

# Readiness report — AMSAT CubeSatSim — CubeSat Simulator (hardware v2.1.0)

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## Readiness: AMSAT CubeSatSim — CubeSat Simulator (hardware v2.1.0)

**Verdict: Ready with caveats** · 2026-09-02 · est. parts cost insufficient pricing

**Cybersecurity — software & network: Do not place on an open network**

Verdict unchanged from this morning's report. Every part carried by authorized catalog distributors is Active with healthy stock and identical pricing, and the retail breakout modules remain widely listed. The caveats are unchanged too: the two RF transceiver modules — SR105U (U6) and the Dorji DRA818V alternative (U7) — are absent from every ECIA-authorized distributor and can only be bought through maker marketplaces and direct vendor storefronts. Today none of those retail product pages could be fetched for confirmation, so their listings are reported from search results and should be verified manually before ordering. The exact Sseed ferrite part number is likewise not distributor-stocked, but a fully verified Murata drop-in is plentiful.

### Action required

| Part                                    | Problem                                                                                                                                                        | Recommended action                                                                                                                                                      |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SR105U (U6 - Main Board)                | Not stocked by any authorized distributor; specialty sourcing only. Retail listings could not be re-verified today (product-page fetches returned no content). | Order via the <a href="#">odlstore listing</a> or the earlier-revision <a href="#">SR-FRS-0W5U at dwmzone</a> ; verify the live listing and footprint before purchase.  |
| Dorji DRA818V (U7 - Main Board)         | Not stocked by any authorized distributor; maker/hobbyist channels only. Tindie and dorji.com pages could not be fetched today.                                | If building the VHF configuration, order via <a href="#">Tindie (DORJI store)</a> , <a href="#">uputronics</a> or <a href="#">eBay</a> ; verify the live listing first. |
| 303030001 ferrite (L1, L2 - Main Board) | Sseed part number not carried by DigiKey or any ECIA distributor.                                                                                              | Use the verified substitute <a href="#">BLM18AG121SN1D</a> (Murata, \$0.10, 706,396 in stock).                                                                          |

## Parts

### 1. Integrated Circuits and Proprietary Modules

| Part                                            | Spec/Package                             | Status            | Stock    | Price                   | Source                                | Drift                                   |
|-------------------------------------------------|------------------------------------------|-------------------|----------|-------------------------|---------------------------------------|-----------------------------------------|
| Raspberry Pi Pico (U1)                          | Microcontroller board, 3.3V logic        | Readily available | In stock | <a href="#">\$3.95</a>  | PiShop USA                            | prev. \$2.99 (Micro Center); comparable |
| SR105U (U6)                                     | 0.5W UHF FM module, footprint SR_FRS_0W5 | Hard to obtain    | Listed   | <a href="#">listing</a> | odlstore (unverified today)           | prev. \$22.50; unconfirmed              |
| Dorji DRA818V (U7)                              | VHF FM module, footprint DORJI_DRA818V   | Hard to obtain    | Listed   | <a href="#">listing</a> | Tindie DORJI store (unverified today) | prev. \$8.98; unconfirmed               |
| INA219AIDR (U2, U10-U14 Solar; U2 Battery)      | Digital current/power monitor, SOIC-8    | Readily available | 29,736   | <a href="#">\$2.12</a>  | DigiKey                               | none                                    |
| INA219 "Purple Board" (U1 Battery; U3-U8 Solar) | Sensor breakout module                   | Readily available | In stock | <a href="#">\$9.95</a>  | Adafruit (generics from \$1.25)       | prev. \$6.90; comparable                |
| MPU6050 Module (J4)                             | 6-DOF IMU breakout                       | Readily available | In stock | <a href="#">\$12.99</a> | Micro Center (Adafruit)               | none                                    |
| BME280 Module (J5)                              | Environmental sensor breakout            | Readily available | In stock | <a href="#">\$9.98</a>  | ShillehTek                            | prev. \$9.00; comparable                |

