LAUNCH THE PROJECT - 16

Vibration Detector

(using SW-520D Tilt Switch)

On AYNOP® UNO Launchpad Kit

Author: AYNOP Enterprises | Doc Version: 1.0 | Date: 22-9-2025

Table of Contents

1. Overview

This project demonstrates how to detect vibrations or tilts using the **SW-520D tilt switch** with Arduino® UNO R4 Minima.

You will learn to:

- Connect a tilt/vibration switch directly to Arduino.
- Detect vibrations through digital input.
- Blink the onboard LED and display messages on Serial Monitor.
- Apply a lockout period to avoid false or repeated triggers.

2. Components Required

- Arduino® UNO R4 Minima board
- USB Type-C data cable
- SW-520D tilt/vibration switch (bare component)
- Breadboard
- Jumper wires

3. Software Required

- Arduino IDE (v2.3.6 or later recommended)
- No additional libraries required.

Note:

We assume the **Arduino UNO R4 Minima board package** is already installed on your machine, as explained in the 00_Getting_Started/00_GettingStarted_Arduino_R4_Minima guide. If it is not installed, please refer to that document and complete the installation before proceeding.

4. Hardware Setup

This section explains how to connect the components for the **Vibration Detector** project. It includes a **Wiring Diagram** and a **Circuit Schematic**.

4.1 Wiring Diagram

- One leg of **SW-520D → GND**.
- Other leg of **SW-520D → D2** (configured with **internal pull-up** in code).
- Onboard LED → D13 (built-in on UNO R4 Minima)**.**

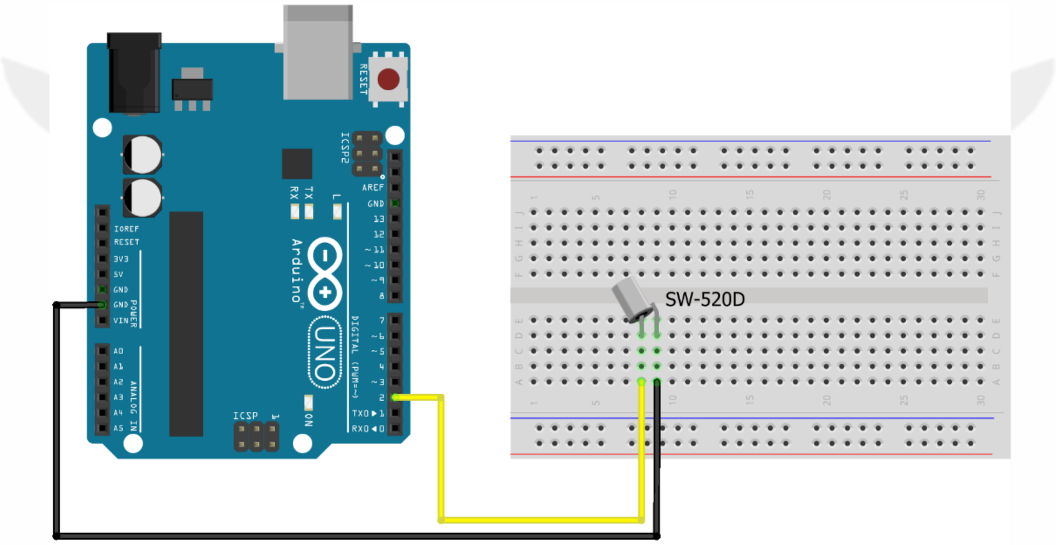


Figure 4.1 – Wiring diagram for SW-520D tilt switch with Arduino UNO R4 Minima

💡 **Tip:** Always disconnect the USB cable before making or changing hardware connections.

5. Principle – How It Works

The **SW-520D tilt/vibration switch** is a small cylindrical sensor with a spring and a metal ball inside

- When the switch is stationary, the spring and ball remain separated, so the circuit is **open**.
- When the sensor is tilted, tapped, or shaken, the ball touches the spring, momentarily closing the circuit.

In this project:

- The Arduino uses the internal pull-up resistor on pin D2, so the input stays stable.
- A vibration event produces a **HIGH signal** that lasts at least 10 microseconds.
- When confirmed, the Arduino prints *"Vibration Detected!"* on Serial Monitor.
- The onboard LED turns ON for 1 second, then OFF.
- To avoid multiple triggers from a single vibration, a **2-second lockout** is applied

This ensures stable detection while filtering out noise and quick repeated movements.

6. Procedure – Steps to Run

1. **Build the Circuit**
   a. Connect the SW-520D tilt switch as shown in the **Wiring Diagram (Figure 4.1)**.

2. **Connect the Board**
   a. Use a USB Type-C data cable to connect your UNO R4 Minima to your computer.

3. **Open the Project Code**
   a. Simply **double-click** the file *16_Vibration_Detector.ino* in the project folder, and it will open directly in the Arduino IDE (if installed).

4. **Confirm Board Selection**
   a. The IDE usually auto-detects the UNO R4 Minima if the package is installed.
   b. If not installed, refer to the *00_Getting_Started/00_GettingStarted_Arduino_R4_Minima* document to install the necessary board package.
   c. Verify that *Arduino UNO R4 Minima* is selected in the IDE's board selector (top toolbar).

