

IoT Smart Clock

Assembly and Programming Guide (v2.0)



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Preface

Thank you for joining my IoT Smart Clock workshop. By the end of the workshop, you will have a working RGB pixel display that can display any information as programmed, including time, weather, news, stock price and more.

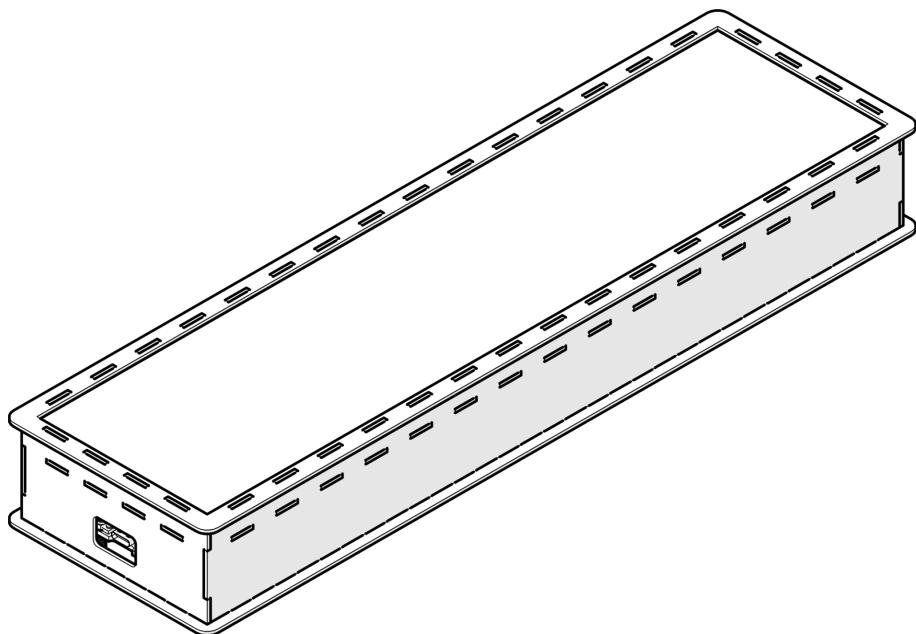
I am Justus Ip, the designer of the IoT Smart Clock. I am a year 4 Computer Science student, but I also like to design IoT and hardware devices. For any inquiries, please don't hesitate to contact me at me@justusip.com. Feel free also to follow my LinkedIn (<https://www.linkedin.com/in/justusip/>).

Happy building!

