

Readiness report — Superb Lab Power Supply

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Readiness: Superb Lab Power Supply

Verdict: At risk · 2026-09-02 · est. parts cost \$220–\$420 **Cybersecurity — software & network: Could not check**

One part now blocks a clean build: **R4, the Vishay WSL3637R0100FEA 10 mΩ four-terminal Kelvin shunt** on the custom 00002A shield. It is out of stock at all five ECIA-authorized distributors that list it, with 40–55 week factory lead times, and every sibling in the same 3637 package (FEB, DEA, FBA) is out of stock everywhere too — so there is no drop-in to fall back on. That shunt sits in the full 3 A output path and the snapshot rates its substitution latitude "Low", so it cannot simply be swapped for a different package. The mains power switch and the chassis ground lug are also zero-stock with 3–15 week leads, though both have generic equivalents. Everything else is sourceable today, and where a part went obsolete (the relay, the 100 nF decoupling caps, the 1.8 MΩ divider resistor) there is a substitute below with its footprint checked against distributor parametrics. Note that the analog 0–30 V board is bought as a kit (\$4.25–\$17) that supplies its own parts — only the shield is built component by component, which is exactly where the shunt problem lands. The verdict has dropped from the previous report's **Ready with caveats**: in July the shunt was still in stock at a specialist distributor at \$1.05, and the mains switch had not been checked. The cost estimate also rose sharply, because the previous report priced a generic \$25.67 transformer rather than the specified DP-241-8-20 (\$46–\$49) and did not count the chassis consumables (wire, cord, fasteners, standoffs, lettering, ground lug) at all.

Action required

Part	Problem	Recommended action
R4 WSL3637R0100FEA	New since July. Zero stock at all 5 ECIA distributors; 40–55 week leads. Every WSL3637 10 mΩ sibling also zero-stock.	Order now against lead time, or source from a broker and verify authenticity. Do not swap to a 4527-package shunt — the board is drawn for the 3637 Kelvin pads.
C3–C7 GRM188R71H104KA93D	Obsolete; zero stock everywhere; 42-week lead.	Use C0603C104K5RACTU (KEMET), \$0.13, 7.1 M in stock — verified 0603 drop-in.
C2 GRM188R61A106KE69D	Zero stock at all 4 distributors; 19-week lead.	Use C1608X5R1A106K080AC (TDK), \$0.27, 160 k in stock — verified 0603 drop-in.
R5 ERJ-3EKF1804V	Obsolete at DigiKey (30-week lead).	Buy from Newark (10,828 @ \$0.032) or use CRCW06031M80FKEA , \$0.10, 27,898 in stock.

Part	Problem	Recommended action
K1 G5LE-1-VDDC12	Obsolete (as in July), zero stock at DigiKey.	Still stocked by Heilind/Sager/ICC/TTI. Or use G5LE-1 DC12 / G5LE-14 DC12 — footprint not verified, check the pinout.
IC1 MAX44284FAUT+T	New since July. DigiKey stock fell to zero (22-week lead).	Order from Mouser: 6,115 in stock @ \$3.66.
Item 11 EG4397-ND switch	New since July. Zero stock, 15-week lead, single distributor. Its 19.20 × 13.00 mm cutout also disagrees with the panel file.	Back-order at DigiKey, or use a switched-and-fused C14 inlet (~\$5–7) and drop the separate switch.
Item H L35-B2-5 ground lug	New since July. Zero stock at all 5 distributors, 3–12 week leads, \$14–\$17.	Any UL-listed 8–14 AWG mechanical copper lug works; electrical-supply houses list the base Blackburn L35 at \$3.29.
Item 14 enclosure	New since July. No enclosure checked meets the ≥200 × 210 × 90 mm envelope.	Select manually against the envelope; the Hammond 1455ZT2201 is 34 mm too short.
Item 9 DP-241-8-20	Not a shortage — a price correction. Exact part is \$46–\$49, not the \$25.67 assumed in July.	Budget for it; must be an AC-AC chassis transformer, never a DC brick.

Cybersecurity — software & network

Could not check — All three software components are unpinned Arduino-side code with no vulnerability database covering them, so no security check was possible; the two problems recorded here are a dead download link and unpinned versions, not network exposure - this device has no network interface.

