ESP32 Main Board Connections (NodeMCU-ESP32)

1. Power Connections

- ESP32 5V → Breadboard +5V rail
- ESP32 GND → Breadboard GND rail

Everything else shares this GND and 5V, unless separately powered.

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2. IR Eye-Blink Sensor (3-pin module)

Pins on sensor: VCC – GND – OUT

Connect as follows:

| Sensor Pin | Connects To |
| --- | --- |
| VCC | ESP32 5V |
| GND | ESP32 GND |
| OUT | ESP32 GPIO 15 (your SENSOR_PIN in code) |

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3. GPS Module (NEO-6M or similar)

Pins: VCC – GND – TX – RX

| GPS Pin | Connects To |
| --- | --- |
| VCC | ESP32 5V |
| GND | ESP32 GND |
| TX | ESP32 RX2 → GPIO 16 *(or whatever RX pin you are using)* |
| RX | ESP32 TX2 → GPIO 17 *(optional, used only if sending commands)* |

(Your diagram shows only TX used, which is okay.)

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4. Vibration Motor With Transistor Driver

You are using:
✔ NPN Transistor
✔ Diode for flyback protection
✔ Motor powered by 9V battery

Connections:

| Part | Connection |
|------|------------|
| Motor + | 9V battery + |
| Motor – | Transistor Collector |
| Transistor Emitter | GND common with ESP32 |
| Transistor Base | ESP32 GPIO 19 through 1kΩ resistor |

Protection:

- Diode across motor terminals (reverse-biased)
    - Diode Cathode → Motor +
    - Diode Anode → Motor –

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5. Buzzer

Pins: + and –

| Pin | Connection |
|-----|------------|
| Buzzer + | ESP32 GPIO 5 |
| Buzzer – | GND |

ESP32-CAM Module Power & Stream

You are powering the ESP32-CAM from the main ESP32 board.

Power:

ESP32-CAM Pin Connects To

5V              ESP32 Main 5V

GND             ESP32 Main GND

Streaming:

No additional pins needed; it streams via WiFi on port 82.

Cam          on/off          happens          through          HTTP:
http://CAM_IP/on
http://CAM_IP/off

## 7. Summary of Primary GPIO Usage

| Feature | ESP32 GPIO |
|---|---|
| IR Eye Sensor | GPIO 15 |
| Buzzer | GPIO 5 |
| Motor Driver | GPIO 19 |
| Camera (separate board) | WiFi + HTTP only |
| GPS RX | GPIO 16 (if used) |
| GPS TX | GPIO 17 (main data line) |