

HARDWARE CONNECTIONS

1. Fire Detection & Monitoring (Thermal Sensors & Camera)

Component	Pins	Connection Details
MLX90614 Thermal Sensor	SDA → GPIO 2 SCL → GPIO 3 VCC → 3.3V GND → GND	Uses I2C communication with Raspberry Pi/ESP32.
FLIR Lepton Thermal Camera	CS → GPIO 8 CLK → GPIO 11 MOSI → GPIO 10 MISO → GPIO 9 VCC → 3.3V GND → GND	Uses SPI communication with Raspberry Pi.
Raspberry Pi Camera	CSI Port	Used for live video streaming.

2. Navigation & Motor Control

Component	Pins	Connection Details
L298N Motor Driver	IN1 → GPIO 17 IN2 → GPIO 27 IN3 → GPIO 22 IN4 → GPIO 23 ENA → 5V (PWM Control) ENB → 5V (PWM Control) VCC → Battery (12V) GND → GND	Controls brushless motors for drone movement.
Brushless Motors + ESCs	Signal → PWM Pins (GPIO 12, 13, 18, 19) VCC → Battery (12V or LiPo) GND → GND	Provides thrust and stability for flight.
GPS Module (Ublox NEO-M8N)	TX → GPIO 14 (RX) RX → GPIO 15 (TX) VCC → 3.3V GND → GND	Sends real-time location data to the drone.

3. Obstacle Avoidance & Stability

Component	Pins	Connection Details
Ultrasonic Sensor (HC-SR04)	VCC → 5V GND → GND TRIG → GPIO 18 ECHO → GPIO 25	Detects obstacles to prevent crashes.
IMU Sensor (MPU6050)	SDA → GPIO 2 SCL → GPIO 3 VCC → 3.3V GND → GND	Maintains balance & stability during flight.

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4. Fire Suppression System

Component	Pins	Connection Details
Water/Foam Sprayer (Relay Module)	IN → GPIO 24 VCC → 5V GND → GND	Controls fire suppression activation.
Solenoid Valve	VCC → 12V (Battery) GND → GND	Opens/closes water or foam flow.
High-Pressure Pump	Power → 12V (Battery) Ground → GND	Sprays water/foam to extinguish fires.

5. Communication & Data Transmission

Component	Pins	Connection Details
WiFi/5G Module (ESP8266 / SIM7600)	TX → GPIO 14 (RX) RX → GPIO 15 (TX) VCC → 3.3V GND → GND	Sends real-time fire alerts & GPS location.
MQTT/Firebase IoT (Cloud Communication)	Connected via WiFi	Transmits fire alerts & live data to remote users.