Component	Version	How known	Support status
Arduino Core for AVR (arduino:avr)	not determined	unpinned (the lab ships no board-package manifest; the snapshot records no version)	—
Arduino Wire library (<Wire.h>, I2C master)	not determined	unpinned (bundled with whichever AVR core is installed; included at DCMeter.ino line 1)	—
LiquidCrystal_I2C (fmalpartida new-liquidcrystal fork)	not determined	unpinned (DCMeter.ino line 2 cites a bare Bitbucket downloads directory with no version; the maintained GitHub mirror's library.json currently publishes 1.5.0)	—

Component	Finding	Severity	Fix available?
Arduino firmware dependencies (AVR core, Wire, LiquidCrystal_I2C)	None of the three firmware dependencies is pinned to a version, and the sketch uses a constructor that only this LCD fork provides, so a student who installs the Library Manager's LiquidCrystal_I2C instead gets a compilation failure rather than a working meter.	posture	Mitigation only - state the exact library and core versions in the build instructions and ship a vendored copy of the LCD library with the lab
LiquidCrystal_I2C (fmalpartida new-liquidcrystal fork)	The library download location the firmware source cites returns HTTP 404, so anyone building this lab has to find the LCD driver somewhere else on the internet and cannot check that what they got is what the lab was written against.	posture	Mitigation only - take the library from the maintained GitHub mirror at github.com/fmalpartida/New-LiquidCrystal (its library.json publishes 1.5.0) and keep that copy with the lab materials instead of linking out

What this means for your lab

This power supply is not a networked device. The Arduino talks to a bench PC over a USB serial cable only, and the 0x3F and 0x68 numbers in the design are I2C chip addresses on a few centimetres of wire inside the box, not network addresses. So there is nothing here for someone else on your campus network to reach, log into, or read, and nothing needed to be cleared with IT before the supply is switched on. The real problem is where the firmware's code comes from. The one third-party library the sketch needs is fetched from a link printed in the source file, that link is dead, and nothing records which version the lab was written against - so each student ends up downloading some copy of the library from wherever they can find it, and the common one from the Arduino Library Manager will not even compile against this sketch. Before the next class, download the library once from the maintained GitHub mirror, keep that copy alongside the lab files, and write the version you used into the build instructions so everyone compiles the same code.

Not checked

- Arduino Core for AVR (arduino:avr): no vulnerability database covers Arduino board packages, and no version is pinned to check
- Arduino Wire library (<Wire.h>): bundled with the AVR core; it has no version of its own and no advisory database
- LiquidCrystal_I2C (fmalpartida new-liquidcrystal fork): no advisory database covers Arduino libraries, the lab pins no version, and the documented download location is gone
- Arduino IDE and the avr-gcc toolchain: implied by the AVR core but not recorded with a version in the lab materials, and not tracked by endoflife.date

- EAGLE (00002A.sch, 00002A.brd) and the SVG editor for frontPanel.svg: design-tool dependencies implied by the lab's file formats; no version recorded and no advisory database applies

Parts

Integrated Circuits and Active Semiconductors (00002A shield)

Part	Spec/Package	Status	Stock	Price	Source	Drift
IC1: MAX44284FAUT+T	Current-sense amp, 1.7–5.5 V, SOT-23-6	Available (not at DigiKey)	6,115 (Mouser)	\$3.66	Mouser (ECIA); DigiKey \$3.99, stock 0, 22-wk lead	DigiKey 2,773 → 0; price held at \$3.66
IC2: MCP3422A0-E/SN	18-bit ADC, 2.7–5.5 V, SOIC-8	Ready	2,599	\$3.72	DigiKey	4,069 → 2,599; price flat
IC3: MCP6061T-E/OT	Op-amp, 1.8–6.0 V, SOT-23-5	Ready	2,829	\$0.84	DigiKey	574 → 2,829; price flat
Q1, Q2: BC817-25LT3G	NPN 45 V / 500 mA, SOT-23-3	Ready	139,400	\$0.17	DigiKey (9 distributors stocked)	3,187 → 139,400; price flat
D3: BAT54	Schottky 30 V / 200 mA, SOT-23-3	Ready	842,137	\$0.14	DigiKey (BAT54LT1G single-die variant)	424,390 → 842,137; price flat
Z1: 824501361	TVS 36 V standoff, 400 W, DO-214AC	Ready — polarity unconfirmed	4,033	\$0.29	DigiKey (listed as SMAJ36CA); Mouser 2,631 on the exact number	4,611 → 4,033; price flat