Section 1

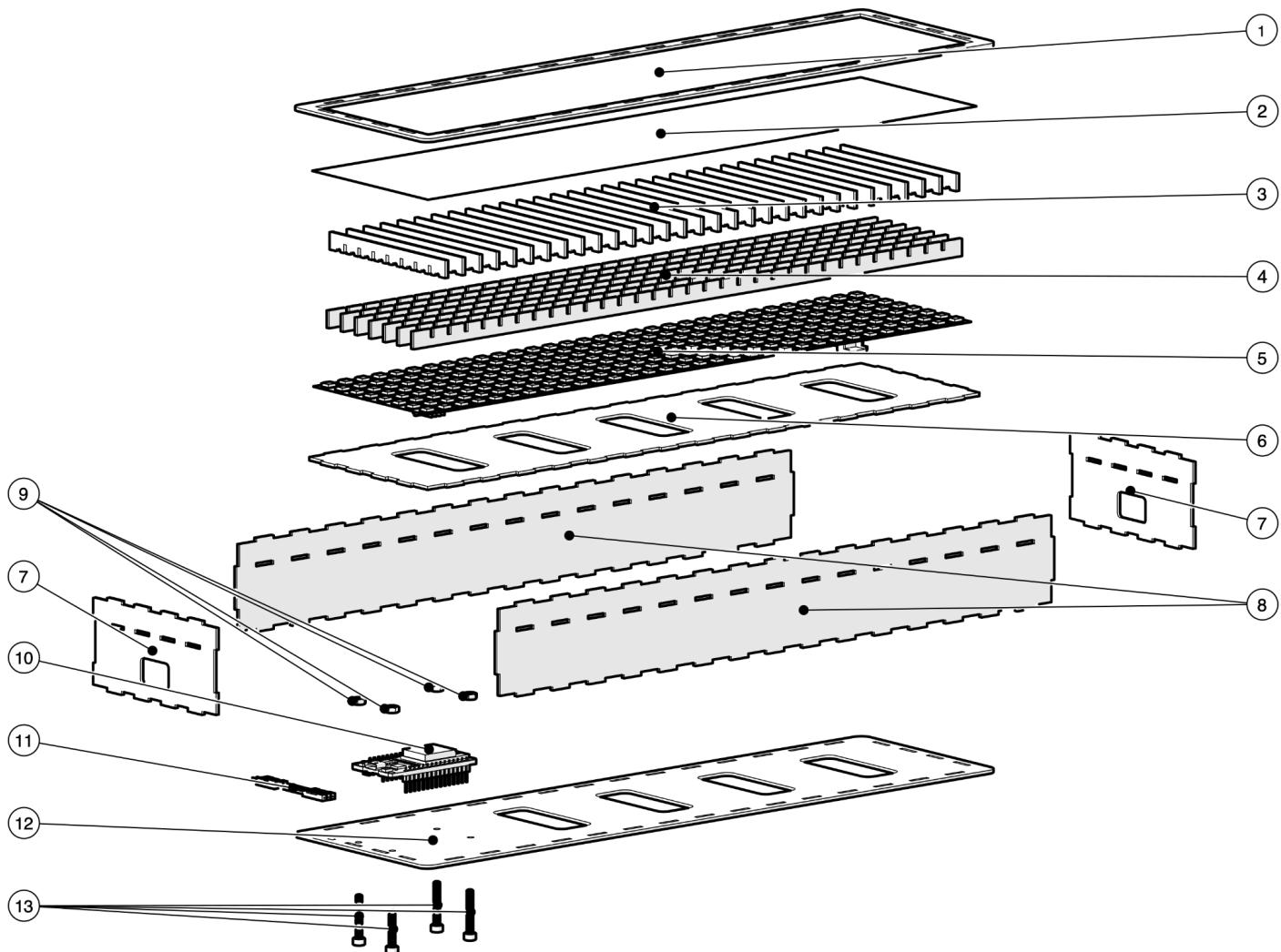
Enclosure Assembly

In this section, we will assemble the enclosure first before proceeding to the programming part. The finished product looks like the following.



1. Parts Checking

Please check if you have all the parts listed below.



#	Part Name	Quantity
1	Front Frame	1
2	Semi-Transparent Film	1
3	Vertical Divider	31
4	Horizontal Divider	7
5	WS2812 LED Matrix Panel	1
6	Middle Pane	1
7	Left / Right Pane	2

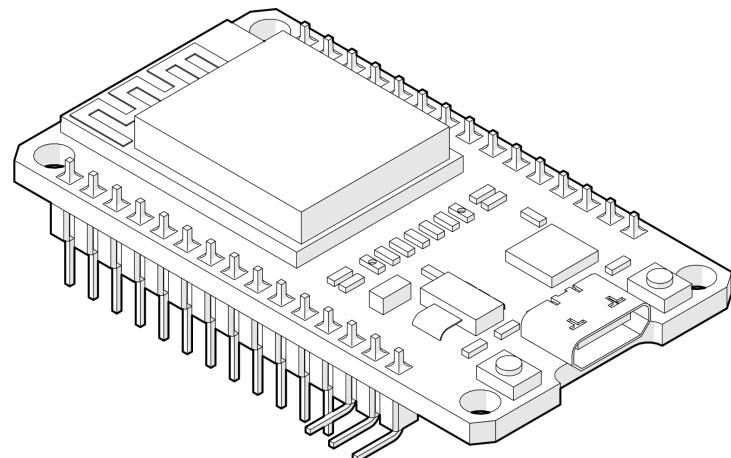
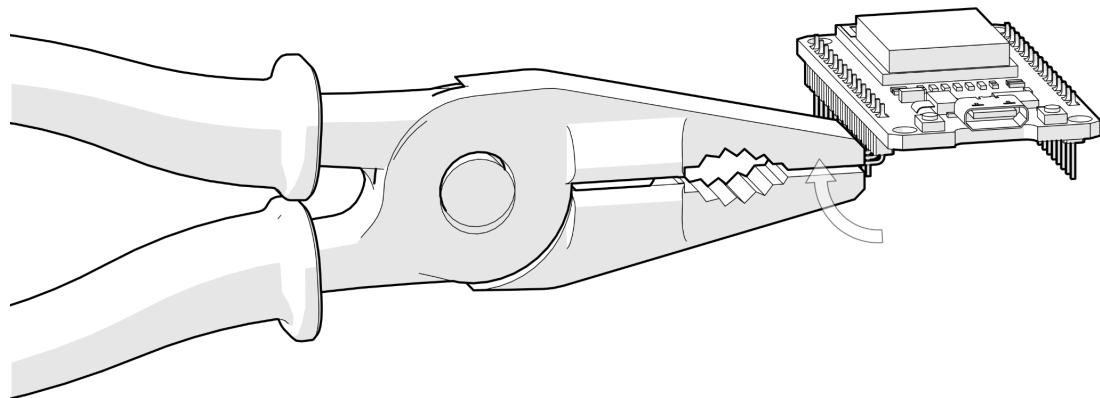
#	Part Name	Quantity
8	Top / Bottom Pane	2
9	M3 Nut	4
10	ESP32 Development Board	1
11	Female to Male Jumper Wire	3
12	Bottom Pane	1
13	M3 20mm Screw	4

