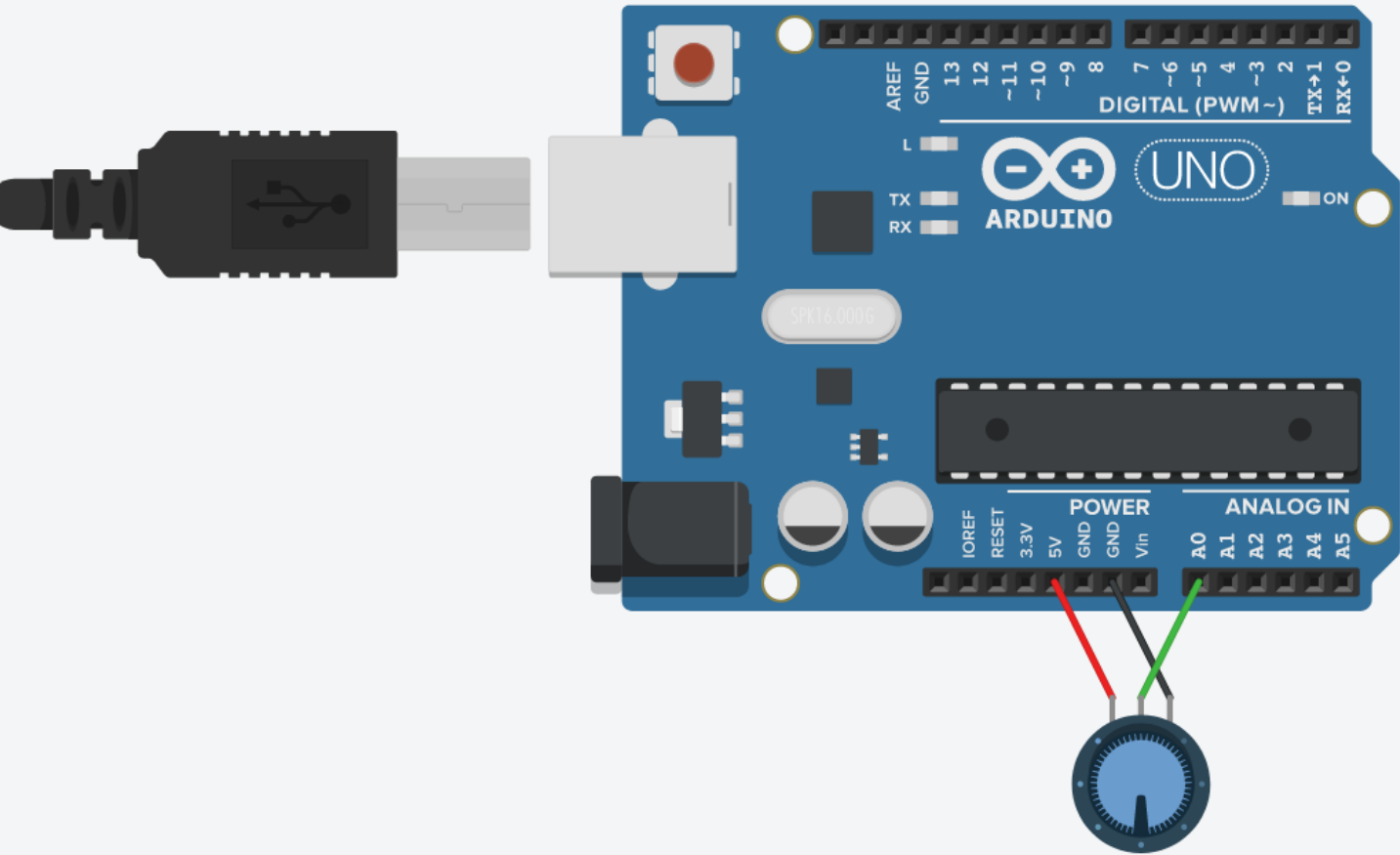


The image shows an Arduino Uno board with three LEDs connected to digital pins 13, 2, and 3. Each LED is connected to a digital pin through a 220Ω resistor. The positive terminal of each LED is connected to the digital pin, and the negative terminal is connected to ground. A USB cable is plugged into the board's USB port.

```
Text
1 int i;
2 void setup()
3 {
4
5 // Serial.begin(9600);
6   for (i=0;i<3;i++)
7   {
8     pinMode(i, OUTPUT);
9   }
10 }
11
12 void loop()
13 {
14
15   for (i=0;i<3;i++)
16   {
17     digitalWrite(i, HIGH);
18     // Serial.print("ON");
19     // Serial.print(i);
20     // Serial.println();
21     delay(2000); // Wait for 2000 millisecond(s)
22     digitalWrite(i, LOW);
23   }
24
25 }
```

Παράδειγμα 3b:

13



Text



1 (Arduino Uno R3)

```
1 // the setup routine runs once when you press reset:
2 void setup() {
3   // initialize serial communication at 9600 bits per second:
4   Serial.begin(9600);
5 }
6
7 // the loop routine runs over and over again forever:
8 void loop() {
9   // read the input on analog pin 0:
10  int sensorValue = analogRead(A0);
11  // print out the value you read:
12  Serial.println(sensorValue);
13  delay(1);      // delay in between reads for stability
14 }
15
```

ΠΟΤΕΝΣΙΟΜΕΤΡΟ



ΠΟΤΕΝΣΙΟΜΕΤΡΟ

15

(α) Άνθρακα (Carbon)

Σε αυτά η πίστα αποτελείται από συμπαγή άνθρακα ή επίστρωση άνθρακα πάνω σε μονωτικό υλικό.

(β) Σύρματος (wire wound)

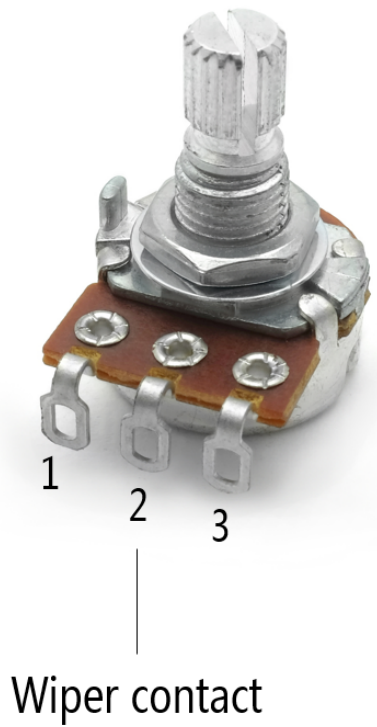
Σε αυτά η πίστα αποτελείται από σύρμα χρωμιονικελίνης τυλιγμένο πάνω σε μονωτικό υλικό.

(γ) Φιλμ μετάλλου (Cermet thin film)

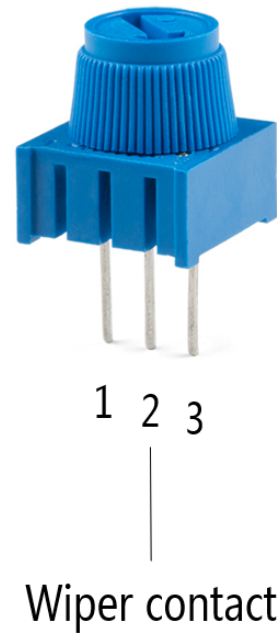
Σε αυτά η πίστα είναι ένα παχύ στρώμα μεταλλικού φιλμ κολλημένο πάνω σε κεραμικό υλικό.

