

Readiness report — NASA JPL Open Source Rover

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Readiness: NASA JPL Open Source Rover

Verdict: Ready with caveats · 2026-09-02 · est. parts cost \$1,900–\$2,400 **Cybersecurity — software & network: Review before networking**

The rover is buildable today, and it is in better shape than at the last check: both problems that headlined the 2026-07-19 report have cleared. The Molex 1726750613 power header, previously out of stock everywhere on a 36-week lead, is back in stock at DigiKey, and the PPTC021LFBN-RC socket that needed a substitute is stocked again at 25,733 pieces — so the substitute the last report recommended is no longer needed. Every other line of the custom-PCB bill of materials that was checked is Active and in stock. The verdict stays at Ready with caveats, but for new reasons. One BOM line does not resolve to a real product: the 12 V regulator is listed as "Pololu D24V50F12 (#2855)", and Pololu item #2855 is in fact a 12 V 2.2 A regulator, well under the 5 A this rover's own specification calls for — that has to be settled before ordering. Beyond that, the two biggest cost centres, the RoboClaw motor controllers and the entire goBILDA chassis, come from single vendors with no authorised-distributor fallback, and the Molex header is stocked at exactly one warehouse. The cost estimate is not directly comparable with the last report's \$1,250–\$1,480: this check prices more of the goBILDA bill and corrects a wrong price the last report carried for the 5 V regulator.

Action required

Part	Problem	Recommended action
Pololu D24V50F12 (#2855)	New since the last report. The BOM line is self-contradictory. Pololu item #2855 is the D24V22F12, 12 V at 2.2 A (input 12.7–36 V) — not a "D24V50F12", and no product by that name appeared anywhere in this check. The rover's own spec for this rail is 12 V at 5 A.	Settle the identity on Pololu's site before ordering. The nearest evidence-backed part found, the 12 V 4.5 A regulator at \$31.95 , still falls short of the stated ≥ 5 A requirement, so it is not a clean drop-in.
goBILDA chassis (57 lines)	Single-vendor. Six representative part numbers spanning motor, servo, ServoBlock, wheel, beam and fastener all returned no match at DigiKey and no ECIA-authorised distributor.	Order direct from goBILDA and budget lead time; there is no distributor fallback. Apply for the educational discount if eligible.
Basic Micro RoboClaw 2x7A (x3)	Single-vendor and protocol-locked — the ROS driver depends on RoboClaw's proprietary packet-serial protocol, so no substitute is possible.	Order direct from Basic Micro; vendor page reads In Stock at \$79.95. Buy spares if the budget allows.

Part	Problem	Recommended action
Molex 1726750613 (x6)	Resolved since the last report, but DigiKey is the only distributor holding stock (Newark, ICC, Heilind and Avnet all show zero).	Order all six at once rather than in stages.
goBILDA 5203-2402-0027 encoder spec	The vendor page states 751.8 PPR at the output shaft and 530 oz-in stall torque; the lab's own snapshot records 537.7 PPR and 258 oz-in.	Re-derive the encoder counts from the vendor page before setting the ROS launch parameters, or odometry will be wrong.

Cybersecurity — software & network

Review before networking — No advisories could be checked because nothing in the stack is version-pinned, and the rover ships with SSH enabled and an auto-starting service that accepts drive commands over the local network with no documented access control.

Component	Version	How known	Support status
Ubuntu LTS 24.04 (Noble Numbat) - documented target image	24.04	inferred (The lab's setup notes say to flash the latest Ubuntu LTS with Raspberry Pi Imager and name Noble as tested (snapshot); no image file or checksum is pinned.)	supported until 2029-05-31
Ubuntu LTS 22.04 (Jammy Jellyfish) - alternative tested image	22.04	inferred (Listed in the setup notes as a tested release (snapshot).)	supported until 2027-06-01
Ubuntu LTS 20.04 (Focal Fossa) - alternative tested image	20.04	inferred (Listed in the setup notes as a tested release (snapshot).)	extended/LTS support only until 2030-04-23
ROS 2 Jazzy Jalisco (robotics middleware)	jazzy	inferred (Setup notes state 'In what follows, we assume ROS 2 Jazzy' (snapshot); installed with an unconstrained 'apt install ros-\${ROS_DISTRO}-ros-base', so no package version is pinned.)	supported until 2029-05-31
nasa-jpl/osr-rover-code (ROS packages osr_bringup, osr_control, osr_interfaces, osr_gazebo)	0.0.0	read from project (ROS/osr_control/setup.py (fetched/05-setup.py) declares version='0.0.0'; the repository itself is cloned with a bare 'git clone', with no tag or commit pinned.)	—