You also need these tools: pliers, screwdriver (\oplus M3), hammer, hot-glue gun

2. Bend ESP32 Pins

Use a plier to bend the “VIN”, “GND” and “13” pins of the ESP32 Development Board to a 90-degree angle (the 3 pins most near to the EN pin).

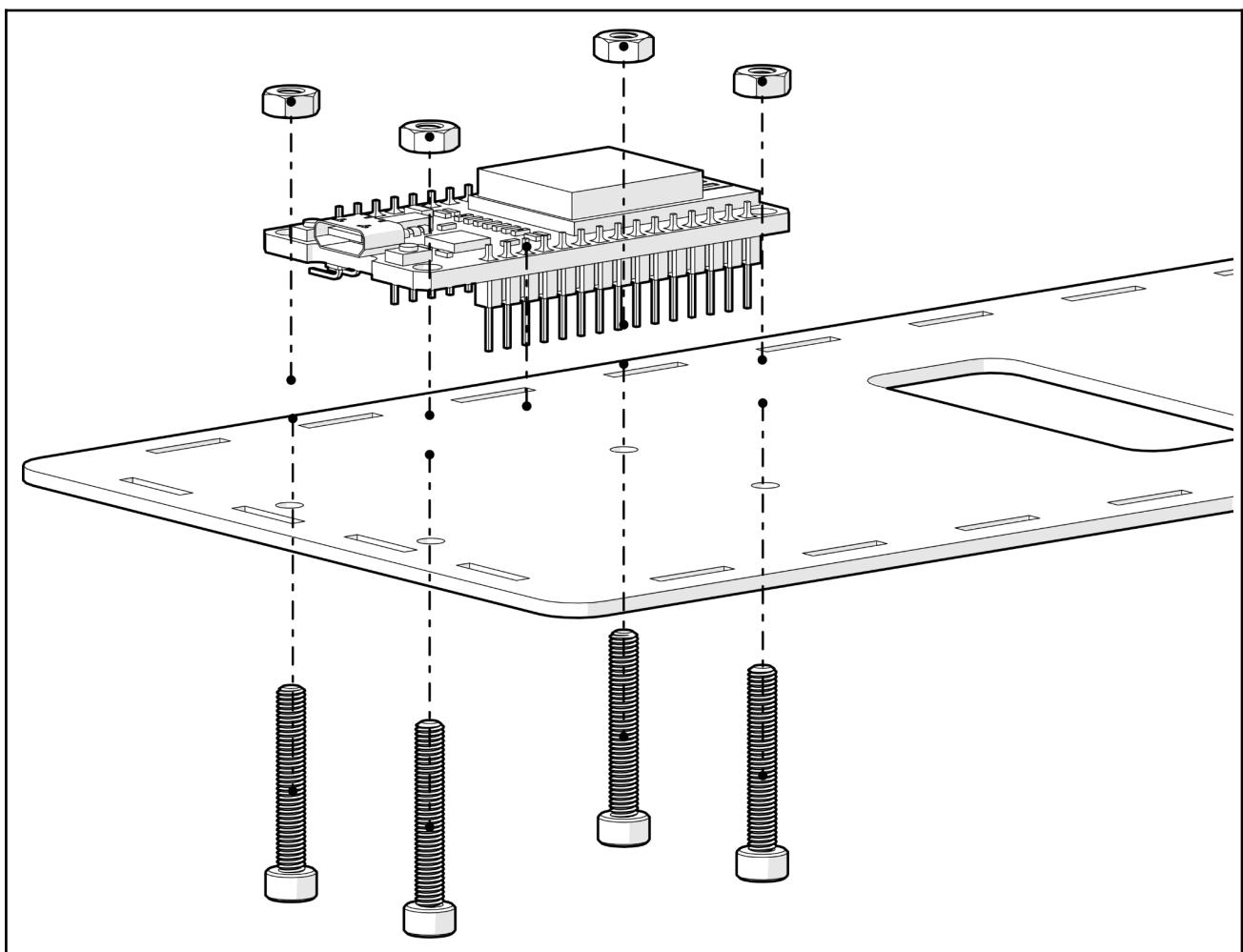
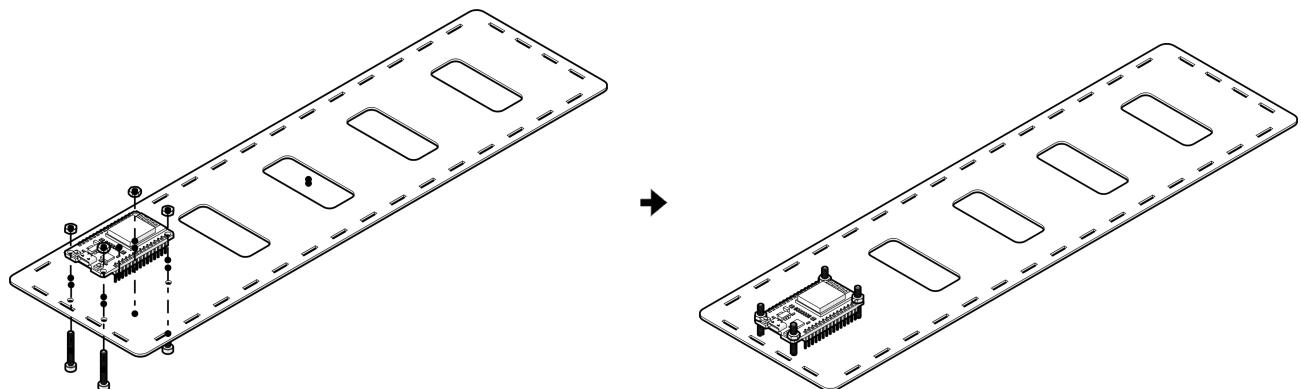
We will use only these 3 pins of the ESP32 Development Board in this project, and bending these 3 pins to a 90-degree angle will be useful later when we insert the jumper wires to it after it is mounted onto the case.