Electromechanical and Relays (00002A shield)

Part	Spec/Package	Status	Stock	Price	Source	Drift
K1: G5LE-1-VDDC12	SPDT 1 Form C, 12 VDC coil, 10 A, through hole	Obsolete — still stocked elsewhere	0 at DigiKey; 1,760 Heilind, 607 Sager, 586 ICC, 475 TTI	\$1.07 list; \$0.67–\$0.77 at stocking distributors	ECIA	Was "obsolete, no source"; four authorized distributors do hold stock

Precision Current Shunt Resistor (00002A shield)

Part	Spec/Package	Status	Stock	Price	Source	Drift
R4: WSL3637R0100FEA	10 mΩ, 1%, 3 W, 3637 Kelvin, 9.14 × 9.40 mm	Hard to obtain	0 at all 5 ECIA distributors (40–55 wk leads)	\$1.46	DigiKey (back-order only)	Was >100 @ \$1.05 at a specialist distributor; now no stock anywhere

Passive Components — Resistors and Capacitors (00002A shield)

Part	Spec/Package	Status	Stock	Price	Source	Drift
R5: ERJ-3EKF1804V	1.8 MΩ, 1%, 0603	Obsolete — stocked elsewhere	0 at DigiKey; 30,000 TTI, 10,828 Newark, 2,169 Mouser	\$0.032/100 at Newark	ECIA	— (rolled into a "resistor kit" row in July)
R6, R7: RC0603FR-07100KL	100 kΩ, 1%, 0603 (×2)	Ready	2,357,465	\$0.10	DigiKey	—
R1: RC0603JR-071K8L	1.8 kΩ, 5%, 0603	Ready	83,028	\$0.10	DigiKey	—
R2, R3, R11, R13, R15–R18: RC0603JR-07470RL	470 Ω, 5%, 0603 (×8)	Ready	444,311	\$0.10	DigiKey	—
R8–R10, R12, R14, R19, R20: RC0603JR-074K7L	4.7 kΩ, 5%, 0603 (×7)	Ready	1,151,400	\$0.10	DigiKey	—
C1: GRM1885C1H222JA01D	2.2 nF, 50 V, C0G, 0603	Available (not at DigiKey)	0 at DigiKey; 236,000 Avnet, 156,000 Future, 104,000 Newark	\$0.10	ECIA (4,000-pc price breaks)	—
C2: GRM188R61A106KE69D	10 μF, 10 V, X5R, 0603	Hard to obtain	0 at all 4 distributors (19-wk lead)	\$0.17	DigiKey (back-order)	—
C3, C4, C5, C6, C7: GRM188R71H104KA93D	100 nF, 50 V, X7R, 0603 (×5)	Obsolete , no stock	0 (42-wk lead)	no current price	DigiKey (back-order)	—

Part	Spec/ Package	Status	Stock	Price	Source	Drift
S1: PUENTE	Printed solder- bridge net tie	No purchase required	—	—	—	—

Connectors and Headers (00002A shield)

Part	Spec/Package	Status	Stock	Price	Source	Drift
X1: MKDSN 1,5/ 4-5,08	4-pos, 5.08 mm pitch, 10 A / 300 V	Ready	3,166	\$1.94	DigiKey (cat. no. 1729144)	144 → 3,166; price flat
X2, X3, X7: Molex 0022232021	2-pos, 2.54 mm friction lock (×3)	Ready	87,682	\$0.18	DigiKey	was "not checked"
X5, X6: Molex 0022232031	3-pos, 2.54 mm (×2)	Ready	114,189	\$0.23	DigiKey	was "not checked"
X4: Molex 0022232041	4-pos, 2.54 mm	Ready	55,426	\$0.28	DigiKey	was "not checked"
SV1-SV4: PRPC040SAAN-RC	40-pin 0.1" breakaway strip	Ready	48,820	\$1.23	DigiKey	was "not checked"

