VIEWR: A Visual, InExpensive and Wireless Rheometer (Software Configuration)

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Download the *Code*, *Interface* (optional) and *VIEWRUserData* folder from the permanent project repository on OSF: https://osf.io/wj62b/

Part 1: Configuration of Hardware (ESP-32 board)

1. Installation of Arduino IDE from here
    a. Install ESP32 boards manager by going to:
        - Open File () – Preferences (Windows) | Arduino – Settings (Mac)
        - Add the following URL to the "Additional boards manager": https://raw.githubusercontent.com/espressif/arduino-esp32/gh-pages/package_esp32_index.json
        - Connect the ESP32 board via a micro-USB cable.
        - Choose the right port/board by going to Tools - Board (**ESP32 - NodeMCU-32S**) or Tools – Port

          ℹ If you cannot see the port, please go to this link to download and install the latest driver for the ESP32 board, and restart Arduino IDE.

          ℹ If you cannot find the ESP32 option in the Broad list, go to Board Manager (Tools – Board:xxx – Board Manager) and search "esp32", download the board manually (*esp32* by Espressif Systems)
    b. Install *SubPubClient*
        - Open Tools - Manage Libraries
        - Search *PubSubClient* and install

          ℹ Please make sure you download the exact package as following, as there are many variants of this package.

2. Open *esp_code.ino* in the *Code* folder with the Arduino IDE
3. Modify the Wi-Fi credentials in the *esp_code.ino* file

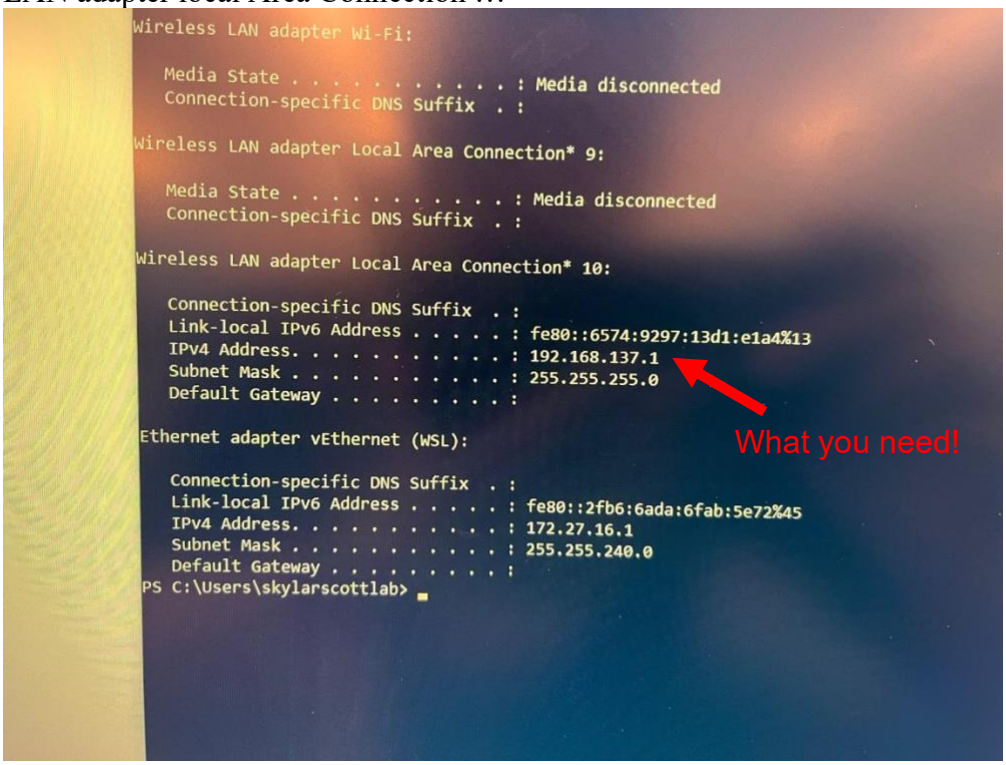
If a common router is used	Use the SSID / password for the router
If a hotspot is set up from Raspberry Pi (using `dnsmcq` and `hostapd` following this article)	Use the specified SSID / password set from the configuration step

If a personal hotspot is set up **(using a Wi-Fi dongle, or creating from PC/phone)**	Use the SSID and password for the hotspot

ℹ How to create hotspots from PC
Windows: "Network & Internet settings" - "Mobile hotspot". For newer models, users can still connect to the Internet while using the software.
Mac: "System Setting" - "General" - "Internet sharing". Users will not be able to connect to the Internet while using the software.

4. Modify the MQTT configuration using the host **intranet** IP address. You can check this using `ifconfig` (Mac) or `ipconfig` (Windows) from the command line. The IP address should be in the format of `192.168.xx.xx`.

   ℹ In Windows, the hostname for the IP address we need is usually named "Wireless LAN adapter local Area Connection …"



5. Make sure the Wi-Fi connection is established before loading the *.ino* firmware file
6. Load the firmware to the ESP32 board by clicking *Upload* (→) button

Part 2: Configuration of Interface from Docker Image

This method using Docker image is for EZ installation of the SLA printer interface, which does not require the installation of Node-RED or any local configurations.

A little intro of Docker: Docker is a software-distribution platform using OS-level virtualization to create environments with necessary dependencies. In short, software on Docker is distributed in the form of a virtual environment (called "Images"). Users can create instances of an Image on their local environment (called "Containers") for plug-and-play software executions, and the file systems created by Containers are fully independent of the user's local file system.