3. Bottom Part Assembly

Mount the ESP32 Development Board by inserting 4 M3 20mm Screws from the bottom, through the 4 holes of the bottom casing and the mounting holes of the ESP32 Development Board.

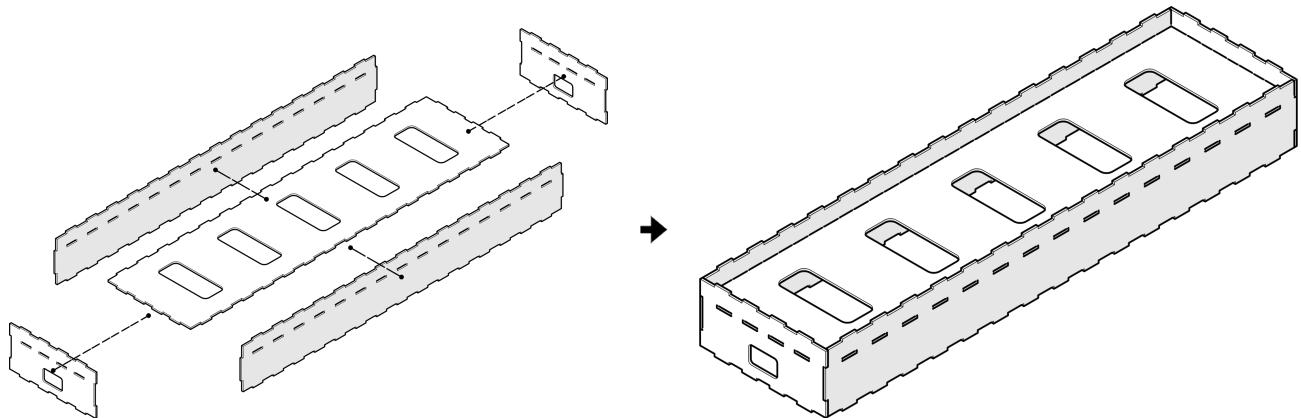
Secure the screws with 4 M3 nuts from the top.