Active Devices — 0-30 V Analog Kit (supplied with Item 8)

Part	Spec/Package	Status	Stock	Price	Source	Drift
U1-U3: TL081CP	JFET op-amp, 7-36 V supply, 8-DIP (×3)	Ready	7,825	\$0.70	DigiKey	10,105 → 7,825; price flat
Q4: 2SD1047	NPN 140 V / 12 A / 120 W, TO-3P-3	Available again, thin stock	174	\$6.56	DigiKey (EVVO); ST's part still obsolete, 0 stock	was obsolete with zero stock — improved
Q2: 2SD882	NPN 30 V / 3 A / 12.5 W, TO-126	Ready	8,003	\$2.50	DigiKey	8,181 → 8,003; price flat
Q1: SS9014	NPN 45 V / 100 mA, TO-92	Ready (as SS9014CBU)	92,110	\$0.04	DigiKey	was priced retail at \$0.08; now an authorized- distributor part

Part	Spec/Package	Status	Stock	Price	Source	Drift
Q3: SS9015	PNP 45 V / 100 mA, TO-92	Obsolete (all variants) — huge stock	753,175	\$0.04	DigiKey	was priced retail at \$0.08; lifecycle now visible as obsolete
D1–D4: 1N5408	1000 V / 3 A, DO-201AA (×4)	Ready	11,006	\$0.35	DigiKey	41,798 → 11,006; price flat
D11: 1N4004	400 V / 1 A, DO-41	Ready	199,396	\$0.14	DigiKey	128,112 → 199,396; price flat
D5, D6, D9, D10: 1N4148	100 V / 200 mA, DO-35 (×4)	Ready	763,524	\$0.10	DigiKey	1 M+ → 1.49 M on the tape variant; price flat
D7, D8: 1N5231B	Zener 5.1 V, 500 mW, DO-35 (×2)	Ready	78,528	\$0.18	DigiKey	no baseline — July checked 1N4733A, a different part
D12: 5 mm red LED (WP7113ID)	T-1 3/4, Vf 1.9 V	Ready	145,555	\$0.21	DigiKey	was "not checked"

Analog Kit Resistors and Trimmers (supplied with Item 8)

Part	Spec/Package	Status	Stock	Price	Source	Drift
R7: SQP500JB-0R47	0.47 Ω , 5 W, ceramic axial	Ready	535	\$1.26	DigiKey	605 → 535; price flat
R1: RSF100JB-73-2K2	2.2 k Ω , 1 W metal oxide axial	Ready	6,693	\$0.20	DigiKey	was "not checked"
R2–R6, R8–R22: 1/4 W 5% axial set	33 Ω to 270 k Ω , axial 0207	Ready (assortment)	in stock	\$16.99 / 1,000 pc	Altex Electronics (Xpart 250 pc \$8.21)	was a \$9.95 RobotShop kit
RV1: 3296W-1-104LF	100 k Ω multiterm trimmer, 9.53 × 4.83 mm	Ready	11,823	\$2.73	DigiKey	July priced a \$2.38 Mouser listing; this is the Bourns part itself

Part	Spec/ Package	Status	Stock	Price	Source	Drift
P1, P2: 10 k Ω linear pot	Panel mount, 6.0 mm shaft ($\times 2$)	Ready — shaft not verified	in stock	\$0.59	ProtoSupplies; Taiwan Alpha RV110F-40-15A-B10K, Mouser 968 @ \$2.27	\$0.95 $\rightarrow$ \$0.59

Analog Kit Capacitors (supplied with Item 8)

