

# AFRIBOT FIRE PATROL REPAIR MANUAL

## Authors:

Ahmed 221218  
Abdallahman 223399  
Mohammed  
Moaz

## Table of content

1) Safety .....	3
1.1) General hazards .....	3
1.2) Electrical hazards .....	3
2) Installation .....	3
2.1) Pre-Install checklist .....	3
2.2) Wiring connections .....	3
3) system operations .....	3
3.1) fire detected.....	3
3.2) object/obstacle detected .....	4
3.3) Emergency pager .....	4
4) Prototype.....	4
4.1) installing motors .....	4
4.2) installing servo motors.....	4
4.3) Final adjustments.....	5
5) Technical Specifications .....	5

## 1) Safety

### 1.1) General hazards

Don't turn on any battery alone as it might cause one set of wheels to move alone which could flip the car.

Any wire removal could cause a short circuit and damage some of the components. It may also cause the device to not work again.

### 1.2) Electrical hazards

Water shall not be spilled on top of the components. The water sprayed by the pump is positioned to not be spilled under any circumstances and the top cover helps in avoiding any type of mishap related to the pump.

Any sort of water leakage from the pump could cause damage to the components and may render the project useless therefore installing the pump pipes must be done carefully and thoroughly.

Also, the vehicle should not be near any conductive material ex: - mercury, exposed wires, etc. As it may cause for intake of higher volt than expected or required since most of the sensors require just about 5v and the pump and motors require 12v.

The wiring should be exactly like the wiring diagram. Every wire must be rechecked. It will be the user's error if any pin was either disconnected or not installed correctly as it may cause for permanent damage in the robot.

## 2) Installation

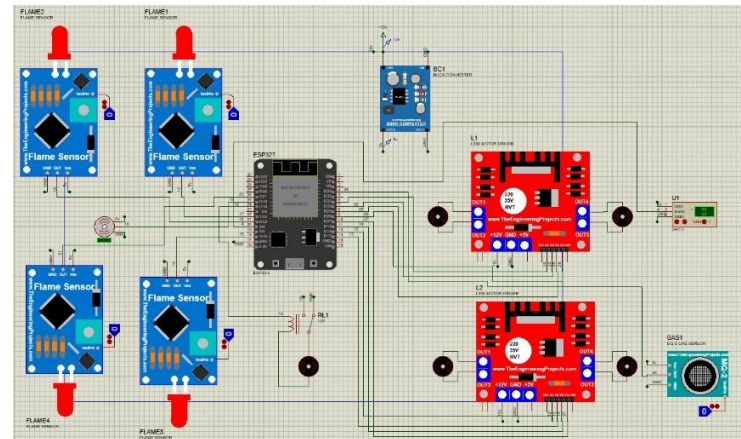
### 2.1) Pre-Install checklist

- Check if pump tubes are tightly installed and won't allow any leakage
- Make sure all pins are pushed in fully and none are about to or did come off

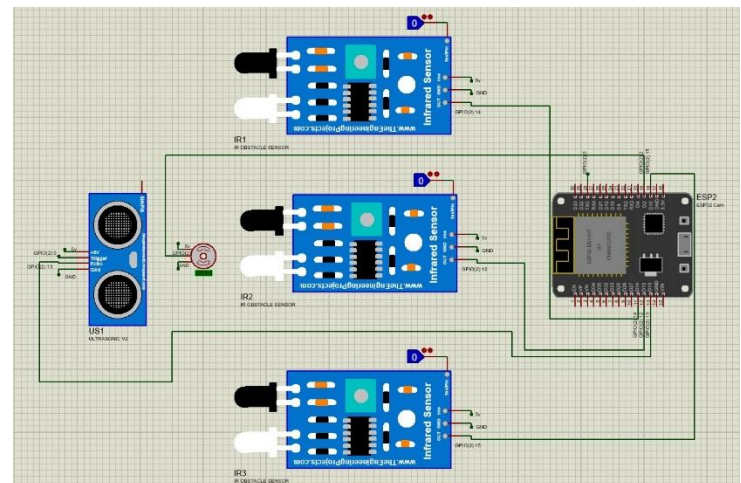
- Make sure the batteries are charged just enough to output 12v to give enough power to work the motors and pump.

