MQ-07 is a high-sensitivity sensor commonly used in electronics projects to detect **Carbon Monoxide (CO)**.The **MQ-07** is a metal oxide semiconductor (MOS) type sensor. It is specifically calibrated to detect **CO** concentrations in the air, typically ranging from 10 to 10,000 ppm.

MQ-07 requires a "high/low" heating cycle to function accurately. It usually switches between a high voltage (5V) to clean the sensor and a lower voltage.

When **carbon monoxide** is present, the conductivity of the sensor increases. The higher the gas concentration, the lower the electrical resistance.

MQ-07 has 4 pins:

- **VCC:** Connects to 5V.
- **GND:** Connects to Ground.
- **Digital Out (DO):** Provides a HIGH/LOW signal based on a threshold (set by the onboard potentiometer).
- **Analog Out (AO):** Provides a variable voltage (0-5V) representing the gas concentration. **I used this for calibration.**

NB:

Problem That I faced with my Arduino and its Solution:

If you face the problem where your device can't recognize the specific driver for the **FT232R USB UART** chip that is required for your specific "**Arduino Uno"** Then**,**

Please do this:
Manually install the **FTDI VCP (Virtual COM port)** drivers from this website :
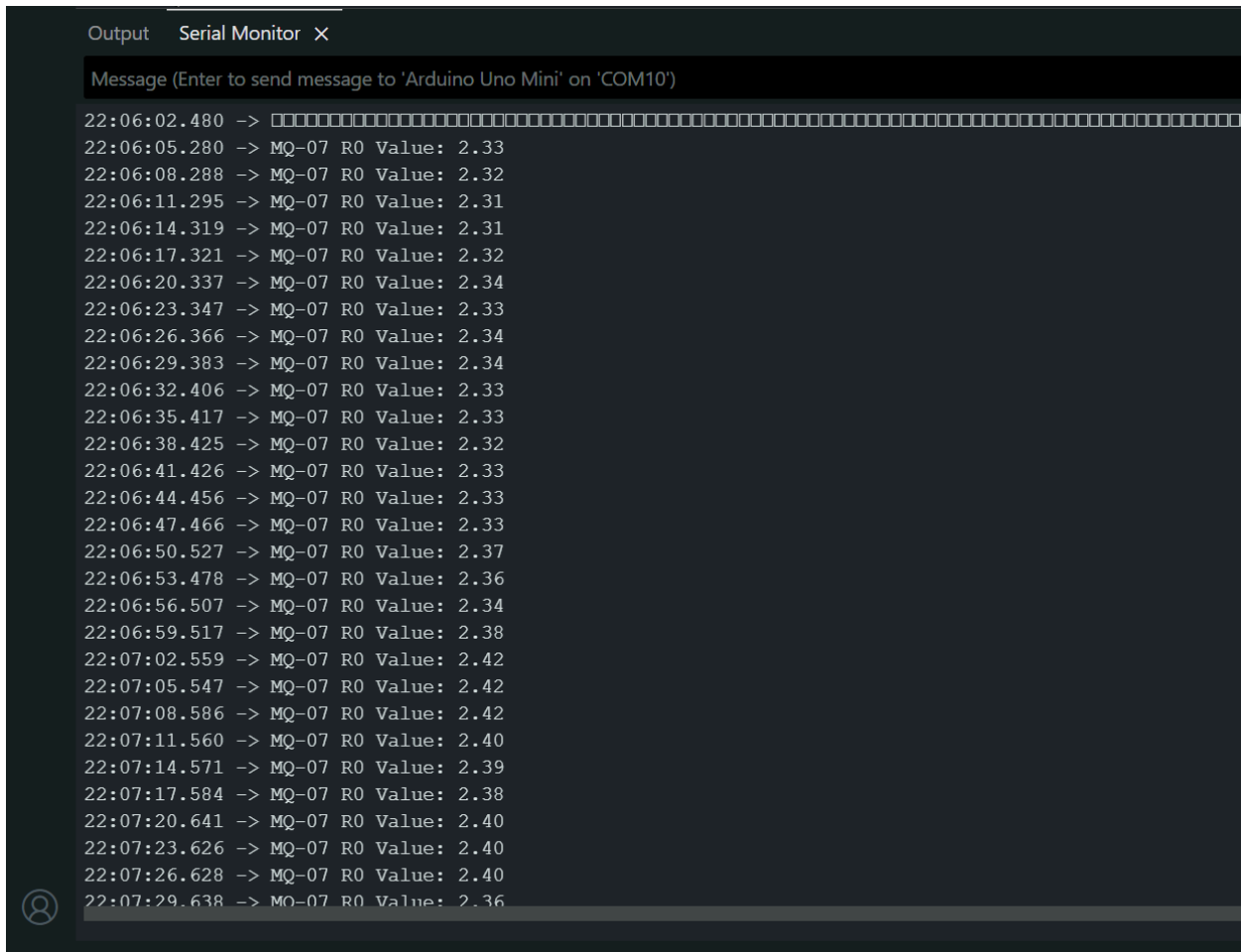https://ftdichip.com/drivers/vcp-drivers/