Component	Version	How known	Support status
ROS 2 dependency set declared in package.xml	not determined	unpinned (37 dependencies across four fetched package.xml manifests, none carrying a version constraint - ROS package manifests do not express versions, so what gets installed is whatever the apt repository serves that day.)	—
Python packages installed by pip (adafruit-circuitpython-servokit, ina260, RPi.GPIO, smbus)	not determined	unpinned (Installed by a bare 'python3 -m pip install adafruit-circuitpython-servokit ina260 RPi.GPIO smbus' in the setup notes (snapshot); no requirements.txt or lockfile exists in the project.)	—
System and build packages installed by apt (git, python3-rosdep, python3-pip, python3-colcon-common-extensions, raspi-config, ros-\${ROS_DISTRO}-joy)	not determined	unpinned (Bare 'apt install' commands in the setup notes (snapshot); versions are whatever the OS repository serves.)	—
Basic Micro RoboClaw 2x7A motor-controller firmware	4.2.8	inferred (The setup notes record roboclawtest.py reporting 'USB Roboclaw 2x7a v4.2.8' (snapshot); the firmware itself was not fetched.)	—

Component	Finding	Severity	Fix available?
nasa-jpl/osr-rover-code (ROS packages osr_bringup, osr_control, osr_interfaces, osr_gazebo)	The rover's own control code is installed with a bare 'git clone' at no tag or commit, so each class gets whatever is on the default branch that day and a lab that worked last term may not build this term.	posture	Mitigation only - clone a tagged release or record the commit hash the class was built against
osr_startup.service / ROS 2 DDS networking	The rover boots straight into a systemd service that launches the ROS 2 stack, which listens on local-network UDP and multicast for discovery and for the drive-command topics /cmd_pwm and /joy; the lab's own documentation records no authentication or access control on those topics.	posture	Mitigation only - keep the rover on an isolated segment and never run it on an open or shared campus network
Python packages installed by pip (adafruit-circuitpython-servokit, ina260, RPi.GPIO, smbus)	Dependencies unpinned: 4 of 4 Python packages are installed by a bare pip command with no requirements.txt or lockfile, so two builds a year apart run different code and neither can be checked for known vulnerabilities.	posture	Mitigation only - pin the four packages in a requirements.txt and install from it

Component	Finding	Severity	Fix available?
ROS 2 dependency set declared in package.xml	Dependencies unpinned: 37 of 37 across the four package.xml manifests, so the rover's ROS 2 software has no fixed, checkable version set and no advisory lookup is possible against it.	posture	Mitigation only - record the ROS 2 distro and the apt package versions used by the class, and rebuild from that record
SSH server on the Raspberry Pi	The build instructions turn on SSH at imaging time so the rover can be reached headless over Wi-Fi, which means any machine on the same network can attempt to log in; the credentials are chosen by the builder, so the strength of that login is entirely down to what the student typed.	posture	Mitigation only - put the rover on an isolated network segment, require a strong unique password or key-only login, and clear it with campus IT before connecting
Ubuntu LTS 20.04 (Focal Fossa) - alternative tested image	One of the three Ubuntu releases the lab documents as tested, 20.04 Focal Fossa, left standard support on 2025-05-31 and now receives security updates only through Ubuntu Pro / ESM, so a rover built on it stops getting ordinary patches.	posture	Yes - update to 24.04
Udev rules installed to /etc/udev/rules.d/	The setup installs udev rules granting world read/write (0666) on the serial and input devices, so any local account on the Pi can drive the motors or read the gamepad, not just the rover's own user.	posture	Mitigation only - narrow the udev rules to the rover's user or group instead of 0666