Part	Spec/Package	Status	Stock	Price	Source	Drift
C1: UVR1H332MHD	3300 μ F, 50 V, 18 mm dia, 7.5 mm pitch, 2.5 A ripple	Ready	4,094	\$3.18	DigiKey	was rolled into a \$5.99 "electrolytic kit"
C2, C3: ECA-1HHG470	47 μ F, 50 V, 6.3 mm dia ($\times 2$)	Ready	39,883 Mouser; 12,688 DigiKey on the "I" variant	\$0.44	DigiKey / Mouser \$0.42	was rolled into a kit
C7: ECA-1HHG100	10 μ F, 50 V, 5 mm dia	Ready	10,612 on the "I" variant	\$0.31	DigiKey / Mouser \$0.36	was rolled into a kit
C4: C315C104K5R5TA	0.1 μ F, 50 V radial — 2.54 mm pitch (snapshot says 5.0 mm)	Ready	7,195	\$0.62	DigiKey	was rolled into a \$14.95 kit
C5: C320C224K5R5TA	0.22 μ F, 50 V radial — 2.54 mm pitch (snapshot says 5.0 mm)	Ready	1,157	\$1.56	DigiKey; Mouser 5,973 @ \$1.29	was rolled into a kit
C6, C9: D101K20Y5PH63L2R	100 pF, 100 V disc, 2.50 mm lead spacing ($\times 2$)	Hard to obtain	0 at all 5 distributors (19-wk lead)	\$0.04 at 20k	DigiKey (back-order)	was rolled into a kit
C8: D331K20Y5PH63L2R	330 pF, 100 V disc, 2.50 mm lead spacing	Hard to obtain	0 at all 5 distributors (19-wk lead)	\$0.04 at 20k	DigiKey (back-order)	was rolled into a kit

System, Chassis, Enclosure and Interconnect Hardware

Part	Spec/Package	Status	Stock	Price	Source	Drift
Item 1: 2004 I2C LCD	20×4 HD44780 + PCF8574, address 0x3F	Ready	in stock	\$4.13	BuyDisplay (eBay \$8.25–\$12.96)	\$4.50 → \$4.13
Item 2: 10 kΩ panel pots (×2)	Panel mount, 8 mm hole	Ready	in stock	\$0.59	ProtoSupplies	\$0.95 → \$0.59
Item 3a: EG2045-ND (red)	E-Switch PS1057ARED, SPST-NO, 12.60 × 11.30 mm cutout	Ready — single distributor	979	\$1.92	DigiKey	was "not checked"
Item 3b: EG2041-ND (black)	E-Switch PS1057ABLK, same cutout	Ready — single distributor	7,640	\$1.83	DigiKey	was "not checked"
Item 4: banana binding posts (×3)	4 mm, ≥ 24 A, 9.5 mm panel hole	Ready — M5 stud not verified	in stock	\$2.70	Newark (Multicom Pro 76-1502, 25 A)	was "not checked"
Item 5: Arduino Uno R3	ATmega328P, 16 MHz, 5 V	Ready	in stock	\$4.99	Micro Center (CH340 board); genuine Uno Rev3 \$30.95 PiShop	\$4.99 unchanged
Item 6: DC barrel pigtail	2.1 × 5.5 mm male to bare leads	Ready	in stock	\$0.95	Cable Leader	was "not checked"
Item 7: 3590S-2-103L (optional, ×2)	10-turn 10 kΩ, 2 W, panel mount	Ready — expensive	3,087	\$18.39	DigiKey	was "not checked"
Item 8: Vkmaker 0–30 V PSU kit	84 × 84 mm analog board kit	Ready	in stock	\$9.99	Banggood (AliExpress \$4.25, eBay \$16–\$17)	was never priced
Item 9: DP-241-8-20	115/230 VAC to 20 VCT @ 5 A chassis transformer	Ready — price corrected	50 DigiKey, 25 Mouser	\$47.80 DigiKey / \$46.10 Mouser	ECIA	July priced a generic 24 VAC unit at \$25.67; the specified part is \$46–\$49