Prerequisite for Docker image

- PC/Mac that can install Docker
- Capability to set up a personal hotspot (with internal WiFi or USB WiFi dongle)
- >2GB free space

First-time configuration

1. Install Docker: https://www.docker.com/products/personal/
2. Run Docker Desktop
   ℹ For Windows users: If meeting the error of "Docker Desktop requires a newer WSL kernel version", type
   `wsl –update`
   in Windows PowerShell first to update the environment
3. Open Windows PowerShell (Windows) or Terminal (mac)
   ℹ Both shell environments are case sensitive for the inputs. Mind the case in the following prompts
4. Create a Docker network to allow communications among multiple Containers by typing
   `docker network create iot`
   ℹ This is necessary for the crosstalk between MQTT server and the interface
   ℹ If meeting "error during connect: This error may indicate that the docker daemon is not running, …": You need to wait until the Docker Desktop fully opens and initializes
5. Create a mosquito Container to support MQTT communications by typing
   `docker run -itd --network iot -p 1883:1883 --name mybroker eclipse-mosquitto mosquitto -c /mosquitto-no-auth.conf`
6. Check if mosquitto is successfully setup and running by typing
   `docker logs -f mybroker`
   If you see "mosquitto version x.x.xx running", the MQTT channel is successfully set up
7. Press "Ctrl/Control+C" to return the command line interface
8. Copy the *VIEWRUserData* folder from the *Code* folder to the target data folder
9. *cd* into the new *VIEWRUserData* by typing
   `cd [path-to-data-folder]/VIEWRUserData`
   ℹ Make sure to use the correct "/" or "\" on different OS
   - Backslash on Windows: C:\Users\xxx\VIEWR\
   - Slash on Mac: /Users/xxx/VIEWR/
10. Create Container of the VIEWR interface by typing

```
docker run -itd -p 1880:1880 --env-file env.list --network
iot -v [path-to-data-folder]/VIEWRUserData:/Data --name
dockerviewr dujianyivapor/node-red-docker-viewr:latest
```

ℹ Please make sure you are in the *VIEWRUserData* folder for the creation of Container, because the *env.list* file is necessary to set the environment for the interface

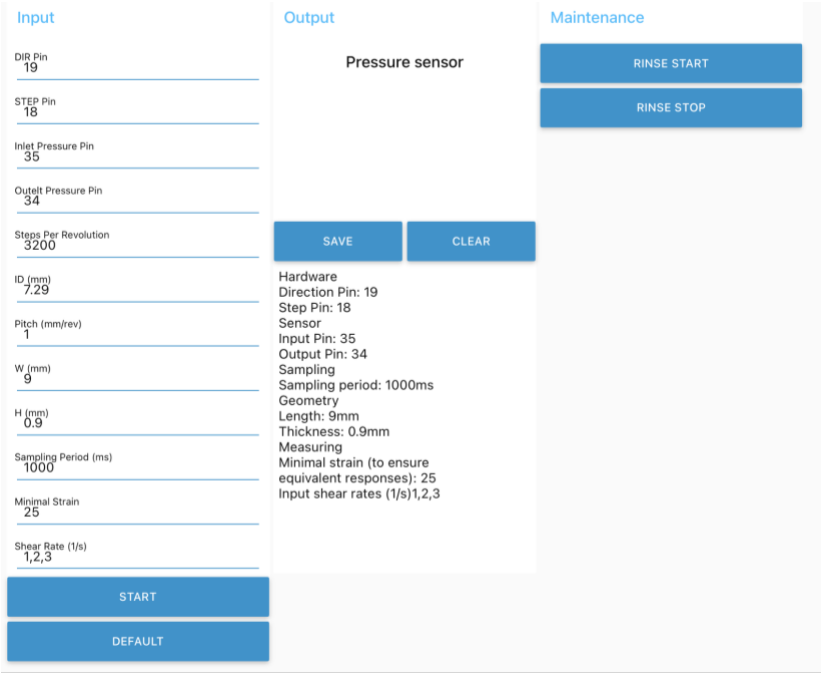
ℹ Only absolute path is legal input when specifying the folder location to avoid ambiguity. If you don't know the absolute path of the current folder, you can use `pwd`

ℹ If the file path contains spaces, you should replace with "_" (Windows) or prefix with "\" (Mac) to legalize the input. For example (`xxx\User Files`)

Windows: `xxx\User_Files`

Mac: `xxx/User\ Files`

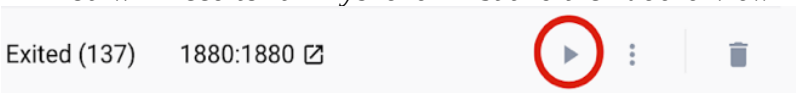
10. At this moment the software should have been loaded. Check the status by `docker logs -f dockerviewr`
    You should see "Connected to broker: mqtt://mybroker:1883"
11. Open the VIEWR interface from any web browser (Safari/Chrome/Edge) at `localhost:1880/ui`
    You should see this interface as below



<u>Reaccess after installation</u>

1. Once the Docker Image is set up, you can simply open the software again by clicking the "Run" button (see below), followed by Step 11 above

ℹ You will need to run *mybroker* first and then *dockerviewr*



<u>In case of software update</u>

1. Go to Docker Desktop

2. Stop *dockerviewr* and delete it (it won't affect your local files)
3. Go to "Image" tab: Delete the "dujianyivapor/node-red-docker-viewr" image
4. Repeat Step 9-11 in First-time configuration

FAQs:
Q: Setup hotspot on Windows
A: www.appuals.com/we-cant-set-up-mobile-hotspot-error-on-windows-10/

Q: MQTT not connected in Arduino Serial Monitor
A: Make sure `-p 1883:1883` is added when creating the broker in Docker (Step 5 of First-time configuration)