4. Middle Body Assembly

Combine the middle pane with the 4 side panes (left, right, bottom, and top pane).

Use a hot glue gun to secure them.

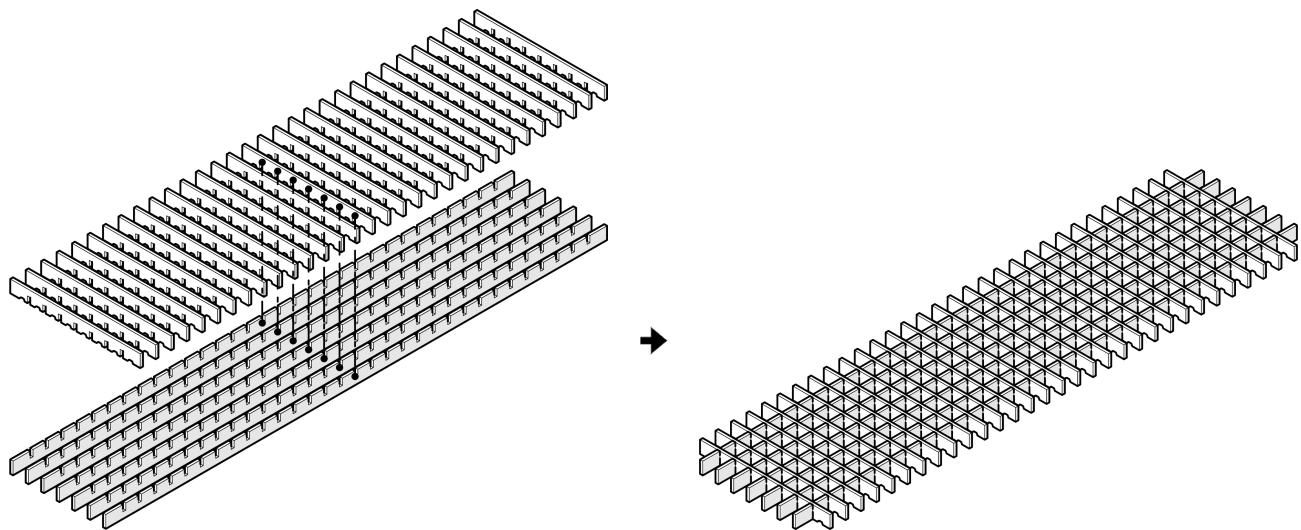


5. Divider Assembly

Combine the vertical dividers and horizontal dividers.