### 2.2) Wiring connections

ESP32-s main system



ESP32-cam (detection system)



## 3) system operations

### 3.1) fire detected

- fire is detected through any of the flame sensors located at the top of the vehicle.
- When fire signal is sent pump signal activates the relay which enables the pump.

### 3.2) object/obstacle detected

If an obstacle is detected using IR sensors the car would react accordingly to avoid the obstacle.

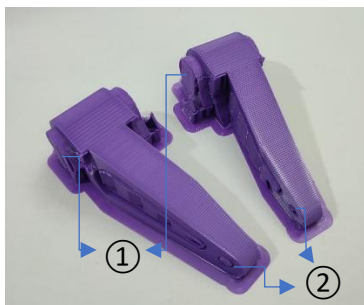
This is done using a communication from another ESP (ESP32-cam) to the main system which holds the actuators.

### 3.3) Emergency pager

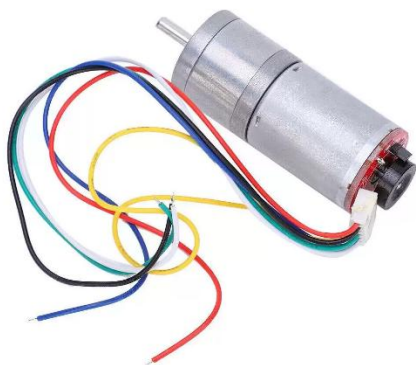
This prototype comes with its own emergency pager that reads information from the car that are being monitored like the temperature and gas levels and shows it on the lcd.

## 4) Prototype

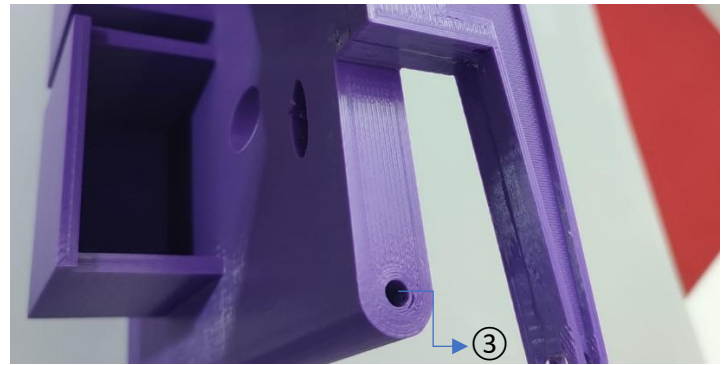
### 4.1) installing motors



The motors go into are to be locked into their places marked as ①, where the opening is a tight fit for the exact motor shown in the picture below.



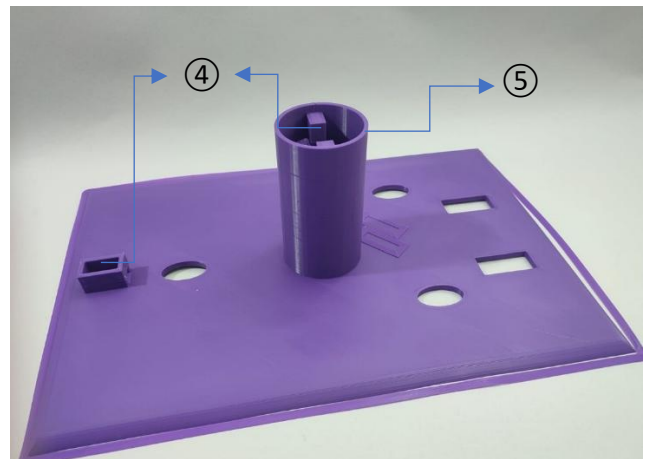
Then the legs are connected from the opening at ② to the main chassis at ③.



