ARDUINO 10DOF SENSOR MODULE GY-652

The **GY-652** is a 10-degree-of-freedom (10DOF) sensor module that combines multiple sensors to provide a wide range of environmental and motion data. It is commonly used with microcontrollers like Arduino for projects involving motion tracking, orientation sensing, and environmental monitoring. Below is an overview of the GY-652 module and how to use it with Arduino.

Key Features of GY-652

1. **10DOF Sensors**:
   - **MPU-6050**: 3-axis gyroscope + 3-axis accelerometer (6DOF).
   - **HMC5883L**: 3-axis magnetometer (compass).
   - **BMP180**: Barometric pressure sensor (for altitude and temperature).
2. **Communication**:
   - Uses I2C (Inter-Integrated Circuit) protocol for communication with the Arduino.
3. **Applications**:
   - Drone stabilization.
   - Robotics.
   - Motion tracking.
   - Orientation sensing (pitch, roll, yaw).
   - Altitude measurement.

Pinout of GY-652

The GY-652 module typically has the following pins:

- **VCC**: Power supply (3.3V or 5V).
- **GND**: Ground.
- **SCL**: I2C clock line.
- **SDA**: I2C data line.

Connecting GY-652 to Arduino

1. **Wiring**:

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- Connect **VCC** to **3.3V** or **5V** on the Arduino.
- Connect **GND** to **GND** on the Arduino.
- Connect **SCL** to **A5** (or the SCL pin on your Arduino).
- Connect **SDA** to **A4** (or the SDA pin on your Arduino).

2. **I2C Pull-up Resistors**:
   - If your module doesn't have built-in pull-up resistors, add 4.7kΩ resistors between **SCL** and **VCC**, and between **SDA** and **VCC**.

Libraries for GY-652

To interface with the GY-652, you'll need libraries for each sensor:

1. **MPU-6050**: Use the `MPU6050` library.
2. **HMC5883L**: Use the `HMC5883L` library.
3. **BMP180**: Use the `Adafruit_BMP085` library.

You can install these libraries via the Arduino IDE Library Manager.

Example Code

Below is an example sketch to read data from the GY-652 module:

```
cpp
Copy
#include <Wire.h>
#include <MPU6050.h>
#include <HMC5883L.h>
#include <Adafruit_BMP085.h>

MPU6050 mpu;
HMC5883L mag;
Adafruit_BMP085 bmp;

void setup() {
 Serial.begin(9600);

 // Initialize MPU6050
 Serial.println("Initializing MPU6050...");
```

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```
  mpu.initialize();

  // Initialize HMC5883L
  Serial.println("Initializing HMC5883L...");
  mag.initialize();

  // Initialize BMP180
  Serial.println("Initializing BMP180...");
  if (!bmp.begin()) {
    Serial.println("Could not find a valid BMP180 sensor, check wiring!");
    while (1) {}
  }
}

void loop() {
  // Read MPU6050 data
  int16_t ax, ay, az;
  int16_t gx, gy, gz;
  mpu.getMotion6(&ax, &ay, &az, &gx, &gy, &gz);

  // Read HMC5883L data
  int16_t mx, my, mz;
  mag.getHeading(&mx, &my, &mz);

  // Read BMP180 data
  float temperature = bmp.readTemperature();
  float pressure = bmp.readPressure();
  float altitude = bmp.readAltitude();

  // Print MPU6050 data
  Serial.print("Accel: ");
  Serial.print(ax); Serial.print(", ");
  Serial.print(ay); Serial.print(", ");
  Serial.print(az); Serial.println();

  Serial.print("Gyro: ");
  Serial.print(gx); Serial.print(", ");
  Serial.print(gy); Serial.print(", ");
  Serial.print(gz); Serial.println();

  // Print HMC5883L data
  Serial.print("Mag: ");
  Serial.print(mx); Serial.print(", ");
  Serial.print(my); Serial.print(", ");
  Serial.print(mz); Serial.println();
```

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```
  // Print BMP180 data
  Serial.print("Temp: "); Serial.print(temperature); Serial.println(" C");
  Serial.print("Pressure: "); Serial.print(pressure); Serial.println(" Pa");
  Serial.print("Altitude: "); Serial.print(altitude); Serial.println(" m");

  delay(1000); // Wait 1 second before next reading
}
```

Troubleshooting

1. **No Data**:
   - Check wiring and ensure the I2C address is correct.
   - Verify pull-up resistors are present on SCL and SDA.
2. **Incorrect Readings**:
   - Calibrate the sensors (especially the MPU-6050 and HMC5883L).
   - Ensure the module is placed on a flat surface during calibration.
3. **Library Issues**:
   - Make sure you have the correct libraries installed.

The GY-652 is a versatile module for advanced projects requiring motion and environmental sensing. With proper calibration and coding, it can provide highly accurate data for your Arduino projects.