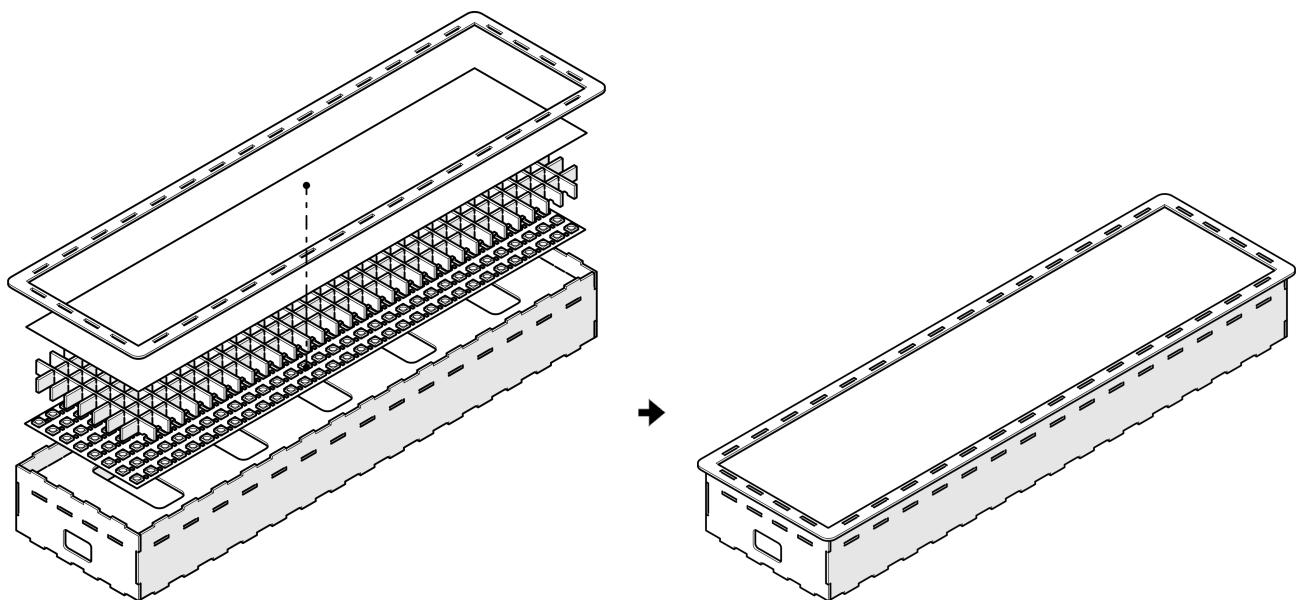


Make sure all the dividers are **pressed flat** before proceeding to the next step.

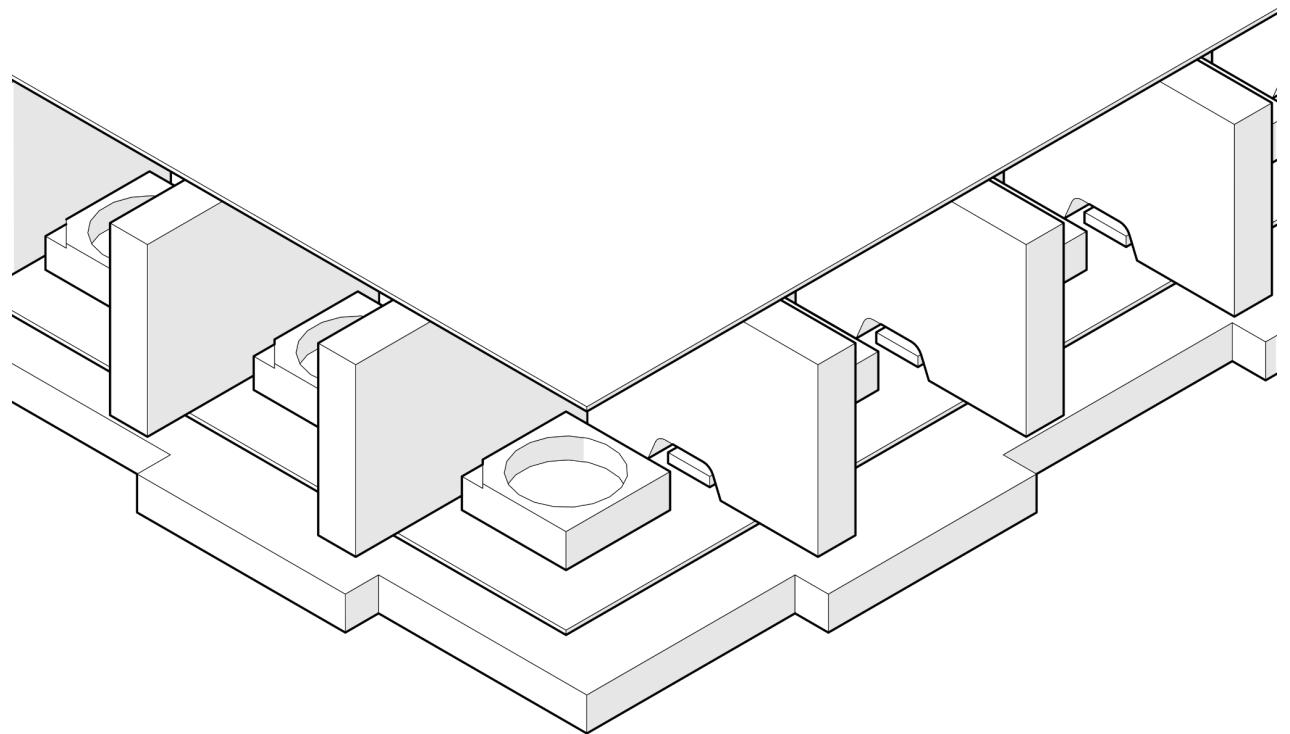


6. Top Part Assembly

Combine the LED Matrix Panel, dividers, semi-transparent film and the front frame.



