

Wall · E Components						
Hardware Components June 2024 io1						
Electronics & Control						
No	QTY	Component	Description	Function in Project	Why This Component?	Photo
1	x1	ESP-WROOM-32 Dev Board 38pins	Dual-core microcontroller with Wi-Fi & Bluetooth by Espressif. Acts as the central processing unit for all logic, communication, and control tasks.	Acts as the brain of the robot, managing sensor input, motor control, communication, and logic.	Chosen for its wireless capabilities, performance, and large community. Ideal for embedded robotics.	
		Double H-bridge L293 DIP-16	Dual H-Bridge motor driver capable of driving two DC motors or one stepper motor. Supports bidirectional control.	Drives the left and right DC motors to enable robot locomotion.	Simple integration with microcontrollers, handles small DC motors efficiently.	
2	x1					
3	x1	TIP31C & 2N2222 Transistors	TIP31C: Medium-power NPN BJT, rated for 3A collector current, 40V Vce. 2N2222: Low-power NPN BJT with 800mA max current and fast switching.	TIP31C: Used as a switch for the laser. Receives signal from ESP32 and allows higher current to activate the laser safely. 2N2222: Used to switch the relay for the Taser. Prevented dangerous startup <small>had to use two for the laser driver</small> . Activates the Taser circuit when triggered.	Allows safe control of higher loads using GPIO signals.	
		5V Relay Module (1 channel)	Electromechanical switch that isolates and controls high-voltage circuits using low-voltage control.		Ensures electrical safety and modularity. Initially problematic, later replaced by transistor system.	
4	x1					
5	x2	LM2596 Step-Down Regulator	Step-down voltage regulator, input up to 35V, output adjustable, 3A max.	Converts 7.4V from battery to 3.3V for logic-level devices and 6V to Motors and High Voltage Generator	Maintains stable 3.3V for ESP32 and logic circuits from 7.4V Li-ion pack.	
		High Voltage Generator (Taser)	Generates high-voltage pulses (~10kV)	Powers the simulated "Taser" mechanism in the arm.	Mainly for curiosity and add a funny touch :)	
6	x1					
Power System						
No	QTY	Component	Description	Function in Project	Why This Component?	Photo
7	x1	18650 Battery Pack (2S1P, 7.4V 2200mAh)	Rechargeable lithium-ion battery pack configured as 2 cells in series for 7.4V output.	Provides main power supply for motors, logic, and peripherals.	Provides sufficient capacity and current for both logic and motors.	
		1A 8.4V Charger	Standard Li-ion battery charger for 2S (7.4V) configurations.	Recharges the main battery pack.	Matched to battery chemistry and voltage.	
8	x1					
9	x1	M430 Voltmeter & Ammeter	Measures and displays real-time voltage and current of the power supply.	Monitors battery status and power draw.	Prevents undervoltage and ensures safe operation.	
Mechanical Actuation & Movement						
No	QTY	Component	Description	Function in Project	Why This Component?	Photo
10		SG90 Micro Servo (Head)	Compact analog servo with ~180° movement range, low power consumption.	Controls lightweight parts like the neck articulation.	Budget-friendly and sufficient for one head. Future upgrade required.	
		MG996R Servo (Arms)	High-torque digital servo with metal gears, rotation of ~180°, operating at 4.8~7.2V.	Controls the arm movement for expression and motion.	Chosen for torque, accessibility and capacity, though near operational limit. Future upgrade required.	
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12		Yellow Gear Motors (L-shaped)	Main movement system	Main movement system. Future upgrade required.	Low-cost motors with adequate torque. Limited for heavy load.	
		Plastic Track System	Pre-assembled plastic track mechanism with wheels.	Provides traction, but due to poor fit, not fully functional.	Bought pre-assembled for ease; unfortunately, poorly designed, with wheels often slipping out.	
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3D Design & Materials						
No	QTY	Component	Description	Function in Project	Why This Component?	Photo
14		Fusion 360 Design	Autodesk Fusion is a commercial computer-aided design (CAD), has built-in capabilities for 3D modeling, collaboration, simulation and documentation.	Used to Design WALL·E's body, arms, and head components.	Ensures accurate fit, modularity, and presentation quality.	
		PLA Filament (Black, Yellow, Silver)	Thermoplastic material used for 3D printing parts.	Used to print WALL·E's body, arms, and head components.	Lightweight, good finish, and easy to post-process.	
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16		M4 Brass Inserts	Brass components used to reinforce screw holes in 3D printed parts.	Provides stronger and reusable screw threading in PLA pieces.	Avoids plastic cracking and adds professionalism.	
Auxiliary & Visual Effects						
No	QTY	Component	Description	Function in Project	Why This Component?	Photo
17		DFPlayer Mini	MP3 audio playback module with onboard microSD and speaker support.	Plays sound effects or voice commands from WALL·E.	Allows autonomous sound effects stored on microSD.	
		5mm Laser Diode (Red)	Compact red diode laser module operating at 5V.	Aesthetic effect used in the arm for visual targeting.	Aesthetic enhancement and directional indicator.	
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19		RGB LED (Common Anode)	Multi-color LED with 4 pins: one common anode and R/G/B cathodes.	Indicates Safe mode, green for safe, red for taser activated	For simplicity and a lot of documentation online	
		DPDT Switch	Double Pole Double Throw switch with two stable ON states.	Ensures manual override for safe operation.	A classic Switch	
20	x3					
21		40hm 3W speaker	Audio playback speaker, connected to DF player mini	Audio output for Sound effects and music	Maximum power and resistance supported by the DF player mini	
		Xbox Series Controller	Wireless Bluetooth gamepad compatible with ESP32 via BLE. Offers analog and digital input.	Used as the remote controller to wirelessly operate WALL·E's movement and features.	Chosen for its BLE compatibility, precision, and ergonomic design. Easy to integrate and intuitive for real-time control.	
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