What this means for your lab

Nothing here is a known break-in bug - no vulnerability database covers this software in a way that could be checked, which is not the same as it being clean. The real issue is reach. The rover is built to be logged into over Wi-Fi by design, and once it boots it automatically starts a service that listens on the local network for the messages that make its wheels turn; the lab's documentation describes no password or permission check on those driving messages. In practice that means anyone else on the same Wi-Fi - a shared campus, dorm or lab network - may be able to reach the rover, and the only door with a lock on it is the SSH login whose password the student chose during setup. Treat the rover as an unprotected device on whatever network you put it on: give it its own isolated network or a dedicated access point rather than the main campus Wi-Fi, insist on a strong unique password (not the classroom default everyone shares), and talk to campus IT before it goes on an institutional network. Two smaller housekeeping points: the software is installed without any version pinning at all, so a build that works this term may behave differently next term and cannot be security-

checked; and if you image with Ubuntu 20.04 rather than the documented 24.04, you are on a release that has stopped receiving ordinary security updates.

Not checked

- ROS 2 dependency set declared in package.xml (37 dependencies): ROS package.xml carries no version constraints, so there is no exact version to match against an advisory database; no OSV lookup was possible.
- Python packages installed by pip (adafruit-circuitpython-servokit, ina260, RPi.GPIO, smbus): Unpinned - the project states no version, and a guessed version would produce a meaningless result.
- System and build packages installed by apt: Unpinned - versions come from whatever the OS repository serves at build time.
- Basic Micro RoboClaw 2x7A firmware v4.2.8: Vendor embedded firmware; no public advisory database covers it.
- nasa-jpl/osr-rover-code application code: Source-only checkout with no registry release; no advisory database covers it.
- Ubuntu and ROS 2 packages as actually installed on the rover: Installed unpinned from apt at build time; only the platform release's support status could be checked, not the package set.
- ros jazzy: support status: version matches no release cycle on endoflife.date

Parts

1. Custom PCB bill of materials (DigiKey)

Part	Spec/ Package	Status	Stock	Price	Source	Drift
C317C103K5R5TA7301	0.01 μ F 50 V X7R radial, 5.08 mm	Active	38,448	\$0.45	DigiKey	\$0.35 $\rightarrow$ \$0.45 (+29%)
ESK107M050AG3EA	100 μ F 50 V radial can, 3.50 mm	Active	DigiKey: not published; Newark 858	\$0.36	DigiKey / Newark \$0.443	new baseline
C322C104K5R5TA7317	0.1 μ F 50 V X7R radial, 5.08 mm	Active	14,701	\$1.23	DigiKey	\$0.94 $\rightarrow$ \$1.23 (+31%)

Part	Spec/ Package	Status	Stock	Price	Source	Drift
ESK106M050AC3DA	10 μ F 50 V radial can, 2.00 mm	Active	29,541	\$0.20	DigiKey	prev. report priced the - AC3AA variant
STPS10L25D	Schottky 25 V 10 A, TO-220AC	Active	2,758	\$2.66	DigiKey	\$2.51 $\rightarrow$ \$2.66 (+6%)
1N4148	75 V 300 mA, DO-35 axial	Active	763,524	\$0.10	DigiKey	price flat; stock 997k $\rightarrow$ 764k
2N3906TA	PNP BJT, TO-92-3	Active	4,389	\$0.27	DigiKey	flat
CF14JT / CD14ZT / CF18JT resistor group (9 values)	Axial carbon film, 0.25 W (68 Ω is 0.125 W), $\pm$ 5%	Active (representative CF14JT4K70)	139,905	\$0.10	DigiKey	flat; 8 of 9 values not individually checked
MIC2937A-3.3WT	LDO 3.3 V 750 mA, TO-220-3	Active	603	\$3.02	DigiKey	price flat; stock 360 $\rightarrow$ 603
DC10CGKWA	10-seg green bar graph, DIP-20	Active	857	\$4.69	DigiKey	flat
206-124	SPDT slide DIP, 2.54 mm	Active	7,714	\$2.34	DigiKey	flat
C3920BAAAA	ON-OFF- ON toggle, panel mount	Active	813	\$10.30	DigiKey	flat
696108003002	5x20 mm PCB fuse clip	Active	32,135	\$0.64	DigiKey	flat
0233010.MXP	10 A 5x20 mm glass fuse	Active	1,319	\$1.56	DigiKey	flat