When pushing the dividers down to the LED Matrix Panel, **align the small openings of the vertical dividers with the resistors** (the small component next to every LED light). Be careful not to break the LEDs due to misalignment when pushing.



7. Connecting Wires

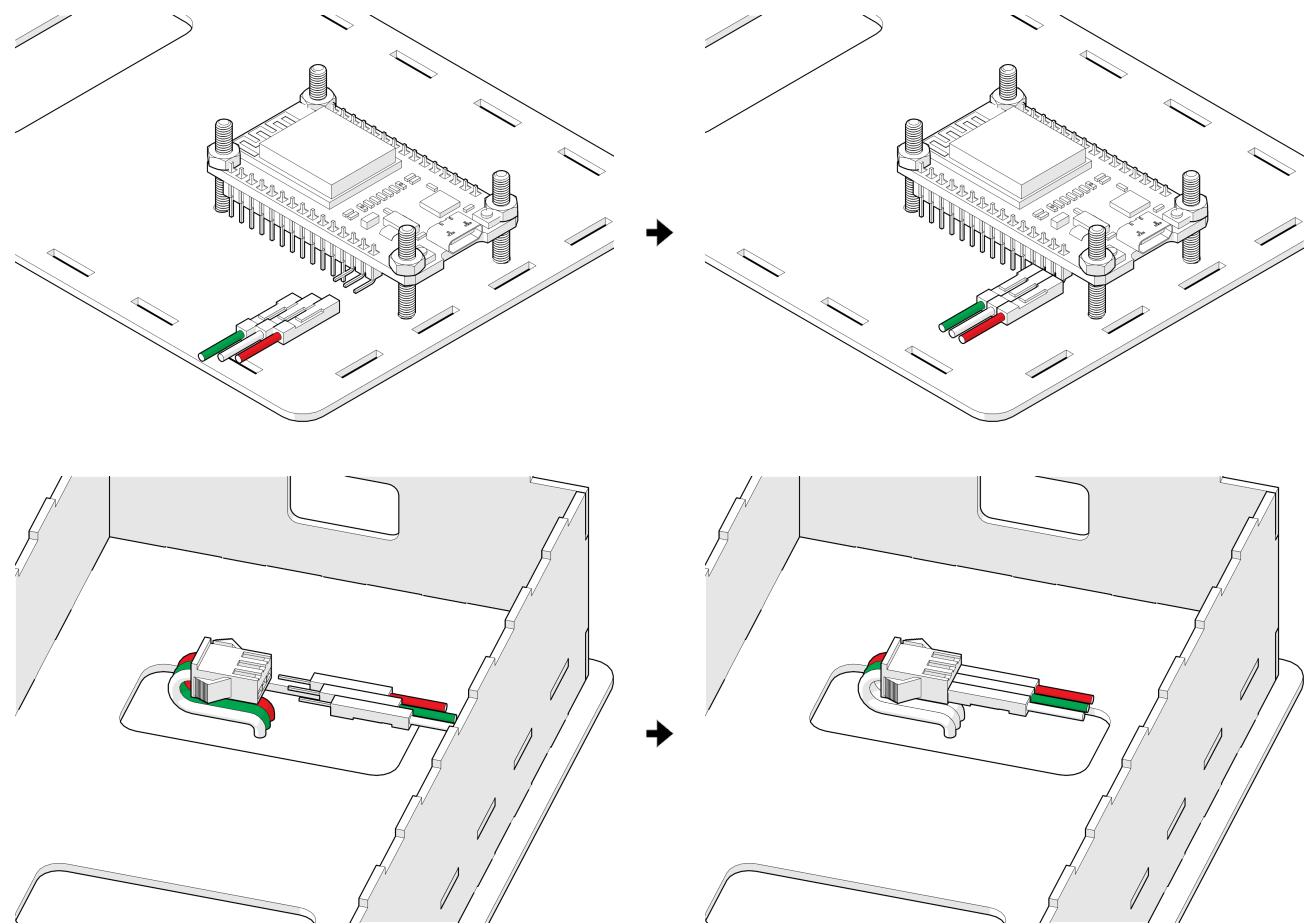
Connect the ESP32 Development Board to the JST-SM male connector of the LED Matrix Panel using a female-to-male connector.