After installing it, now you will be able to see the **Port** connection in your Arduino IDE which was not seen before.

Working Steps:

The MQ-07 is designed to work on a **cycle** (High voltage for 60s, then Low voltage for 90s) to get the most accurate results.

1) At first I let the gas sensor's VCC port connected to the 5V pin of Arduino Uno for about 5-10 minutes so that the gas sensor gets heated up and show accurate results.
2) After that, I connected the A0 (Analogue Pin) of MQ-07 to Arduino's A0 pin and GND pin to Arduino's GND pin
3) After that I uploaded the code for the Calibration Phase. Here's the code link of the phase: CODE
4) Then I opened the Serial Monitor to see its readings. Here's what I saw:

I set the band to 9600. You can see MQ-07's R0 value printing every few seconds.At first, the number will changes quickly. Then I performed a 15-minute stabilization period until the number stays almost the same.

Then I Implemented a power-law regression formula (PPM = 100 X (Rs/R0)^(-1.53) to convert analog voltage into PPM values.

As a result, I found the value: 2.65 for the R0 value.

5) Then I opened another sketch file where I uploaded the "**Detection**" code.
6) After uploading the code I reopened the serial monitor to see the reading.

Problem Faced:

But unfortunately I found that my **Raw value (13-14)** is extremely low. For an Arduino, the raw analog range is 0 to 1023. A value of 14 means the sensor is sending almost 0 volts.

As the Raw value was so low, my **Ratio (27.20)** is very high, which is why I see that **PPM (0.64,0.65,0.67,.....)** .

Solution:

Later, I still could see that "Clean Air" Raw value stays at 14,13,12….So I tried to recalculate the Rs using my current data:

Vout = 14 X (5.0 / 1023.0) = approximately 0.068V
Rs = (5.0 - 0.068) / 0.068 = approximately 72.5 ohm

7) Then I replaced the value of R0 with Rs so that there will be accurate readings.
8) Then I uploaded the code and reopened the Serial Monitor. This is what I saw:

```
Output    Serial Monitor X

Message (Enter to send message to 'Arduino Uno Mini' on 'COM10')

22:32:42.353 -> □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
22:32:44.190 -> Raw: 14 | Ratio: 0.99 | CO: 100.91 PPM
22:32:46.142 -> Raw: 14 | Ratio: 0.99 | CO: 100.91 PPM
22:32:48.148 -> Raw: 14 | Ratio: 0.99 | CO: 100.91 PPM
22:32:50.147 -> Raw: 14 | Ratio: 0.99 | CO: 100.91 PPM
22:32:52.154 -> Raw: 13 | Ratio: 1.07 | CO: 89.96 PPM
22:32:54.148 -> Raw: 14 | Ratio: 0.99 | CO: 100.91 PPM
22:32:56.148 -> Raw: 13 | Ratio: 1.07 | CO: 89.96 PPM
22:32:58.175 -> Raw: 13 | Ratio: 1.07 | CO: 89.96 PPM
22:33:00.151 -> Raw: 13 | Ratio: 1.07 | CO: 89.96 PPM
22:33:02.162 -> Raw: 13 | Ratio: 1.07 | CO: 89.96 PPM
22:33:04.176 -> Raw: 13 | Ratio: 1.07 | CO: 89.96 PPM
22:33:06.166 -> Raw: 13 | Ratio: 1.07 | CO: 89.96 PPM
22:33:08.189 -> Raw: 13 | Ratio: 1.07 | CO: 89.96 PPM
22:33:10.158 -> Raw: 13 | Ratio: 1.07 | CO: 89.96 PPM
```

As a result, the **ratio** is hovering around **1.0**, and the **PPM** is sitting at roughly **100**.