### 2. Diodes and Protection

| Part                               | Spec/Package                                | Status            | Stock   | Price                  | Source                                                               | Drift    |
|------------------------------------|---------------------------------------------|-------------------|---------|------------------------|----------------------------------------------------------------------|----------|
| BYW27-400 (D1)                     | Avalanche rectifier, 400V 1A, DO-41 axial   | Readily available | 4,834   | <a href="#">\$0.43</a> | DigiKey                                                              | stock -1 |
| 1N5817 (D2, D10 Main; D1-D6 Solar) | Schottky, 20V 1A, DO-41 axial               | Readily available | 8,866   | <a href="#">\$0.29</a> | DigiKey (MCC 1N5817-TP; exact-suffix <a href="#">1N5817 \$0.34</a> ) | none     |
| 1N4148 (D3)                        | Small-signal diode, 100V 200mA, DO-35 axial | Readily available | 763,524 | <a href="#">\$0.10</a> | DigiKey (onsemi)                                                     | none     |

| Part                                 | Spec/Package                    | Status                                                              | Stock  | Price                  | Source               | Drift    |
|--------------------------------------|---------------------------------|---------------------------------------------------------------------|--------|------------------------|----------------------|----------|
| BAT20J (D7-D12 Solar)                | Schottky, 23V 1A 620mV, SOD-323 | Available (shallow at DigiKey; deep at Arrow 63,000 / Newark 8,773) | 39     | <a href="#">\$0.62</a> | DigiKey (BAT20JFILM) | none     |
| RHEF100-2 (F1 Main)                  | PTC resettable fuse, 30V 1A     | Readily available                                                   | 11,411 | <a href="#">\$0.84</a> | DigiKey (Littelfuse) | stock -1 |
| MF-R010 (F1 Battery, representative) | PTC resettable fuse             | Readily available                                                   | 12,053 | <a href="#">\$0.40</a> | DigiKey (Bourns)     | none     |

### 3. Passive Components

| Part                                        | Spec/Package   | Status      | Stock | Price | Source | Drift |
|---------------------------------------------|----------------|-------------|-------|-------|--------|-------|
| 1 kΩ (R1, R3, R7, R30 Main)                 | Axial 0.1 inch | not checked | —     | —     | —      | —     |
| 100 Ω (R8, R19 Main)                        | Axial 0.1 inch | not checked | —     | —     | —      | —     |
| 220 Ω (R9, R20, R29 Main)                   | Axial 0.1 inch | not checked | —     | —     | —      | —     |
| 68 Ω (R13, R15 Main)                        | Axial 0.1 inch | not checked | —     | —     | —      | —     |
| 180 Ω (R14 Main)                            | Axial 0.1 inch | not checked | —     | —     | —      | —     |
| 4.7 kΩ (R23, R24 Main)                      | Axial 0.1 inch | not checked | —     | —     | —      | —     |
| 10 kΩ (R27 Main)                            | Axial 0.1 inch | not checked | —     | —     | —      | —     |
| 10 kΩ (R2, R3 Battery)                      | 0603 SMD       | not checked | —     | —     | —      | —     |
| 0.1 Ω shunt (R1, R2, R5, R6, R9, R10 Solar) | 0805 SMD, 1%   | not checked | —     | —     | —      | —     |
| 4.7 kΩ (R3, R4 Solar)                       | Axial 0.1 inch | not checked | —     | —     | —      | —     |
| 18 pF (C1, C3 Main)                         | 0603 SMD       | not checked | —     | —     | —      | —     |
| 16 pF (C2, C4 Main)                         | 0603 SMD       | not checked | —     | —     | —      | —     |

| Part                                                     | Spec/Package                             | Status                                                 | Stock                | Price                  | Source                          | Drift                |
|----------------------------------------------------------|------------------------------------------|--------------------------------------------------------|----------------------|------------------------|---------------------------------|----------------------|
| 100 nF (C6, C9 Main; C2-C7 Solar)                        | 0603 SMD or PTH small                    | not checked                                            | —                    | —                      | —                               | —                    |
| 47 µF (C5 Main)                                          | PTH small electrolytic/tantalum          | not checked                                            | —                    | —                      | —                               | —                    |
| Ferrite 120 Ω L0603 (L1, L2 Main), snapshot PN 303030001 | Chip ferrite bead, 120 Ω @ 100 MHz, 0603 | Exact PN hard to obtain; verified substitute available | 706,396 (substitute) | <a href="#">\$0.10</a> | DigiKey (Murata BLM18AG121SN1D) | substitute stock –55 |

