

Robot Body: R2-D3 Dome Droid: Step-by-step build

Concept assembly guide derived from the staged build plan. Not a certified engineering drawing. Prices are estimates (Oct 2026); nothing here is a purchase.

Stage 1

1	Flash Raspberry Pi OS onto the 64 GB robot microSD card. Part R4: 64 GB microSD (robot card) x1 (\$10) Buy: Amazon search
2	Insert the card into your Pi 4B. Part R4: 64 GB microSD (robot card) x1 (\$10) Buy: Amazon search
3	Connect the Camera Module 3 ribbon to the Pi CAM port (contacts toward HDMI). Part R1: Raspberry Pi Camera Module 3 x1 (\$25) Buy: Raspberry Pi
4	Plug the USB mic into a blue USB 3 port. Part R2: USB mini microphone x1 (\$15) Buy: Amazon search
5	Solder headers onto the MAX98357A amp board. Part R3: MAX98357A I2S amp + 3 W speaker x1 (\$10) Buy: Adafruit
6	Wire amp VIN/GND/BCLK/LRC/DIN to Pi pins 2, 6, 12, 35, 40. Part R3: MAX98357A I2S amp + 3 W speaker x1 (\$10) Buy: Adafruit
7	Screw the 3 W speaker leads into the amp terminals. Part R3: MAX98357A I2S amp + 3 W speaker x1 (\$10) Buy: Adafruit
8	Print the desk stand / dome in PETG. Part R6: PETG filament (desk stand / dome, ~\$2 used) x1 (\$2) Buy: Amazon search
9	Mount the Pi 4B and 10-inch touchscreen on the stand. Part R6: PETG filament (desk stand / dome, ~\$2 used) x1 (\$2) Buy: Amazon search
10	Plug in the 5.1V 3A supply and boot. Part R5: Pi 4 USB-C 5.1V 3A supply (if needed) x1 (\$8) Buy: Raspberry Pi
11	Run rpikam-hello and confirm the camera image. Part R1: Raspberry Pi Camera Module 3 x1 (\$25) Buy: Raspberry Pi
12	Record and play back a test clip to check mic and speaker. Part R2: USB mini microphone x1 (\$15) Buy: Amazon search

Stage 2

13	Assemble fuse, switch, XT60 and 5V 5A buck into the bench power harness. Part R13: Fuse, switch, XT60, 5V 5A buck x1 (\$30) Buy: Amazon search
14	Verify 5.1 V under a 4 A dummy load before any board sees it. Part R13: Fuse, switch, XT60, 5V 5A buck x1 (\$30) Buy: Amazon search
15	Mount the 3S pack and BMS on the nylon-standoff thermal break. Part R12: 3S 5000 mAh LiPo + BMS + nylon-standoff thermal break x1 (\$51) Buy: Amazon search
16	Print the motor mounts in PETG. Part R15: Wiring + PETG x1 (\$45) Buy: Amazon search

- 17 Bolt the two JGB37-520 motors into the mounts on the chassis.**
Part R7: Chassis + 2x JGB37-520 encoder gearmotors + wheels x1 (\$56) Buy: [Amazon search](#)
- 18 Press the wheels onto the motor shafts; fit the casters.**
Part R7: Chassis + 2x JGB37-520 encoder gearmotors + wheels x1 (\$56) Buy: [Amazon search](#)
- 19 Solder headers on the TB6612FNG and plug it onto the breadboard/perfboard.**
Part R8: TB6612FNG motor driver x1 (\$6) Buy: [Pololu](#)
- 20 Wire ESP32-S3 PWM/DIR pins to the TB6612FNG.**
Part R9: ESP32 dev board (OWNED, from video: at least 2 on hand) x1 (\$0 owned) Buy: [Amazon search](#)
- 21 Connect motor leads and encoder wires; spin one motor and read encoder counts.**
Part R7: Chassis + 2x JGB37-520 encoder gearmotors + wheels x1 (\$56) Buy: [Amazon search](#)
- 22 Mount three HC-SR04P sensors front-left, front, front-right.**
Part R10: HC-SR04 ultrasonic sensor (OWNED: at least 1; buy only the shortfall to reach 3) x3 (≥ 1 owned) (\$0-6)
Buy: [Amazon search](#)
- 23 Wire the MPU-6050 to the ESP32 I2C pins.**
Part R11: MPU-6050 IMU x1 (\$4) Buy: [Amazon search](#)
- 24 Link Pi to ESP32 over UART; pull the cable and confirm motors stop within 300 ms.**
Part R9: ESP32 dev board (OWNED, from video: at least 2 on hand) x1 (\$0 owned) Buy: [Amazon search](#)
- 25 Balance-charge the 3S pack on the charger before first drive.**
Part R14: 6S-capable AC/DC balance charger (shared with drones) x1 (\$55) Buy: [Amazon search](#)