Connect “VIN” to Red, “GND” to White, and “13” to Green.

Use a hot glue gun to fix the connections.

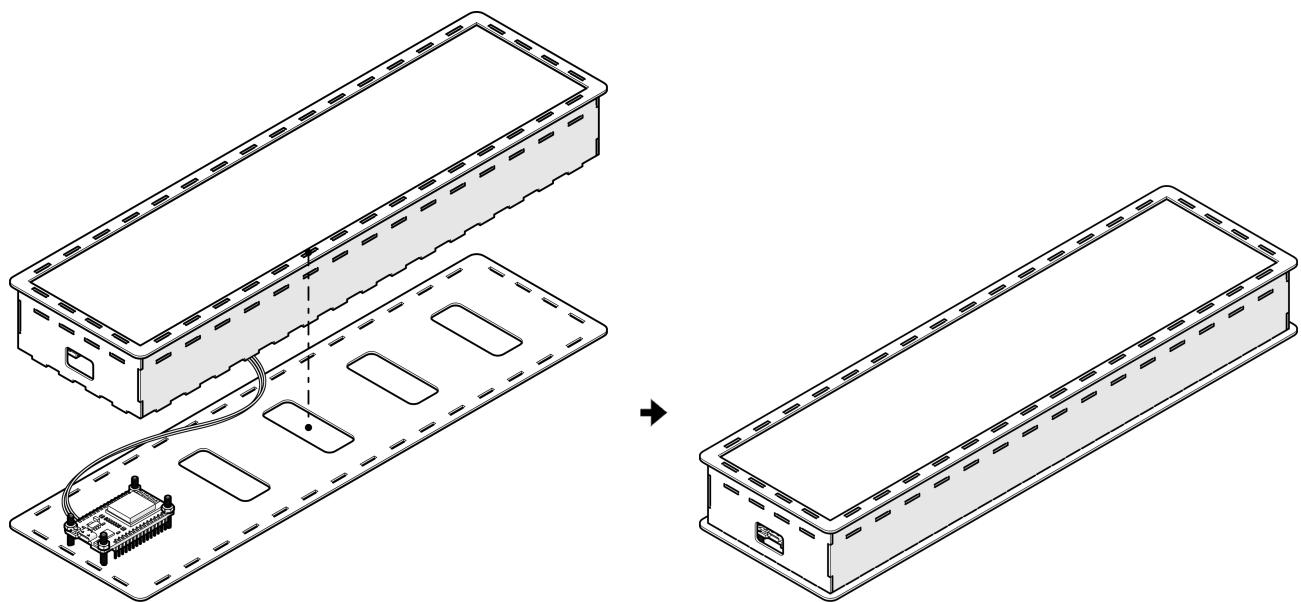


Do not just connect the ESP32 Development Board to the LED Matrix Panel directly. Use a female-to-male connector to bridge the connections, because you have to **swap the GREEN and WHITE wires**.



8. Finishing Up

Combine the Upper and Lower Assembly.



After verifying everything is working, use hot glue to fix them together.



Upload a sample program (refer to step 9) to verify that the wiring is correct and everything is working before using hot glue to fix them together. After glueing them permanently, no changes to the wiring can be made.

Section 2

Programming

In this section, we will try to program the clock to display different types of information.

9. Upload Sample Program

Visit the following URL. Follow the instructions to upload a sample program to the ESP32, to show the message “Hello!” on the display.



<https://go.justusip.com/step-09>



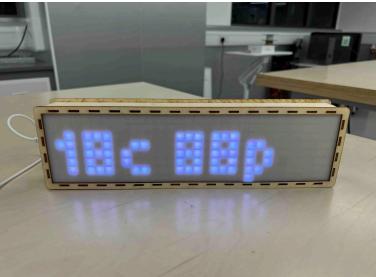
10. Show the Time

Follow the instructions in the URL to show the current time.

 https://go.justusip.com/step-10	
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11. Show the Weather

Follow the instructions in the URL to show the current temperature and humidity.

 https://go.justusip.com/step-11	
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12. (For Advanced Users) Upload Full Program

The URL below contains a program which can display various pages of information such as time, date, weather, stock prices, and static messages. You may try to upload the program on your own.

<https://go.justusip.com/step-12>