Part	Spec/ Package	Status	Stock	Price	Source	Drift
TSW-104-07-F-T	3x4 header, 2.54 mm	Active	171	\$1.04	DigiKey	price flat; stock 227 → 171
PEC08SAAN	1x8 header, 2.54 mm	Active	8,488	\$0.52	DigiKey (only stocking distributor)	\$0.82 → \$0.52; prev. "discontinued" not supported
PPTC102LFBN-RC	2x10 female socket, 2.54 mm	Active	3,820	\$1.32	DigiKey	flat
SBH11-PBPC-D20-ST-BK	2x20 shrouded header, 2.54 mm	Active	28,699	\$0.66	DigiKey	flat
B6B-PH-K-S(LF)(SN)	1x6 JST PH header, 2.00 mm	Active	29,733 (DigiKey) + 5 ECIA distributors	\$0.28	DigiKey	\$0.27 → \$0.28
0702462001	2x10 shrouded header, 2.54 mm	Active	4,006	\$3.09	DigiKey	price flat; stock 6,971 → 4,006
PPTC021LFBN-RC	1x2 female socket, 2.54 mm	Active	25,733	\$0.27	DigiKey (only stocking distributor)	was out of stock (11-wk lead) → now stocked
OSTTA024163	2-pos screw terminal, 5.08 mm	Active	34,635	\$0.72	DigiKey	flat
1726750613	2x3 power header, 4.20 mm	Active	3,734	\$2.74	DigiKey (only stocking distributor)	was out of stock everywhere, 36-wk lead → now stocked
EDSTL130/24	1x24 terminal header, 5.00 mm	Active	17,857	\$6.71	DigiKey	\$4.73 → \$6.71 (+42%)

Part	Spec/ Package	Status	Stock	Price	Source	Drift
0395016006	1x6 Eurostyle PCB header, 3.50 mm	Active	9,324	\$2.46	DigiKey	flat
0395005006	1x6 Eurostyle plug, 3.50 mm	Active	12,032	\$3.07	DigiKey	flat

2. Active modules, computing and power

Part	Spec/Package	Status	Stock	Price	Source	Drift
Raspberry Pi 5	SBC, 40-pin GPIO, dual UART	Active	in stock	\$60.00	CanaKit	\$59.99 → \$60.00
MicroSD card 32 GB	Class 10 UHS-I	Active	in stock	\$10.25	Camera Film Photo	new baseline
Basic Micro RoboClaw 2x7A (x3)	Dual 7.5 A brushed H- bridge, packet serial	In Stock (vendor page)	in stock	\$79.95	Basic Micro (IMC404)	\$75.00 → \$79.95 (+6.6%)
Adafruit PCA9685 (815)	16-ch 12-bit PWM, I2C 0x40	Active	in stock	\$14.95	Adafruit	flat
Adafruit INA260 (4226)	I2C current/ power monitor, 15 A	Active	in stock	\$9.95	Adafruit	flat
Pololu D24V50F5 (#2881)	5 V 5 A buck	Active	in stock	\$32.95	Pololu	prev. \$18.95 was a different part; \$32.95 is the corrected baseline
Pololu D24V50F12 (#2855)	12 V 5 A buck required	BOM line does not resolve	—	—	see Action required	prev. priced \$29.95 without catching the mismatch
DC power meter LCD panel	DC 6.5–100 V / 20 A panel meter	Active	in stock	\$11.25	DROK	\$12.50 → \$11.25 (–10%)
4S LiPo battery	14.8 V, 5000 mAh, 50C, XT60	Active	in stock	\$47.99	RCBattery.com	\$53.99 → \$47.99 (–11%)

Part	Spec/Package	Status	Stock	Price	Source	Drift
LiPo balance charger	IMAX B6-class, 80 W	Active	in stock	\$28.80	Porcupine RC	new baseline
Fireproof LiPo bag	Flame-retardant charging sack	Active	in stock	\$8.99	Zeee	new baseline
Gamepad + wireless adapter	Xbox Wireless Controller + USB adapter	Active	in stock	\$76.55	Rarewaves	new baseline