## 4. Connectors and Electromechanical

| Part                                    | Spec/Package                           | Status            | Stock    | Price                       | Source                 | Drift    |
|-----------------------------------------|----------------------------------------|-------------------|----------|-----------------------------|------------------------|----------|
| Stacking header 20x2 (J1, all boards)   | 40-pin female stacking, 0.1 inch pitch | Readily available | In stock | <a href="#">\$2.95</a>      | PiShop USA / Adafruit  | none     |
| ANT-916-CHP-T (E1, E2 Main)             | 916 MHz chip antenna, SMD              | Readily available | 2,656    | <a href="#">\$3.61</a>      | DigiKey (TE/Linx)      | none     |
| SMA vertical female PTH (X2, X3 Main)   | SMA jack, PCB mount vertical           | Readily available | In stock | <a href="#">\$4.49</a>      | Vetco Electronics      | none     |
| SJ1-2503A (J13, J14 Main)               | 3.5mm stereo jack, PTH                 | Readily available | 24,759   | <a href="#">\$0.75</a>      | DigiKey (Same Sky)     | stock –1 |
| SparkFun USB-C breakout (J8 Main)       | USB-C receptacle breakout              | Readily available | In stock | <a href="#">\$4.95</a>      | SparkFun               | none     |
| Micro JST 2-pin (J6, J7 Main; JP1-JP26) | JST-PH 2-pin vertical PTH              | Readily available | In stock | <a href="#">\$0.50</a>      | SparkFun               | none     |
| Keystone 1024 (BT1 Battery)             | Single AA clip/holder, SMD             | Readily available | 1,675    | <a href="#">\$4.92</a>      | DigiKey                | stock –1 |
| Keystone 1012 (BT2 Battery)             | Dual AA clip/holder, SMD               | Readily available | 12,275   | <a href="#">\$8.02</a>      | DigiKey                | stock –1 |
| RA-SPST switch (S1 Main)                | Right-angle SPST slide, PTH            | Readily available | In stock | <a href="#">\$0.15</a>      | Jameco                 | none     |
| 5mm LEDs (LED1-LED5 Main)               | 5mm T1-3/4, five colors                | Readily available | In stock | <a href="#">\$13.48 kit</a> | DigiKey (assorted kit) | none     |

## Substitutes

| For part                           | Substitute                                                           | Differences                                                                                                                                                                                                                                                                           | Verified                                                                                                                                                                 | Judgment                                                                        |
|------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| 303030001<br>ferrite (L1,<br>L2)   | <a href="#">BLM18AG121SN1D</a><br>(Murata)                           | 120 $\Omega$ @ 100 MHz matches spec; 0603 (1608 metric) matches L0603; 800 mA rating; $-55$ to $+125$ °C.                                                                                                                                                                             | Verified: impedance and package from DigiKey parametrics.                                                                                                                | Acceptable drop-in.                                                             |
| BAT20J /<br>BAT20JFILM<br>(D7-D12) | <a href="#">SBA130CS_R1_00001</a><br>(Panjit, DigiKey-suggested)     | Vr 30V exceeds the 23V requirement (acceptable); Io 1A matches; Vf 470 mV @ 1A is lower than 620 mV (acceptable). Package listed as SC-90/SOD-323F (flat-lead) vs the original's SC-76/SOD-323, though both carry supplier package "SOD-323". Stock: DigiKey 21, Mouser 910 @ \$0.21. | Verified: Vr/Io/Vf ratings from DigiKey parametrics. Not fully verified: footprint — SOD-323F vs SOD-323 lead-form difference; confirm land-pattern fit before ordering. | Electrically acceptable; confirm footprint manually.                            |
| BAT20J /<br>BAT20JFILM<br>(D7-D12) | 1SS404,H3F (Toshiba, DigiKey-suggested)                              | 20V Vr and 300 mA Io both fall short of the 23V / 1A requirement.                                                                                                                                                                                                                     | Verified: ratings from DigiKey substitute data.                                                                                                                          | Rejected — under-rated on both counts.                                          |
| SR105U<br>(U6)                     | <a href="#">SR-FRS-0W5U</a> (earlier revision, dwmzone / AliExpress) | Same manufacturer family, 0.5W UHF 400–480 MHz per listing titles; snapshot names the U6 footprint SR_FRS_0W5, matching this family's naming.                                                                                                                                         | Not verified: every product-page fetch this run returned no content — revision equivalence and footprint rest on listing titles and the snapshot only.                   | Plausible, unverified — confirm the live listing and footprint before ordering. |
| SR105U<br>(U6)                     | <a href="#">Dorji DRA818V</a> on footprint U7                        | VHF (134–174 MHz) instead of UHF; uses the board's dedicated U7 footprint — physically incompatible with the U6 pads (hard stop as a direct swap; supported as an alternative build by the PCB per the snapshot).                                                                     | Verified: board-supported alternative per snapshot; module listing unverified today.                                                                                     | Alternative build option, not a U6 drop-in.                                     |

Always verify pinouts, footprint dimensions, and electrical ratings against component datasheets before ordering substitutes.

## Cybersecurity — software & network

**Do not place on an open network** — The required OS (Debian 11) is past the end of all security support with no fix short of platform migration, and the lab enables an SSH service that may carry default credentials.