ΠΟΤΕΝΣΙΟΜΕΤΡΟ

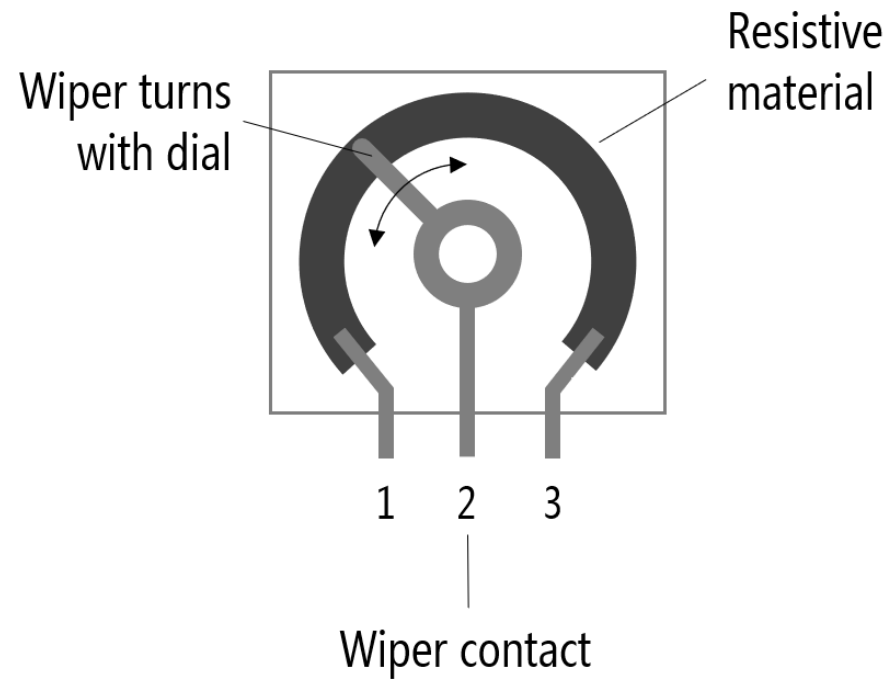
PANEL MOUNT POT 10KΩ



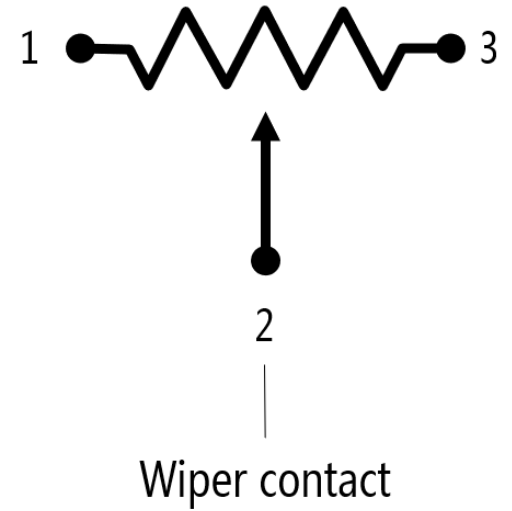