3. Wiring, connectors and standoffs

Part	Spec/Package	Status	Stock	Price	Source	Drift
18 AWG 2-cond. red/black	Primary DC power runs	Active	in stock	\$0.14	Missouri Wind and Solar	new baseline
20 AWG 3-cond.	Servo and auxiliary power	Active	in stock	\$1.75	Tiny's LEDs	new baseline
22 AWG 4-cond.	Encoder and serial signals	Active	in stock	\$4.46	DigiKey (Belden 88444)	new baseline
Adafruit 1988	40-pin GPIO ribbon, F-F	Active	in stock	\$2.95	Adafruit	new baseline
USB-C power pigtail	5 V 5 A injection for RPi 5	Active	in stock	\$5.41	eBay	new baseline
XT30 connectors (DFRobot FIT0586)	15 A continuous, 5 pairs	Active	8,800	\$1.90	DigiKey	new baseline
JST-XH 4-pos encoder harness (x6)	4-pos JST XH to 4x 1-pos TJC8, 300 mm	Active	in stock	\$3.99	RobotShop (ServoCity)	new baseline
Molex 0469920610 (x6)	6-pin Mini-Fit receptacle housing	Active	16,463	\$0.73	DigiKey	new baseline
Molex 0039000077 (x36+)	Female crimp terminal	Active	390,187	\$0.10	DigiKey	new baseline
DuPont 2.54 mm housings + pins	3-pos x4, 4-pos x8, 44+ pins	Active	in stock	\$5.26	Banggood (620-pc kit)	new baseline
3.5 mm female bullet connectors (x12)	With insulating sleeves	Active	in stock	\$3.99	ServoCity	new baseline
M2.5 standoff assortment kit	Brass/nylon, 6–20 mm	not checked	—	—	—	—

4. goBILDA powertrain and structure

No goBILDA part is carried by DigiKey or by any ECIA-authorised distributor — six representative part numbers were checked and all came back with no match. Everything below is vendor-direct.

Part	Spec/Package	Status	Stock	Price	Source	Drift
3616-0014-0144 (x6)	Wasteland Wheel, 144 mm x 52 mm	Active	in stock	\$24.99	goBILDA	flat
5203-2402-0027 (x6)	Yellow Jacket 26.9:1, 223 RPM, 8 mm REX	Active	in stock	\$54.99	goBILDA	flat
3202-0001-2501 (x4)	ServoBlock, 25T spline, hub-shaft	Active	in stock	\$34.99	goBILDA	flat
2000-0025-0002 (x4)	Dual Mode Servo, 25-2 torque	Active	in stock	\$36.99	goBILDA	flat
1106-0029-0232 (x7)	Square Beam, 29 hole, 232 mm	Active	in stock	\$3.99	goBILDA	new baseline
1608-0001-0001 (x1)	Idler Bearing-Hub, 32 mm OD	Active	in stock	\$16.99	goBILDA	new baseline
2805-0004-0108 (x1 pack)	Hurricane Nut for goRAIL, 25-pack	Active	in stock	\$12.99	goBILDA	new baseline

The remaining structural, spacer, bracket and fastener lines were not individually priced this check — they are the same single vendor whose channel status is established above, so their risk is vendor-level rather than per-part. They are listed here so the next check has a baseline.

Part	Spec	Qty	Status	Stock	Price	Source	Drift
1401-0043-0036	2-side 2-post clamping mount, 43 mm / 36 mm bore	6	not checked	—	—	goBILDA	—
1310-0016-4008	Hyper Hub, 8 mm REX bore	6	not checked	—	—	goBILDA	—
1120-0002-0072	U-Channel, 2 hole, 72 mm	8	not checked	—	—	goBILDA	—
1109-0024-0144	goRAIL, 144 mm	4	not checked	—	—	goBILDA	—
1121-0004-0120	Low-Side U-Channel, 4 hole, 120 mm	4	not checked	—	—	goBILDA	—
1120-0001-0048	U-Channel, 1 hole, 48 mm	2	not checked	—	—	goBILDA	—