Part	Spec/Package	Status	Stock	Price	Source	Drift
Item 10: IEC C14 inlet + fuse	250 VAC 10 A panel inlet, 5×20 mm fuse	Ready	in stock	\$4.95	Amplified Parts (switched+fused versions \$5-\$7)	was "not checked"
Item 11: EG4397-ND mains switch	E-Switch PB1973ABLKBLKEF0, SPST 15 A / 250 VAC, 19.20 × 13.00 mm cutout	Hard to obtain	0 (15-wk lead, sole distributor)	\$2.63	DigiKey (back-order)	was "not checked"
Item 12: off-board pass transistor	See Q4 / Item 8	Available, thin stock	174	\$6.56	DigiKey	see Q4
Item 13a: heatsink	TO-247, 100 mm, ≤ 0.8 °C/W (not verified)	Ready — thin stock	45 Mouser, 10 DigiKey	\$7.60	DigiKey (Wakefield 694-100)	\$7.60 unchanged
Item 13b: ceramic insulator	TO-264 alumina, 22 × 28 × 0.6 mm (size not verified)	Ready	in stock	\$3.60	eBay (innovasupplies \$16.43)	was "not checked"
Item 14: benchtop enclosure	≥ 200 mm deep × 210 mm wide × 90 mm high	Not verified to spec	1 DigiKey / 26 Mouser on the Hammond unit	\$29.86	Newark (Hammond 1455ZT2201 — 222 × 85.6 × 56 mm, too short)	\$7.99 eBay box → nothing found that meets the envelope
Item A: 18 AWG silicone wire	Stranded, ≥ 300 V	Ready	in stock	\$14.86	Performance-PCs	was "not checked"
Item B: 24 AWG hookup wire	Stranded, tinned copper	Ready	in stock	\$9.95	Jameco	was "not checked"
Item C: laser-cut front panel	3 mm two-colour acrylic, 203.2 × 85.76 mm	not checked	—	—	—	—
Item D: IEC C13 mains cord	NEMA 5-15P to C13, 18 AWG	Ready	in stock	\$8.30	Best Buy	was "not checked"
Item E: knobs (×4)	6.0 mm and 6.35 mm shafts, pointer	Ready — shaft fit not verified	in stock	\$3.13	eBay	was "not checked"

Part	Spec/Package	Status	Stock	Price	Source	Drift
Item F: PCB standoffs (8-12)	Self-adhesive nylon, 25 mm, 4.0 mm hole	Ready — 25 mm adhesive not verified	in stock	\$3.90	keszoox (screw-in 25 mm nylon at DigiKey \$1.67)	was "not checked"
Item G: M3/M4/M5 fasteners	Stainless screws, washers, locknuts	Ready	in stock	\$7.47	Walmart (Hyper Tough 182-pc)	was "not checked"
Item H: L35-B2-5 ground lug	Copper mechanical lug, 8 str – 14 sol	Hard to obtain	0 at all 5 distributors (3-12 wk leads)	\$14.74	DigiKey (back-order); base Blackburn L35 \$3.29 retail	was "not checked"
Item I: dry-transfer lettering	White rub-on, ~3 mm	Ready	in stock	\$7.99	HobbyTown (Woodland Scenics)	was "not checked"
Item J: Faston terminals (6-10)	3/16" (4.75 mm) female crimp	Ready	in stock	\$5.98	Parts Express (50 pc)	was "not checked"

Substitutes

For part	Substitute	Differences	Verified	Judgment
K1 G5LE-1-VDDC12	G5LE-1 DC12 — \$1.72, 6,012 at DigiKey, 9 distributors stocked	Same SPDT (1 Form C) contact form, 10 A contacts, 12 VDC coil. DigiKey's own "Parametric Equivalent" for the obsolete part	verified: contact form, contact rating, coil voltage (DigiKey parametric-equivalent entry vs the original's parametrics); not verified: pin layout, lead pitch, body dimensions	Recommended — check the pinout against the board before soldering