TRIM POT 10KΩ



FUNCTIONAL DIAGRAM

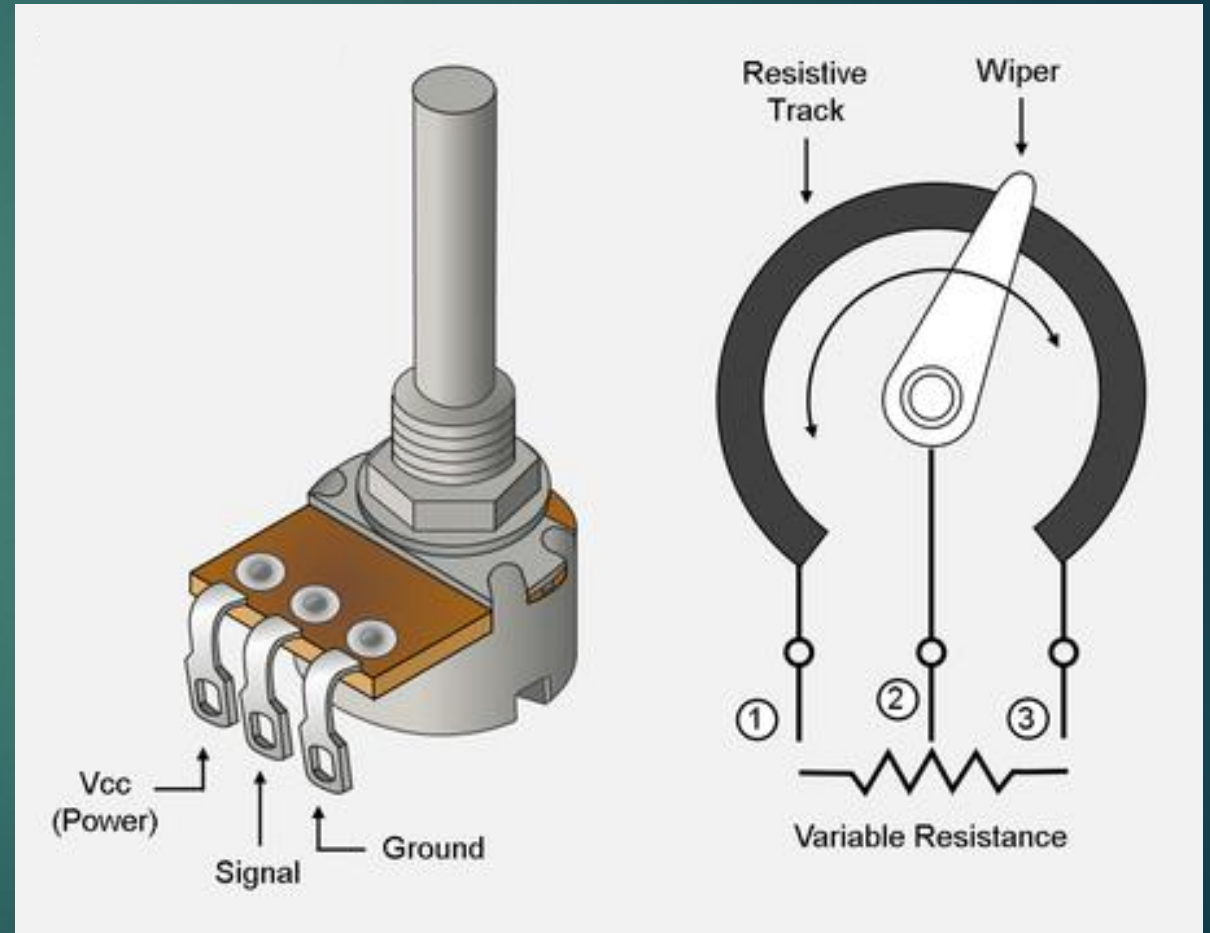
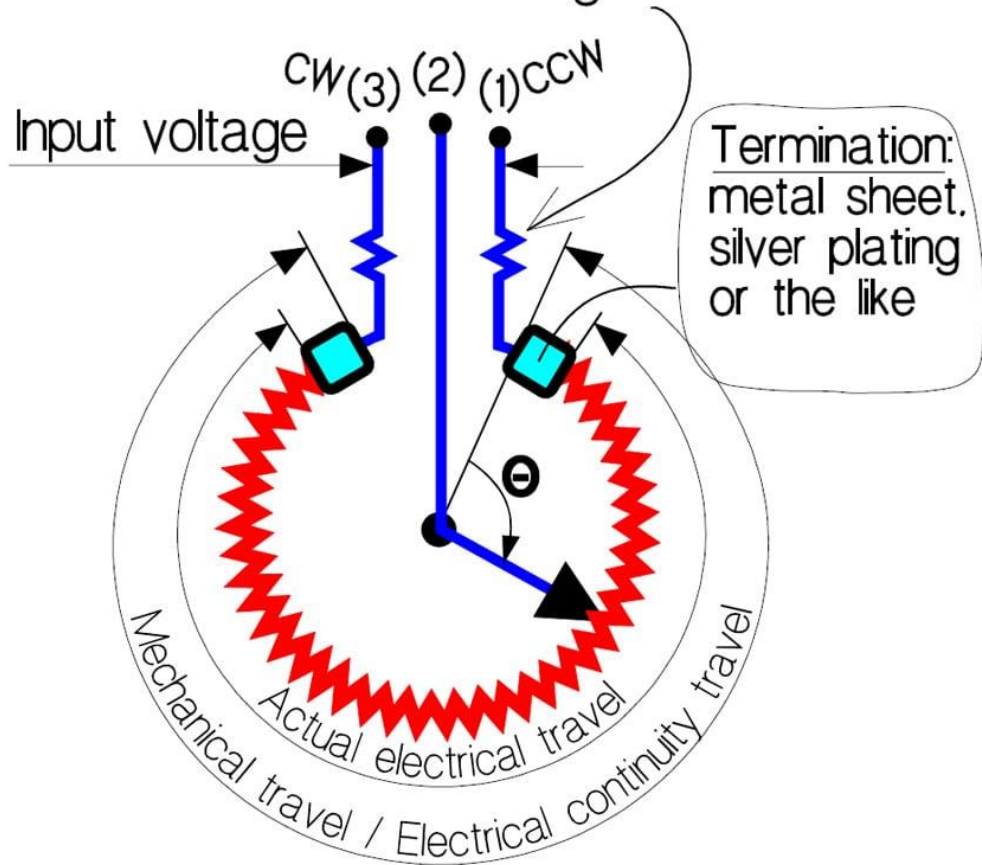