Part	Spec	Qty	Status	Stock	Price	Source	Drift
1309-0016-0008	Sonic Hub, 8 mm bore	2	not checked	—	—	goBILDA	—
1611-0514-0008	Flanged ball bearing, 8x14x5 mm (2-pack)	2	not checked	—	—	goBILDA	—
1504-0032-0020	32 mm OD pattern spacer, 2 mm	4	not checked	—	—	goBILDA	—
2100-0008-0050	Stainless round shaft, 8 mm x 50 mm	2	not checked	—	—	goBILDA	—
1102-0003-0024	Flat Beam, 3 hole, 24 mm (2-pack)	4	not checked	—	—	goBILDA	—
1221-0032-0002	2-side 2-post pattern mount (32-2)	4	not checked	—	—	goBILDA	—
1126-0001-0001	Steel flat bracket (1-1) (2-pack)	2	not checked	—	—	goBILDA	—
1116-0024-0040	Grid Plate, 3x5 hole, 24x40 mm	8	not checked	—	—	goBILDA	—
1111-0003-0001	Angle pattern bracket (3-1)	2	not checked	—	—	goBILDA	—
1118-0024-0096	Open goRAIL, 96 mm	6	not checked	—	—	goBILDA	—
1118-0024-0288	Open goRAIL, 288 mm	2	not checked	—	—	goBILDA	—
1111-0001-0001	Angle pattern bracket (1-1, 45°)	4	not checked	—	—	goBILDA	—
1137-0001-0001	Steel flat grid bracket (1-1, 90°) (2-pack)	1	not checked	—	—	goBILDA	—
1916-0014-0072	Plastic hub-mount control arm, 72 mm	4	not checked	—	—	goBILDA	—
1522-0010-0060	8 mm ID spacer, 10 mm OD, 6 mm (4-pack)	1	not checked	—	—	goBILDA	—
1522-0010-0040	8 mm ID spacer, 10 mm OD, 4 mm (4-pack)	1	not checked	—	—	goBILDA	—
1118-0024-0120	Open goRAIL, 120 mm	2	not checked	—	—	goBILDA	—
1604-0043-0032	2-side 2-post pillow block, 32 mm bore	4	not checked	—	—	goBILDA	—

Part	Spec	Qty	Status	Stock	Price	Source	Drift
1506-0032-0006	32 mm ID spacer, 36 mm OD, 6 mm (2-pack)	3	not checked	—	—	goBILDA	—
1106-0041-0328	Square Beam, 41 hole, 328 mm	4	not checked	—	—	goBILDA	—
1106-0012-0096	Square Beam, 12 hole, 96 mm	8	not checked	—	—	goBILDA	—
1101-0041-0328	U-Beam, 41 hole, 328 mm	1	not checked	—	—	goBILDA	—
1102-0007-0056	Flat Beam, 7 hole, 56 mm (2-pack)	2	not checked	—	—	goBILDA	—
1205-0001-0004	Dual block mount (1-4) (2-pack)	2	not checked	—	—	goBILDA	—
1203-0001-0001	Block mount (1-1, 90° gusset) (4-pack)	1	not checked	—	—	goBILDA	—
2808-0004-0050	Stainless threaded rod, M4 x 50 mm (2-pack)	1	not checked	—	—	goBILDA	—
2913-0004-0241	Steel ball linkage, female M4, 24.1 mm (2-pack)	2	not checked	—	—	goBILDA	—
2902-0003-0001	Plastic hinge (2-pack)	2	not checked	—	—	goBILDA	—
1501-0006-0080	M4 standoff, 6 mm OD, 8 mm (4-pack)	2	not checked	—	—	goBILDA	—
1501-0006-0220	M4 standoff, 6 mm OD, 22 mm (4-pack)	2	not checked	—	—	goBILDA	—
1500-0010-0006	Plastic spacer, 6 mm ID x 8 mm OD, 1 mm (12-pack)	1	not checked	—	—	goBILDA	—
1102-0002-0016	Flat Beam, 2 hole, 16 mm (2-pack)	2	not checked	—	—	goBILDA	—
2911-0014-0001	Plastic cable grommet (14-1) (12-pack)	1	not checked	—	—	goBILDA	—
2801-0004-0008	Steel washer, M4 x 8 mm OD (25-pack)	1	not checked	—	—	goBILDA	—
2811-0004-0007	Steel hex nut, M4 x 7 mm (25-pack)	4	not checked	—	—	goBILDA	—
2812-0004-0007	Nylon-insert locknut, M4 x 7 mm (25-pack)	1	not checked	—	—	goBILDA	—