Stage 3

- 26 Cut and bolt the 2020 extrusion into the torso spine.**
Part R16: 2020 aluminum extrusion (torso) + printed shell x1 (\$40) Buy: [Amazon search](#)
- 27 Fasten the spine battery cradle to the extrusion.**
Part R22: Spine battery cradle + hardware x1 (\$16) Buy: [Amazon search](#)
- 28 Move the main pack from the deck into the spine cradle.**
Part R12: 3S 5000 mAh LiPo + BMS + nylon-standoff thermal break x1 (\$51) Buy: [Amazon search](#)
- 29 Mount the MG996R pan servo under the lazy-susan bearing.**
Part R17: MG996R pan servo on lazy-susan bearing x1 (\$12) Buy: [Amazon search](#)
- 30 Thread the head wiring through the slip ring.**
Part R18: MG90S tilt servo + slip ring x1 (\$17) Buy: [Amazon search](#)
- 31 Mount the MG90S tilt servo in the dome/head.**
Part R18: MG90S tilt servo + slip ring x1 (\$17) Buy: [Amazon search](#)
- 32 Bolt one MG996R shoulder servo on each side of the torso.**
Part R19: MG996R shoulder servos x2 (\$14) Buy: [Amazon search](#)
- 33 Wire all servos to the PCA9685 channels 0-3.**
Part R20: PCA9685 16-ch servo driver x1 (\$10) Buy: [Adafruit 815](#)
- 34 Feed the PCA9685 servo rail from the 6V 10A UBEC.**
Part R21: 6V 10A servo UBEC x1 (\$15) Buy: [Amazon search](#)
- 35 Clip the printed shell panels onto the torso.**
Part R16: 2020 aluminum extrusion (torso) + printed shell x1 (\$40) Buy: [Amazon search](#)

Stage 4

- 36** Insert two Molice P28A cells into the X1200 (check polarity).
Part R24: Molice P28A 18650 cells (UNVERIFIED owned; still a buy) x2 (\$15) Buy: [18650 Battery Store](#)
- 37** Stack the X1200 UPS board under the brain board.
Part R23: Geekworm UPS board (OWNED, from video; exact model unverified) x1 (\$0 owned) Buy: [Geekworm](#)
- 38** Replace the main battery lead with the XT90-S anti-spark pair + VBAT sense.
Part R25: XT90-S anti-spark pair + VBAT sense lead x1 (\$8) Buy: [Amazon search](#)
- 39** Pull the main pack and confirm the brain stays on.
Part R23: Geekworm UPS board (OWNED, from video; exact model unverified) x1 (\$0 owned) Buy: [Geekworm](#)
- 40** (Optional) Swap in the Pi 5 2GB as brain; Pi 4 moves to drone ground station.
Part R26: Raspberry Pi 5 2GB (optional brain upgrade) x1 (\$77.50) Buy: [Raspberry Pi](#)
- 41** (Optional) Press the Active Cooler onto the Pi 5.
Part R27: Pi 5 Active Cooler x1 (\$5) Buy: [Raspberry Pi](#)
- 42** (Optional) Flash the second microSD for the Pi 5.
Part R28: 64 GB microSD (second card) x1 (\$10) Buy: [Amazon search](#)

Stage 5

- 43** Mount the reSpeaker XVF3800 flat on top of the head.
Part R29: reSpeaker XVF3800 mic array x1 (+\$46) Buy: [Amazon search](#)
- 44** Mount the LD19 lidar on the top deck; fit three VL53L1X ToF sensors.
Part R30: LD19 lidar + 3x VL53L1X ToF x1 (+\$117) Buy: [Amazon search](#)
- 45** Swap in the Pololu 37D encoder motors.
Part R31: Pololu 37D encoder motors x2 ((in \$135)) Buy: [Pololu 4753](#)
- 46** Fit the Pololu wheels and hubs.
Part R32: Pololu wheels / hubs x1 ((in \$135)) Buy: [Pololu 2762](#)
- 47** Replace the TB6612 with the Cytron 10A driver.
Part R33: Cytron 10A dual motor driver x1 ((in \$135)) Buy: [Amazon search](#)
- 48** Install the Bioenno LiFePO4 pack and INA226 monitor in the spine.
Part R34: Bioenno 12.8V LiFePO4 pack + INA226 x1 (+\$77) Buy: [Amazon search](#)
- 49** Upgrade arms to Feetech STS bus servos; add the BNO085 IMU.
Part R35: BNO085 IMU + Feetech STS bus servos x1 (+\$95) Buy: [Amazon search](#)
- 50** Print the ASA outdoor shell; fit gaskets, E-stop and fan.
Part R36: ASA shell, gaskets, wiring, E-stop, fan x1 (+\$170) Buy: [Amazon search](#)

Add-on

- 51** (Add-on) Plug the SIM7600G-H dongle into a USB port.
Part R37: SIM7600G-H 4G dongle (add-on) x1 (+\$90) Buy: [Waveshare](#)
- 52** (Add-on) Install the A123 structural pouch pack after Stage 5.
Part R38: 4S A123 pouch structural pack (add-on) x1 (+\$195) Buy: [Amazon search](#)