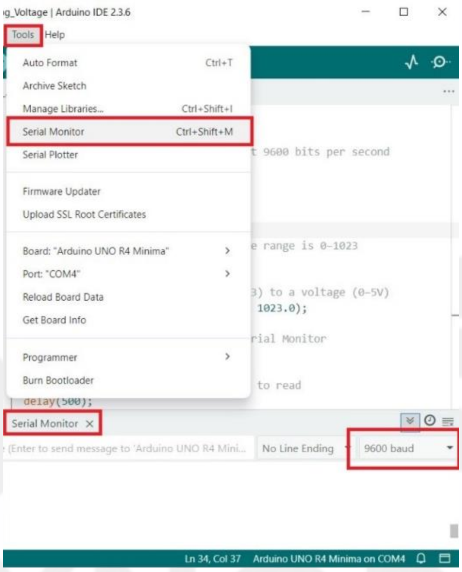
5. **Upload the Code**
   a. Click the **Upload** button (arrow icon) in the top-left corner of the IDE.
   b. Wait until the console displays "**Done uploading**."

6. **Observe the Behaviour**
   a. After uploading, gently **tap the SW-520D sensor with your finger** or tilt the breadboard slightly.
   b. Each time vibration is detected
      i. The Serial Monitor prints the message **"Vibration Detected!"**
      ii. The onboard LED turns ON for 1 second, then OFF.
   c. During the 2-second lockout, new vibrations will not be registered.

6.1 How to Use the Serial Monitor:

The Serial Monitor is a **tool in the Arduino IDE** that lets you see text/data sent by the microcontroller (MCU) over the USB connection.

- In Arduino IDE, go to **Tools → Serial Monitor**, or press **Ctrl + Shift + M**.
- A new window will open showing real-time data from your UNO R4 Minima.
- At the bottom-right of the Serial Monitor window, set the baud rate to **9600**. This must match the *Serial.begin*(9600) in the code.


g_Voltage | Arduino IDE 2.3.6
Tools
Help
Auto Format Ctrl+T
Archive Sketch
Manage Libraries... Ctrl+Shift+I
Serial Monitor Ctrl+Shift+M
Serial Plotter
Firmware Updater
Upload SSL Root Certificates
Board: "Arduino UNO R4 Minima"
Port: "COM4"
Reload Board Data
Get Board Info
Programmer
Burn Bootloader
Serial Monitor
(Enter to send message to 'Arduino UNO R4 Mini...
No Line Ending
9600 baud
Ln 34, Col 37 Arduino UNO R4 Minima on COM4

```
t 9600 bits per second
e range is 0-1023
3) to a voltage (0-5V)
 1023.0);
rial Monitor
 to read
delay(500);
```

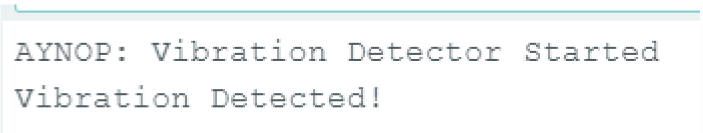
Figure 6.1 – Arduino IDE Serial Monitor set to 9600 baud

💡 **Tip:** If the Serial Monitor shows nothing, check that:

- The correct **COM port** is selected.
- The baud rate is set to **9600**

7. Expected Output

- On each vibration detection, the onboard LED blinks for 1 second.
- On each vibration detection, The Serial Monitor will show values like:



```
AYNOP: Vibration Detector Started
Vibration Detected!
```

8. Code

The source code for this project is included in the downloaded folder:

📁 *uno-launchpad-kit/01_Basic_Projects/16_Vibration_Detector/16_Vibration_Detector.ino*

👉 **Tip:**

- To open the project, simply **double-click the .ino file**. If the Arduino IDE is installed, it will launch automatically and load the code.
- If you **haven't installed the Arduino IDE yet**, please refer to:
  📁 uno-launchpad-kit/00_Getting_Started/00_GettingStarted_Arduino_R4_Minima
  to **download and install it.**

8.1 Function References

- setup() – runs once when the board is powered on or reset.
- loop() – runs continuously after setup() finishes.
- pinMode(pin, mode) – sets a pin as input or output.
- digitalRead(pin) – reads the digital state of a pin (HIGH/LOW).
- digitalWrite(pin, value) – sets a pin HIGH or LOW.
- delay(ms) – pauses program for milliseconds.
- delayMicroseconds(us) – pauses program for microseconds.
- millis() – returns the number of milliseconds since the board was powered.
- Serial.begin(baud) – starts serial communication.
- Serial.println() – prints messages to Serial Monitor.

📚 **For more details and advanced usage, visit:**

🔗 Arduino Language Reference — The official guide for all Arduino functions.

9. Troubleshooting Tips

- **No vibration detected?**
  - Ensure the SW-520D switch is connected correctly (one leg to GND, one leg to D2).
  - Test by tilting or gently tapping the sensor.
- **Too many false triggers?**
  - Place the switch on a stable surface.
  - Adjust debounce timing in code if needed
- **Upload error in Arduino IDE?**
  - Verify that the correct board (**Arduino UNO R4 Minima**) is selected in the IDE.
  - Check that the correct **COM port** is chosen.
- **Board not detected via USB?**
  - Ensure you are using a **data-capable USB Type-C cable** (some cables only provide charging).
  - Try reconnecting the cable or using a different USB port.
- **Board not listed in Arduino IDE?**
  - If you don't see **Arduino UNO R4 Minima** in the board selector, the **board package is not installed**.
  - To fix this, follow the installation steps in:
    📂 *uno-launchpad-kit/00_Getting_Started/00_GettingStarted_Arduino_R4_Minima*

💡 **Tip:** If nothing works, press the **RESET** button on the UNO R4 Minima and try uploading the code again.

10. License

11. Support & Feedback

We value your feedback and are happy to assist with any questions, troubleshooting, or suggestions you may have.

📧 Email: *support@aynop.com*

When sending an email, please include your kit name (AYNOP® UNO Launchpad Kit) and, if applicable, the project name in the subject line. This will help our team respond faster and more accurately. We aim to respond to all queries within 2–3 business days. Your feedback helps us improve our products and create even better learning experiences for all Arduino beginners.