Repeat this for all 4 motors and legs.

### 4.2) installing servo motors

The servo motors are installed on the top cover that goes right atop the main chassis.

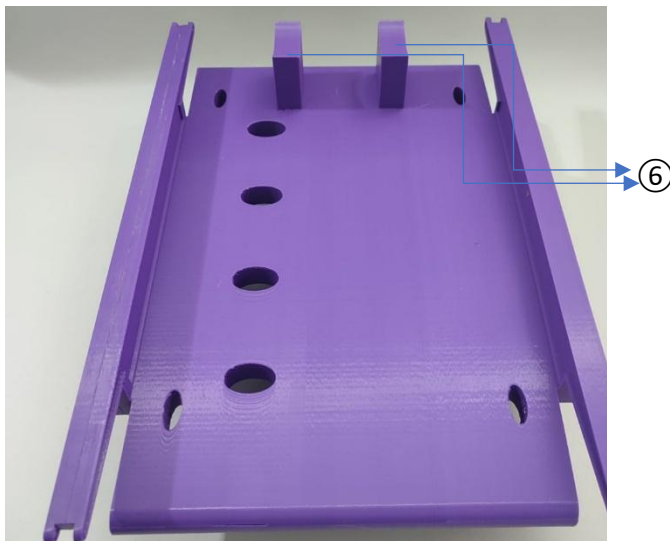


The servo motors fit into the parts labelled as ④ and on top of it fits the flame monitoring system that rotates on the servo to check for flames in a 360-degree angle at ⑤, it is the part below.

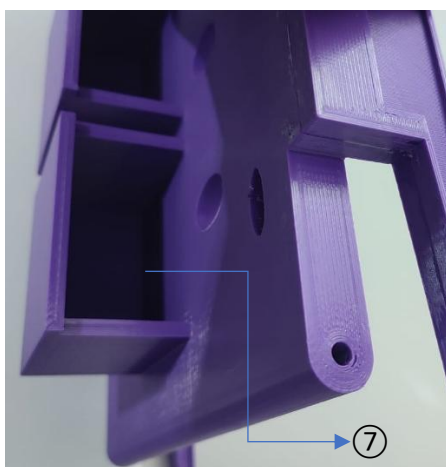


### 4.3) Final adjustments

After all the parts are placed what is left are placing the top cover on top of the main chassis from the holes marked ⑥ in both pictures.



Now all that is left is to add the batteries in its compartments that are present at the bottom of the main chassis at ⑦.



Now the system is fully assembled and ready to go.

### 5) Technical Specifications

- 1) **IR Sensor:** Operating Voltage: 3.3V - 5V, Detection Range: 2-30 cm.
- 2) **MQ2 Gas Sensor:** Operating Voltage: 5V, Gas Detection: LPG, Smoke, CO.
- 3) **DHT11 Temperature and Humidity Sensor:** Voltage: 3.3V - 5V, Temp Range: 0-50°C, Humidity Range: 20%-90%.
- 4) **Ultrasonic Sensor (HC-SR04):** Voltage: 5V, Range: 2cm - 4m, Accuracy:  $\pm 3$ mm.
- 5) **L298N Motor Driver:** Voltage: 5V Logic, Motor Voltage: 5-35V, Max Current: 2A per Channel.
- 6) **DC Motor with Encoder:** Voltage: 12V, Speed: 300 RPM, Encoder: 2 Pulses per Rotation.
- 7) **Flame Sensor Module 1 Channel:** operating Voltage: DC 3~5.5V
- 8) **SG90 Micro Servo Motor:** Voltage: DC 4.8~6V
- 9) **Pump:** Voltage: 12V DC  
Working current: 0.5 – 0.7A
- 10) **ESP32-CAM:** CPU: Dual-core 240 MHz, Camera: OV2640, Wi-Fi: 802.11 b/g/n.
- 11) **ESP32-S:** CPU: Dual-core 240 MHz, Memory: 520 KB SRAM, Wi-Fi & Bluetooth support.