Since the previous report: No change in the software itself since this morning's report: same end-of-life Debian 11 requirement, same unpinned installs, verdict unchanged. The SSH default-credential exposure, previously described only in the exposure statement, is now recorded as its own posture finding.

| Component                                                                                                                        | Version        | How known                                                                                                                    | Support status               |
|----------------------------------------------------------------------------------------------------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Debian                                                                                                                           | 11             | read from project (fetched/01-install refuses to proceed unless /etc/debian_version is 11 and /etc/os-release says bullseye) | unsupported since 2024-08-14 |
| CubeSatSim software suite                                                                                                        | not determined | unpinned (fetched/01-install installs from git master; no tag or commit pinned)                                              | —                            |
| Bundled radio/telemetry tools (direwolf, WiringPi, pi-power-button, ssdv, fcdctl, PiSSTVpp, rpitx, MPU6050 and BME280 libraries) | not determined | unpinned (nine git clones in fetched/01-install, none pinned to a tag or commit)                                             | —                            |
| Python packages (adafruit-blinka, RPI.GPIO, adafruit-extended-bus, adafruit-circuitpython-ina219)                                | not determined | unpinned (pip3 install with no version constraints in fetched/01-install)                                                    | —                            |
| Raspberry Pi Pico SDK / firmware                                                                                                 | not determined | not determined                                                                                                               | —                            |

| Component                 | Finding                                                                                                                                                                                                                                         | Severity | Fix available?                                    |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------|
| CubeSatSim software suite | Dependencies unpinned: 4 pip packages and 9 git clones in fetched/01-install install whatever is current, so the software the students run has no checkable security state. <b>(new)</b>                                                        | posture  | Mitigation only — pin versions / use the lockfile |
| Debian                    | The install script requires Debian 11 (Bullseye), whose standard support ended 2024-08-14 and whose extended LTS security updates ended 2026-08-31, so the operating system the lab runs on no longer receives any security fixes. <b>(new)</b> | posture  | No — requires platform migration                  |

| Component                     | Finding                                                                                                                                                                                       | Severity | Fix available?                                                                        |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------|
| Raspberry Pi OS (SSH service) | The lab's documentation instructs students to enable SSH, and standard Raspberry Pi OS images may retain the published default credentials if they are not changed during setup. <b>(new)</b> | posture  | Mitigation only — change default credentials and keep the simulator off open networks |

## What this means for your lab

This simulator is built on an operating system that stopped receiving security fixes on August 31, 2026, and its setup instructions have students turn on SSH remote access. If it is placed on a shared or campus network, anyone on that network could try the well-known default Raspberry Pi login, and if it was never changed they could sign in, change the simulator's configuration, trigger radio transmissions, or read its files — and future OS flaws will never be patched. Keep the simulator on an isolated bench network or its own network segment, change the default password the day it is set up, and talk to campus IT before ever connecting it to a wider network. The application software itself installs at whatever version is current on install day, so its security state cannot be assessed in advance.

## Not checked

- CubeSatSim software suite: unpinned; installed from git master, no version to check and no advisory database for the project
- Bundled radio/telemetry tools: unpinned git clones of source-only projects; no advisory database covers them
- Python packages (4): unpinned; no exact versions exist to check against OSV
- Raspberry Pi Pico SDK / firmware: version not determined; vendor firmware with no advisory database
- Raspberry Pi OS: endoflife.date has no raspberry-pi-os product entry; assessed via its Debian 11 base instead
- raspberry-pi-os 11: support status: endoflife.date has no such product

## Other dependencies

- PCB fabrication (Main, Battery, Solar boards): 2-layer, ~10 cm × 10 cm CubeSat form factor — not checked.
- Primary project site <https://cubesatsim.org> — not checked.
- Hardware design files <https://github.com/alanbjohnston/CubeSatSim/tree/master/hardware/v2.1> — not checked.
- Audio PWM tutorial (hackster.io) — not checked.
- RF attenuator calculator (chemandy.com) — not checked.

- Adafruit INA219 Current Sensor PCB repository — not checked.

## Watch list

- **SR105U / SR-FRS-0W5U (U6):** specialty walkie-talkie modules sold only through niche storefronts; every product page also resisted automated fetching today, so listings can vanish without this check noticing. Verify before each build cycle.
- **Dorji DRA818V (U7):** same specialty-channel exposure; Tindie/dorji.com/uputronics are the only channels seen.
- **BAT20JFILM (D7-D12):** DigiKey stock is 39 units; deep stock currently at Arrow (63,000) and Newark (8,773), but the DigiKey-suggested substitute has a footprint caveat, so a broader shortage would hurt.
- **ANT-916-CHP-T (E1, E2):** single-source chip antenna with modest stock (2,656).