**Hardware Setup:**

* Connect pin 32 and 33 of ESP32 to SCL and SDA of I/O card respectively.
* Connect +5V power source to I/O card.
* Toggle Reset pin of all MCP23017 LOW then HIGH.

**ESP32 Setup:**

* Install latest version of Arduino IDE from <https://www.arduino.cc/en/main/software>
* Open ‘Preferences’ from ‘File’ drop down menu.
* In ‘Additional Boards Manager URLs’ enter <https://dl.espressif.com/dl/package_esp32_index.json>
* Open ‘Board Manager’. Tools > Board > Boards Manager.
* Search for ESP32 and press install button for the “ESP32 by Espressif Systems“
* Files download for ESP32 support will begin automatically. (Let the download complete).

More detailed information at: <https://randomnerdtutorials.com/installing-the-esp32-board-in-arduino-ide-windows-instructions/>

**Host Setup:**

Host is setup using Arduino IDE

* Setup host IP address as:

IPAddress local\_IP(192, 168, 1, 107);

IPAddress gateway(192, 168, 1, 1);

IPAddress subnet(255, 255, 255, 0);

* Setup UDP port to listen to as:

unsigned int localUdpPort = 4210;

**Client Setup:**

Python sockets programming is used to setup UDP/IP connect between clients with host.

* Enter host details to send data to as:

server\_address = ('192.168.1.107', 4210)

* Use ‘pack(datatype, data)’ to create a packet to send to host.

(Datatype B: Byte)

**Packet Table**

|  |  |  |  |
| --- | --- | --- | --- |
| ( Byte 0 ) Header 1: 0x7D | | | |
| ( Byte 1 ) Header 2: 0xD7 | | | |
| ( Byte 2 ) Function | Configure: 0x01 | Input: 0x02 | Output: 0x03// need to consider data again (no data sent) |
| ( Byte 3 )  Sub-Function | Configure all pins: 0x01 | Read all digital input pins: 0x02 | Write all output pins: 0x06 |
| Read specific digital input pin: 0x03 | Write specific output pin: 0x07 |
| Read all analog input pins:  0x04 |
| Read specific analog input pin: 0x05 |
| ( onwards Byte 4) Data | Configure all pins: Data: 4-19 bytes  (config for 128 pins) | Read all digital input pins: 0x90 | Write all output pins LOW: 0x90 |
| Read specific digital input pin: Input pin number (decimal value: 0 – 127) | Write all output pins HIGH: 0x91 |
| Byte 4: Write specific output pin: Output pin number |
| Read all analog input pins: 0x91 |
| Read specific digital input pin: Input pin number (decimal value: 0 – 127) | Byte 5: Pin status  0x01 : HIGH  0x00 : LOW |
| (2nd last Byte) Footer1: 0xFF | | | |
| (Last Byte) Footer2: 0xFA | | | |