

SMART SURVEILLANCE TURRET

Components Used in Our Model

1. Tactile Push Button Switch

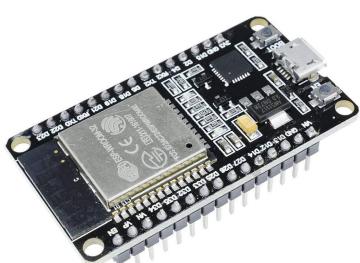


A tactile push button is a momentary contact switch that completes an electrical circuit when pressed. It features a spring mechanism that returns the button to its original position when released.

Working Principle: When the button is pressed, it closes the internal contacts, allowing current to flow through the circuit. Upon release, the spring pushes the button back, breaking the circuit connection.

Key Features: Low actuation force, tactile feedback, through-hole mounting, typically rated for 3-5V DC operation

2. ESP32 Development Board



The ESP32 is a powerful microcontroller with integrated Wi-Fi and Bluetooth capabilities. It serves as the brain of the surveillance turret, processing sensor data and controlling connected devices.

Working Principle: The ESP32 executes programmed instructions, reads inputs from sensors, processes data using its dual-core processor, and sends control signals to actuators. Its wireless capabilities enable remote monitoring and control.

Key Features: Dual-core 240MHz processor, built-in Wi-Fi & Bluetooth, multiple GPIO pins, ADC/DAC support, low power consumption modes

3. Lithium-Ion Battery Pack (14.8V, 2600mAh)



This rechargeable lithium-ion battery pack provides portable power to the surveillance turret system. It consists of multiple cells connected in series to achieve the required voltage.

Working Principle: During discharge, lithium ions move from the negative electrode to the positive electrode through an electrolyte, generating electrical current. The process reverses during charging, storing energy for future use.

Key Features: 14.8V nominal voltage (4S configuration), 2600mAh capacity, rechargeable, built-in protection circuit, approximately 38.48Wh energy storage

4. PIR Motion Sensor Module

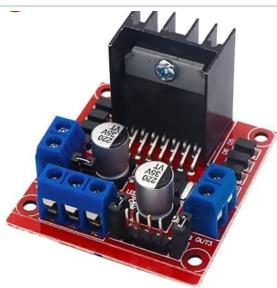


The PIR (Passive Infrared) sensor detects motion by measuring changes in infrared radiation in its field of view. It's essential for triggering the surveillance system when movement is detected.

Working Principle: The sensor contains pyroelectric elements that detect infrared radiation from warm objects. When a person or animal moves within range, the change in infrared levels triggers the sensor to output a digital signal to the microcontroller.

Key Features: Detection range up to 7 meters, 120° detection angle, adjustable sensitivity and time delay, 3.3V-5V operating voltage

5. L298N Motor Driver Module



The L298N is a dual H-bridge motor driver that controls the speed and direction of DC motors. It amplifies the low-power signals from the microcontroller to drive motors that require higher current.

Working Principle: The module uses H-bridge circuits to control motor direction by reversing polarity. PWM signals from the microcontroller regulate motor speed by rapidly switching power on and off. The integrated heat sink dissipates excess heat during operation.

Key Features: Dual motor control, 2A per channel (peak 3A), 5-35V operating voltage, built-in 5V regulator, forward/reverse/brake control

6. DC Geared Motor



A DC geared motor combines a standard DC motor with a gear reduction system to provide higher torque at lower speeds. It's used for precise positioning and rotation of the surveillance turret.

Working Principle: When voltage is applied, the DC motor's rotor spins due to electromagnetic interaction between the permanent magnets and the current-carrying coils. The attached gearbox reduces the rotational speed while increasing torque, enabling smooth and controlled movement.

Key Features: High torque output, variable speed control, compact size, low noise operation, typically 3-12V operating range

7. L7805 Voltage Regulator



The L7805 is a linear voltage regulator that provides a stable 5V output regardless of input voltage fluctuations. It ensures consistent power supply to sensitive electronic components like the microcontroller.

Working Principle: The regulator maintains a constant 5V output by continuously monitoring the output voltage and adjusting its internal resistance. Excess voltage is dissipated as heat through the metal tab, which should be mounted to a heat sink for efficient cooling.

Key Features: Fixed 5V output, 7-35V input range, up to 1.5A output current, built-in thermal overload protection, short circuit protection