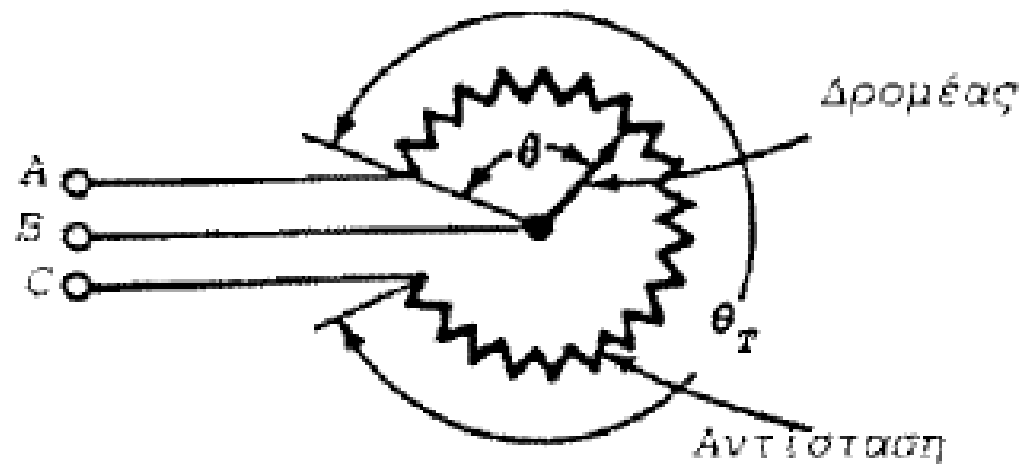
SCHEMATIC SYMBOL



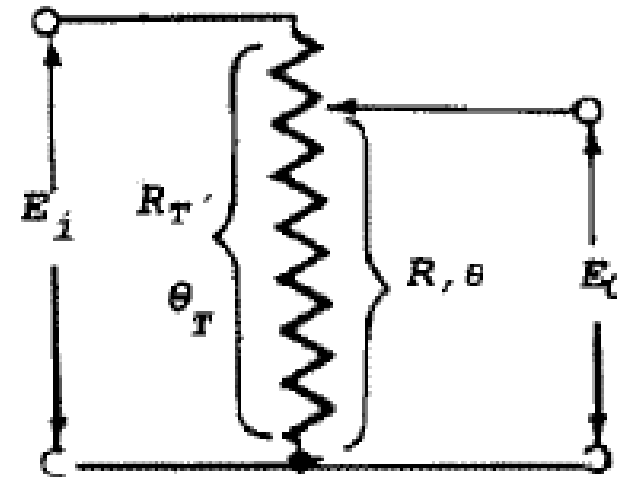
ΠΟΤΕΝΣΙΟΜΕΤΡΟ

Resistance in connecting leads etc.