Part	Spec	Qty	Status	Stock	Price	Source	Drift
2802-0004-0006	Button head screw, M4 x 6 mm (25-pack)	2	not checked	—	—	goBILDA	—
2802-0004-0010	Button head screw, M4 x 10 mm (25-pack)	3	not checked	—	—	goBILDA	—
2802-0004-0016	Button head screw, M4 x 16 mm (25-pack)	2	not checked	—	—	goBILDA	—
2800-0004-0008	Socket head screw, M4 x 8 mm (25-pack)	2	not checked	—	—	goBILDA	—
2800-0004-0010	Socket head screw, M4 x 10 mm (25-pack)	3	not checked	—	—	goBILDA	—
2800-0004-0012	Socket head screw, M4 x 12 mm (25-pack)	1	not checked	—	—	goBILDA	—
2800-0004-0016	Socket head screw, M4 x 16 mm (25-pack)	2	not checked	—	—	goBILDA	—
2800-0004-0020	Socket head screw, M4 x 20 mm (25-pack)	1	not checked	—	—	goBILDA	—

5. Assembly tools and consumables

Part	Spec/Package	Status	Stock	Price	Source	Drift
Loctite 242 blue threadlocker	Removable medium-strength	not checked	—	—	—	—
7 mm nut driver	Hollow shaft, for M4 hex nuts	not checked	—	—	—	—
2.5 mm and 3.0 mm ball-end hex keys	M4 button/socket head screws	not checked	—	—	—	—
Ratcheting terminal crimper	Molex Mini-Fit, JST-XH, DuPont	not checked	—	—	—	—

Substitutes

For part	Substitute	Differences	Verified	Judgment
ESK107M050AG3EA (DigiKey publishes no stock figure)	KEMET ESK107M050AG3AA — \$0.36, 12,845 in stock	Identical on every constraint the lab states: 100 μ F, 50 V, $\pm 20\%$, radial can, through hole. DigiKey classes it a parametric equivalent.	verified: capacitance, voltage rating, tolerance, radial-can through-hole mounting (DigiKey parametrics on the original; exact-match lookup on the substitute). not verified: lead spacing and can diameter — the substitute's lookup returned no parametrics block, so the original's 3.50 mm lead spacing and 8.00 mm diameter could not be matched against it.	Electrically equivalent; footprint not verified. Usable, but check lead spacing on the datasheet first. Alternatively the exact part is stocked at Newark (858 @ \$0.443).

Instructor: verify any substitute against its datasheet before ordering.

Other dependencies

- **Custom PCB fabrication** — Brain Board and Motor Board, 2-layer FR-4, 1.6 mm, 1 oz copper, from gerber archive v2.0.2, suggested vendor JLCPCB. Status: not checked. (v2.0.2 is the board revision, not a software version.)
- **Laser-cut body panels** — DXF profiles, 3 mm acrylic, MDF or birch; services cited are SendCutSend and Sculpteo. Status: not checked.
- **OnShape hosted CAD assembly** — the complete 3D model lives only in OnShape (document e4f00b1a3d2edb1a84bba1c), not as STEP or native files in the bundle. Status: not checked.
- **OSHA certification record US002551** — <https://certification.oshwa.org/us002551.html>. Status: not checked.
- **Source repositories** — <https://github.com/nasa-jpl/open-source-rover> (hardware and documentation) and <https://github.com/nasa-jpl/osr-rover-code> (onboard code). Both reachable this check; the software pass listed and fetched files from osr-rover-code.
- **goBILDA educational discount form** — 123FormBuilder portal, third-party hosted. Status: not checked.

Watch list

- **Basic Micro RoboClaw 2x7A** — three per rover, one vendor, no possible substitute because the ROS driver speaks RoboClaw's proprietary protocol. If Basic Micro stops selling it, the lab needs a new motor-control layer, not a new part number.
- **The whole goBILDA chassis** — 57 lines, one vendor, no distributor fallback. A discontinued series here halts assembly.
- **Molex 1726750613** — recovered from a 36-week stockout, but DigiKey is the only warehouse holding it. This is the line most likely to relapse.
- **Samtec TSW-104-07-F-T** — stock fell from 227 to 171. The thinnest stock figure in the electronics BOM.
- **Pololu 12 V regulator** — unresolved identity; until the BOM line is corrected, the 12 V rail has no confirmed part.
- **On Shore EDSTL130/24** — up 42% in six weeks (\$4.73 → \$6.71). Worth re-pricing next check.
- **Sullins PEC08SAAN and PPTC021LFBN-RC** — both Active now, but DigiKey is the sole stocking distributor for each.