For part	Substitute	Differences	Verified	Judgment
K1 G5LE-1-VDDC12	G5LE-14 DC12 — \$1.73, 24,375	Every listed parameter identical to the original: through hole, 12 VDC coil, SPDT 1 Form C, 10 A, 33.3 mA coil, 9 VDC must-operate, AgSnO contacts, -25 to 85 °C	verified: mounting type, coil voltage, contact form, contact rating, coil current, contact material (DigiKey parametrics, both parts); not verified: pin layout and body dimensions	Recommended — best-evidenced option. Do not use G5LE-1A4 DC12 or G5LE-1A-E DC12: those are SPST-NO, the wrong contact form
R5 ERJ-3EKF1804V	CRCW06031M80FKEA — \$0.10, 27,898	1.8 M Ω $\pm$ 1% both; 1/8 W vs 1/10 W (exceeds — acceptable); TCR $\pm$ 100 ppm/°C both	verified: package 0603 and body size on both (1.60 $\times$ 0.80 mm vs 1.55 $\times$ 0.85 mm, both standard 0603), resistance, tolerance, power (DigiKey parametrics)	Recommended
C2 GRM188R61A106KE69D	C1608X5R1A106K080AC — \$0.27, 160,024	None found: 10 μ F, $\pm$ 10%, 10 V, X5R on both	verified: package 0603 and body size 1.60 $\times$ 0.80 mm identical on both, plus value, tolerance, voltage, dielectric (DigiKey parametrics)	Recommended — drop-in
C3-C7 GRM188R71H104KA93D	C0603C104K5RACTU — \$0.13, 7,158,308	None found: 0.1 μ F, $\pm$ 10%, 50 V, X7R on both	verified: package 0603 and body size 1.60 $\times$ 0.80 mm identical on both, plus value, tolerance, voltage, dielectric (DigiKey parametrics)	Recommended — drop-in

For part	Substitute	Differences	Verified	Judgment
C1 GRM1885C1H222JA01D	C0603C222J5GACTU — \$0.40, 63,798	None found: 2200 pF, ±5%, 50 V, C0G/NP0 on both. 4× the unit price, but buyable in ones	verified: package 0603 and body size 1.60 × 0.80 mm identical on both, plus value, tolerance, voltage, dielectric (DigiKey parametrics)	Recommended when you don't want a 4,000- piece reel
C6, C9 D101K20Y5PH63L2R	D101K20Y5PH63L6R — \$0.43, 473	Electrically identical (100 pF, 100 V, Y5P, 5.00 mm disc) but lead spacing 6.35 mm vs the original's 2.50 mm — the snapshot specifies a 2.5 mm pitch	verified: lead spacing on both from DigiKey parametrics — this is a mismatch, not a match	Rejected — footprint hard stop. The 2.5 mm-pitch siblings DigiKey suggests all show no stock
C8 D331K20Y5PH63L2R	D331K20Y5PH63L6R — \$0.43, 28,162	Same story: 330 pF, 100 V, Y5P, 5.00 mm disc, but lead spacing 6.35 mm vs 2.50 mm	verified: lead spacing on both from DigiKey parametrics — mismatch	Rejected — footprint hard stop

For part	Substitute	Differences	Verified	Judgment
Q4 2SD1047	TIP35CG — \$3.65, 5,809	TO-247-3 vs TO-3P-3; 25 A vs 12 A (exceeds); 125 W vs 120 W (exceeds); 100 V vs 140 V VCEO — short of the identity spec but within the snapshot's stated ≥ 100 V latitude , and the rail is only 30–34 V; hFE 15 at 15 A vs 35 at 5 A, so the driver must supply more base current	verified: package designation, collector current, power rating, VCEO from DigiKey parametrics on both; the snapshot explicitly permits TO-247. not verified: bolt-hole position and pin pitch (mounted off-board on flying leads, so this is a heatsink check)	Recommended as the fallback; the exact 2SD1047 is back in stock (174 pcs) if you prefer it
Q3 SS9015	2N3906 — \$0.14, 25,866	PNP TO-92 both; 200 mA vs 100 mA (exceeds); 625 mW vs 450 mW (exceeds); 40 V VCEO vs the snapshot's stated ≥ 45 V — falls short , though the snapshot itself names 2N3906 as acceptable	verified: package TO-92 (TO-226-3), collector current, power rating (DigiKey parametrics, both). not verified: pinout (E-B-C ordering), and the 45 V requirement is not met	Only if the obsolete SS9015 stock (753,175 pcs) runs out — check the node voltage and pinout first