α)



β)

Σχήμα 2-3: Ποτενσιόμετρο: α) φυσική σχεδίαση και β) σχηματική σχεδίαση

$$\frac{R}{R_T} = \frac{\theta}{\theta_T}$$

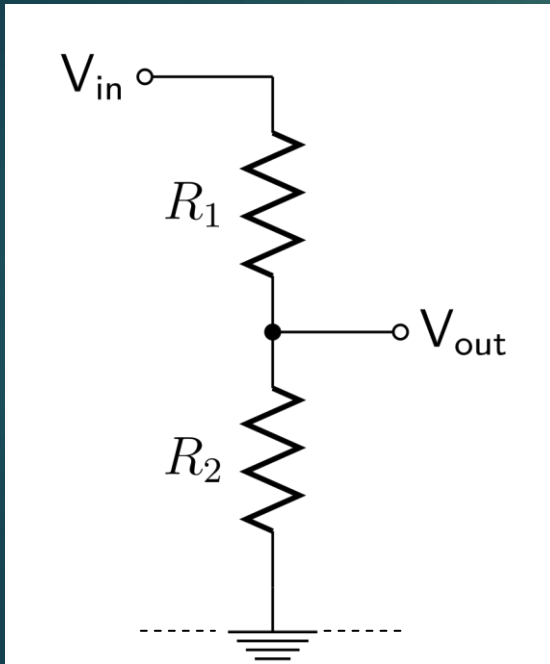
$$\frac{E_0}{E_1} = \frac{R}{R_T} = \frac{\theta}{\theta_T}$$

$$\text{ή } E_0 = \frac{\theta}{\theta_T} E_1$$

ΠΟΤΕΝΣΙΟΜΕΤΡΟ

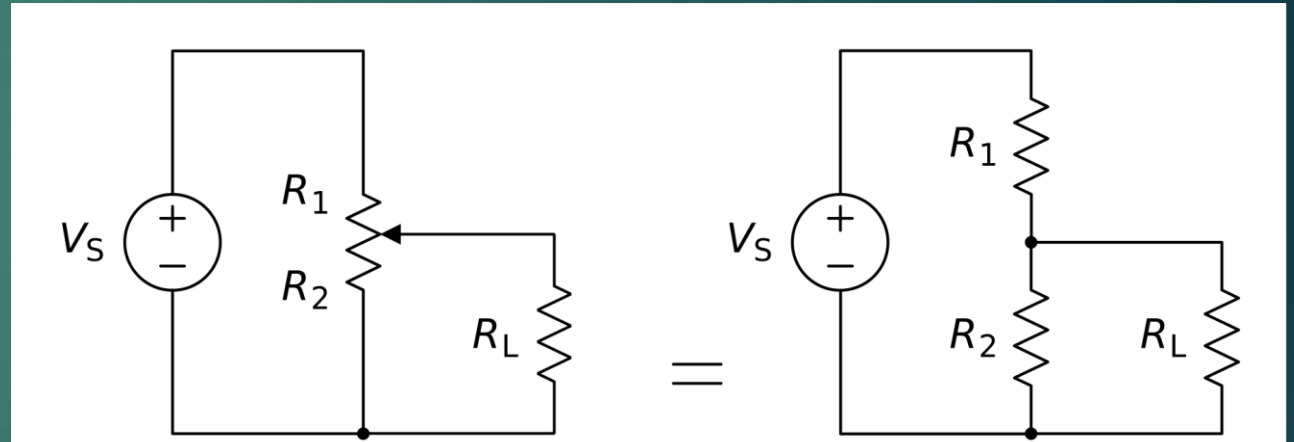
- Το ποτενσιόμετρο είναι ένας διαιρέτης τάσης.

Διαιρέτης τάσης
Υποβιβάζει την τάση



$$V_{out} = \frac{R_2}{R_1 + R_2} \cdot V_{in}$$

Ποτενσιόμετρο
Σχηματικό διάγραμμα



- $R_L \gg R_2 \rightarrow V_L = \frac{R_2}{R_1 + R_2} \cdot V_s$

- Γενικά $\rightarrow V_L = \frac{R_2 R_L}{R_1 R_L + R_2 R_L + R_1 R_2} \cdot V_s$