Now the Lighting up Part to see if it works well enough:

```
01:47:29.773 -> Raw: 13 | Ratio: 1.07 | CO: 89.96 PPM
01:47:31.797 -> Raw: 13 | Ratio: 1.07 | CO: 89.96 PPM
01:47:33.794 -> Raw: 14 | Ratio: 0.99 | CO: 100.91 PPM
01:47:35.802 -> Raw: 139 | Ratio: 0.09 | CO: 4140.55 PPM
01:47:35.834 -> !!! WARNING: HIGH CO LEVELS !!!
01:47:37.818 -> Raw: 95 | Ratio: 0.13 | CO: 2147.27 PPM
01:47:37.842 -> !!! WARNING: HIGH CO LEVELS !!!
01:47:39.825 -> Raw: 55 | Ratio: 0.24 | CO: 872.33 PPM
01:47:39.857 -> !!! WARNING: HIGH CO LEVELS !!!
01:47:41.818 -> Raw: 42 | Ratio: 0.32 | CO: 565.76 PPM
01:47:41.852 -> !!! WARNING: HIGH CO LEVELS !!!
01:47:43.846 -> Raw: 36 | Ratio: 0.38 | CO: 442.75 PPM
01:47:43.878 -> !!! WARNING: HIGH CO LEVELS !!!
01:47:45.839 -> Raw: 29 | Ratio: 0.47 | CO: 314.62 PPM
01:47:45.880 -> !!! WARNING: HIGH CO LEVELS !!!
01:47:47.865 -> Raw: 27 | Ratio: 0.51 | CO: 281.17 PPM
01:47:47.889 -> !!! WARNING: HIGH CO LEVELS !!!
01:47:49.855 -> Raw: 33 | Ratio: 0.41 | CO: 385.76 PPM
01:47:49.888 -> !!! WARNING: HIGH CO LEVELS !!!
01:47:51.853 -> Raw: 407 | Ratio: 0.02 | CO: 37233.85 PPM
01:47:51.917 -> !!! WARNING: HIGH CO LEVELS !!!
01:47:53.898 -> Raw: 413 | Ratio: 0.02 | CO: 38651.47 PPM
01:47:53.921 -> !!! WARNING: HIGH CO LEVELS !!!
01:47:55.881 -> Raw: 211 | Ratio: 0.05 | CO: 8929.94 PPM
01:47:55.944 -> !!! WARNING: HIGH CO LEVELS !!!
01:47:57.887 -> Raw: 108 | Ratio: 0.12 | CO: 2669.82 PPM
01:47:57.951 -> !!! WARNING: HIGH CO LEVELS !!!
01:47:59.907 -> Raw: 71 | Ratio: 0.18 | CO: 1322.60 PPM
01:47:59.940 -> !!! WARNING: HIGH CO LEVELS !!!
01:48:01.908 -> Raw: 51 | Ratio: 0.26 | CO: 772.27 PPM
01:48:01.972 -> !!! WARNING: HIGH CO LEVELS !!!
01:48:03.948 -> Raw: 42 | Ratio: 0.32 | CO: 565.76 PPM
01:48:03.980 -> !!! WARNING: HIGH CO LEVELS !!!
01:48:05.930 -> Raw: 37 | Ratio: 0.37 | CO: 462.42 PPM
01:48:05.993 -> !!! WARNING: HIGH CO LEVELS !!!
01:48:07.956 -> Raw: 35 | Ratio: 0.39 | CO: 423.41 PPM
01:48:07.988 -> !!! WARNING: HIGH CO LEVELS !!!
01:48:09.965 -> Raw: 32 | Ratio: 0.43 | CO: 367.45 PPM
01:48:09.996 -> !!! WARNING: HIGH CO LEVELS !!!
01:48:11.972 -> Raw: 30 | Ratio: 0.46 | CO: 331.88 PPM
```

Analysis of My Test Results:

1. **Detection:** At `01:47:35.802`, my sensor detected the smoke immediately. The **Raw** value jumped from **14** to **139**, proving the sensor is physically active and highly sensitive to Carbon Monoxide.
2. **Accuracy:** The PPM spiked to **4140.55**, which is exactly what is usually expected from a concentrated source of smoke like a blown-out match.
3. **Safety Alert:** Triggered the **"!!! WARNING: HIGH CO LEVELS !!!"** message the moment the value crossed your 250 PPM threshold.
4. **Recovery:** You can see the values beginning to drop (from 4140 down to 281), showing that the sensor is "cleaning" itself and returning to its baseline as the smoke clears.