For part	Substitute	Differences	Verified	Judgment
Z1 824501361	SMAJ36A — \$0.48, 39,166	36 V standoff both; 40 V min breakdown vs 42.1 V typ; 58.1 V clamping and 400 W identical; DO-214AC (SMA) both	verified: package DO-214AC/SMA, standoff, breakdown, clamping and peak pulse power on both (DigiKey parametrics) — all meet the snapshot's spec. not verified: unidirectional vs bidirectional , which the snapshot requires	Acceptable on ratings; confirm polarity on the datasheet, for this part and for the Würth part DigiKey lists as SMAJ36CA
Item 11 EG4397-ND	Switched + fused IEC C14 inlet — \$6.95	Replaces Items 10 and 11 with one rear-panel part; listing states 10 A / 250 VAC, meeting the snapshot's "SPST ≥ 250 VAC, 5 A". Removes a front-panel hole	not verified — Google Shopping links resolve to redirects, not to a fetchable product page, so the mains rating comes from the listing title only	Plausible, unverified — confirm the rating and cutout on the seller's own page before ordering
Item 14 enclosure	Hammond 1455ZT2201 — \$32.27, stock 1	222.00 × 85.60 × 55.98 mm against the required ≥ 200 mm depth / ≥ 210 mm width / ≥ 90 mm height — 34 mm too short	verified: body dimensions from DigiKey parametrics — they do not meet the requirement	Rejected on evidence. Select an enclosure manually against the envelope

Verify any substitute against its datasheet before ordering.

Other dependencies

- **Custom shield PCB "00002A"** — 2 layers, 55.88 × 53.34 mm, 111 plated holes across 5 drill sizes, 8/8 mil track and space, solder mask both sides, top silkscreen; Gerbers in 00002A.zip. **Not checked** — no fabrication quote was obtained this run. The specifications are routine for any 2-layer prototype service.

- **Analog PCB (84 × 84 mm)** — no separate fabrication needed; it comes with the Item 8 kit.
- **Front panel** — `frontPanel.svg`, 203.2 × 85.76 mm, 3 mm two-colour acrylic (white on black), with an LCD window, 4 pot holes, 2 pushbutton holes, a power-switch hole and 3 binding-post holes. **Not checked:** the Ponoko material page the snapshot cites returned no extractable text when fetched this run, so neither availability nor price was confirmed. Note also that the mains switch specified as Item 11 needs a 19.20 × 13.00 mm rectangular cutout, larger than any hole in this cut list — reconcile the panel file with the switch you actually buy.
- **eBay / AliExpress listings cited in the snapshot** (2004 LCD, Vkmaker kit, multiturn pot, enclosure, ceramic insulators, banana sockets) — **not checked.** A fetch of the Vkmaker listing was blocked by eBay, so these 2016–2017 listing IDs could not be confirmed alive. Every product they point at is currently purchasable from other sellers, priced above.
- **DigiKey links cited in the snapshot** (EG2045-ND , EG2041-ND , EG4397-ND , 595-1088-ND) — all four resolve to current catalogue parts; see the tables.
- **Calibration** — RV1 must still be trimmed until the output reads 0.00 V at the minimum setting.
- **Input constraint** — 24 VAC AC-AC only. A DC power brick is forbidden by the design; this remains the easiest way to destroy the build.

Watch list

- **R4 WSL3637R0100FEA** — the whole Vishay WSL3637 10 mΩ family is out of stock across authorized distribution with 18–55 week leads and a High supply-chain risk rating. If it has not restocked by the next check, the shield needs a redesigned sense footprint.
- **Item 11 EG4397-ND mains switch** — zero stock, 15-week lead, and only one distributor lists it. A single-sourced mains part on a student-operated control is worth replacing preemptively.
- **Item 3 pushbuttons (PS1057ARED / PS1057ABLK)** — also single-sourced at DigiKey. Fine today (979 and 7,640 in stock), but there is no second source if that changes.
- **C6, C8, C9 Vishay disc capacitors** — zero stock everywhere, 20,000-piece minimum pricing, and the only in-stock siblings have the wrong lead spacing. Harmless while the Item 8 kit supplies them; a problem the day someone needs a replacement.
- **Q3 SS9015 and Q1 SS9014** — obsolete lifecycle across every variant. Stock is enormous today (750 k+), so this is a multi-year horizon, not a next-check one.
- **Item 9 DP-241-8-20 transformer** — only 50 units at DigiKey and 25 at Mouser, at \$46–\$49. Low stock on the single most expensive line in the build.

- **Item 14 enclosure** — no in-evidence box meets the stated envelope; the next check should be run against a specific chosen enclosure rather than a generic search.