Voltage Divider to measure voltage

To read voltage and current using an Arduino, you'll need appropriate sensors and components. Here's a basic setup for each:

### 1. \*\*Reading Voltage\*\*

To measure voltage, you can use a voltage divider circuit if the voltage you want to measure exceeds the Arduino's ADC (Analog to Digital Converter) input limit of 5V (or 3.3V on some boards).

#### Components:

- Two resistors (for the voltage divider)

- Arduino

#### Circuit Diagram:

```

Vin ---- R1 ----+---- R2 ---- GND

|

Analog Pin (A0)

```

Where:

- `Vin` is the input voltage you want to measure.

- `R1` and `R2` are resistors. The ratio between R1 and R2 determines the voltage divider ratio.

#### Code to Read Voltage:

```cpp

const int analogPin = A0;

float R1 = 10000; // Resistor R1 value in ohms

float R2 = 10000; // Resistor R2 value in ohms

float vIn = 0.0; // Variable to store the input voltage

void setup() {

Serial.begin(9600);

}

void loop() {

int sensorValue = analogRead(analogPin);

float vOut = (sensorValue \* 5.0) / 1023.0; // Convert ADC value to voltage

vIn = vOut / (R2 / (R1 + R2)); // Calculate input voltage using voltage divider formula

Serial.print("Voltage: ");

Serial.print(vIn);

Serial.println(" V");

delay(1000);

}

```

### 2. \*\*Reading Current\*\*

To measure current, you can use a current sensor such as an \*\*ACS712\*\* or a \*\*shunt resistor\*\*.

#### Using ACS712 Current Sensor:

The ACS712 provides an analog voltage proportional to the current passing through it.

#### Circuit Diagram:

- Connect the ACS712 as per its datasheet.

- Connect its output to one of the Arduino's analog pins (A1 in this case).

#### Code to Read Current:

```cpp

const int currentPin = A1;

float sensitivity = 0.185; // Sensitivity for the 5A version of ACS712 (in V/A)

float current = 0.0;

void setup() {

Serial.begin(9600);

}

void loop() {

int sensorValue = analogRead(currentPin);

float voltage = (sensorValue \* 5.0) / 1023.0; // Convert ADC value to voltage

current = (voltage - 2.5) / sensitivity; // Calculate current (2.5V is the zero-current voltage)

Serial.print("Current: ");

Serial.print(current);

Serial.println(" A");

delay(1000);

}

```

### Considerations:

- \*\*Voltage Divider Resistors:\*\* Ensure that the resistors are rated to handle the voltage you're measuring.

- \*\*ACS712 Sensitivity:\*\* The sensitivity value depends on the specific version of ACS712 (5A, 20A, or 30A).

These basic setups will allow you to read both voltage and current using an Arduino.

Yes, you can calculate the current by dividing the measured voltage across a known resistance by the total resistance using \*\*Ohm's Law\*\*, which states:

\[

I = \frac{V}{R}

\]

Where:

- \( I \) is the current in amperes (A).

- \( V \) is the voltage across the resistor (in volts).

- \( R \) is the resistance (in ohms, \( \Omega \)).

### Using a Voltage Divider to Measure Current:

If you have a known \*\*total resistance\*\* (which includes the shunt resistor and any load resistance), you can measure the voltage across that resistance (or part of it) and then apply Ohm's Law to calculate the current.

### Example Setup:

If you're using a \*\*voltage divider\*\* with resistors \( R1 \) and \( R2 \), and you know the total resistance \( R\_{total} \), you can calculate the current through the circuit as:

\[

I = \frac{V\_{in}}{R\_{total}}

\]

Where:

- \( V\_{in} \) is the input voltage (measured using `analogRead()`).

- \( R\_{total} = R1 + R2 \) (if the resistors are in series).

However, this assumes you're measuring \*\*the voltage across the entire resistor network\*\* (or some portion of it). This method is applicable if you know the resistance value accurately and the current through the resistors is consistent.

### Code Example:

If you're using a voltage divider, you can calculate the current as follows:

```cpp

const int analogPin = A0; // Pin where you're reading the voltage

float R\_total = 1000; // Total resistance in ohms (R1 + R2)

float V\_in = 0.0;

float current = 0.0;

void setup() {

Serial.begin(9600);

}

void loop() {

int sensorValue = analogRead(analogPin);

V\_in = (sensorValue \* 5.0) / 1023.0; // Convert ADC reading to voltage

// Calculate current using Ohm's Law

current = V\_in / R\_total;

Serial.print("Current: ");

Serial.print(current);

Serial.println(" A");

delay(1000);

}

```

### Important Considerations:

1. \*\*Resistor Accuracy\*\*: The calculated current depends on knowing the resistance values accurately. Use resistors with a tight tolerance (e.g., 1% or better) for precise current measurement.

2. \*\*Voltage Measurement\*\*: Ensure that the voltage drop you're measuring is across the correct part of the circuit. If you're measuring a part of the voltage divider, calculate the corresponding current carefully.

3. \*\*Limitations\*\*: This method works well if you know the \*\*total resistance\*\* and if the voltage you are measuring is directly related to the current flowing through the resistor network. For more complex circuits or higher currents, a shunt resistor or dedicated current sensor (like ACS712) would provide more accuracy.