

NanoArc ACE RevA

Bill of Materials - Canadian Dollars

Link-enabled, breadboard-first procurement issue
Based on NA-MASTER-001 RevA Freeze / Master Revision 1.2

Scope	Low-voltage ACE controller, operator panel, machine I/O/analog simulator and logic-level fault fixture on solderless breadboards
Price and link date	2026-06-29; planning prices retained from the base BOM
Currency	CAD, quantity-one planning values
Core breadboard BOM subtotal	\$212.15
10% procurement contingency	\$21.22
Planning total before tax	\$233.37
Ontario HST estimate (13%)	\$30.34
Planning total after HST	\$263.71
Deferred / optional planning value	\$96.50 (not included above)

How to use the links

Every blue underlined part name and every OPEN cell is clickable. Exact frozen manufacturer part numbers go to a direct product page. Generic, mechanical or still-deferred selections go to a supplier search so a false shell, colour, geometry or package choice is not presented as frozen.

Core RevA breadboard BOM

Item	Refs	Category	Qty	Part / description	Unit CAD	Ext. CAD	Listing	Basis / note
1	A1	Controller	1	ABX00028 Arduino Nano Every module, no headers	\$19.35	\$19.35	OPEN DigiKey	Quoted: DigiKey Canada Frozen RevA controller
2	U1-U3	Digital I/O	3	MCP23017-E/SP 16-bit I2C GPIO expander, 28-PDIP	\$2.64	\$7.92	OPEN DigiKey	Quoted: DigiKey Canada 0x20 panel input, 0x21 panel output, 0x22 machine I/O
3	U4	Analog acquisition	1	MCP3208-CI/P 12-bit, 8-channel SPI ADC, 16-PDIP	\$4.33	\$4.33	OPEN DigiKey	Quoted: DigiKey Canada RevA prototype ADC
4	U5	Persistence	1	Adafruit 1895 / MB85RC256V class 32 KB I2C FRAM breakout	\$14.55	\$14.55	OPEN DigiKey	Quoted: DigiKey Canada Breakout chosen for RevA assembly
5	U6	Analog acquisition	1	REF5025AID 2.5 V precision reference, 8-SOIC	\$6.40	\$6.40	OPEN DigiKey	Quoted: DigiKey Canada ADC reference and monitor
6	U7	Analog front end	1	MCP6004-I/P Quad rail-to-rail op-amp, 14-PDIP	\$0.92	\$0.92	OPEN DigiKey	Quoted: DigiKey Canada Buffer/filter channels
7	U8-U9	Safety logic	2	LMV393 family Dual low-voltage comparator	\$1.25	\$2.50	OPEN DK search	Allowance: Planning allowance OV/OC and logic-level threshold fixtures; values remain TBD
8	U10	Safety logic	1	CD74HC221PWR Dual non-retriggerable monostable	\$1.39	\$1.39	OPEN DigiKey	Quoted: DigiKey Canada Independent maximum-window logic fixture
9	U11	Fault capture	1	SN74HC573AN Octal transparent latch, 20-PDIP	\$1.69	\$1.69	OPEN DigiKey	Quoted: DigiKey Canada Fault-source bitmap
10	U12	Panel output	1	ULN2803A 8-channel Darlington low-side driver	\$3.76	\$3.76	OPEN DigiKey	Quoted: DigiKey Canada Eight talkbacks; buzzer on spare/discrete channel
11	DS1	Operator panel	1	2.42 in SSD1309 I2C module 128 x 64 monochrome OLED, 4-wire I2C	\$25.60	\$25.60	OPEN Amazon	Quoted: Canadian retail listing Verify controller/address 0x3C before purchase
12	ENC1	Operator panel	1	PEC11R-4215F-S0024 Incremental encoder with push switch	\$4.60	\$4.60	OPEN DigiKey	Quoted: DigiKey Canada Frozen encoder family
13	SW1-SW20	Operator panel	20	TL1105TF1600 6 x 6 mm tactile switch	\$0.46	\$9.20	OPEN DigiKey	Quoted: DigiKey Canada 19 functional positions plus one spare
14	D1-D8	Operator panel	8	5 mm diffused LED Talkback indicators	\$0.40	\$3.20	OPEN DK search	Allowance: Planning allowance SAFE, CHARGE, READY, ARMED, OUTPUT, FAULT, ENERGY, OPR ERR

Core RevA breadboard BOM - continued

Item	Refs	Category	Qty	Part / description	Unit CAD	Ext. CAD	Listing	Basis / note
15	BZ1	Operator panel	1	AI-1223-TWT-5V-6-R or equivalent 5 V through-hole piezo sounder	\$4.34	\$4.34	OPEN DigiKey	Quoted: DigiKey Canada Externally or internally driven variant acceptable after firmware review
16	SW21	Operator panel	1	Maintained toggle switch ARM maintained physical control	\$4.50	\$4.50	OPEN Amazon	Allowance: Planning allowance Mechanically distinct from keypad
17	SW22	Operator panel	1	Guarded/latching red switch HARD SAFE / INHIBIT control	\$8.50	\$8.50	OPEN Amazon	Allowance: Planning allowance Dominant physical safe control
18	RV1-RV8	RevA simulator	8	10 k linear trimmer Sensor-simulator channel controls	\$1.15	\$9.20	OPEN Amazon	Allowance: Planning allowance AIN0-AIN7 simulator
19	TH1-TH4	Sensors	4	10 k NTC, B=3950 Temperature-sensor prototypes	\$1.20	\$4.80	OPEN Amazon	Allowance: Planning allowance Bank, stage, ACE, handpiece simulation/fixture use
20	U13-U16	Protection	4	TPD4E05U06 family Four-line low-capacitance ESD array	\$1.15	\$4.60	OPEN DK search	Allowance: Planning allowance Connector-entry protection
21	D9-D10	Protection	2	SMBJ5.0A 5 V rail TVS diode	\$0.65	\$1.30	OPEN DigiKey	Allowance: Planning allowance Final clamp selection after rail review
26	J5, TP1-TP12	Service	1	2.54 mm headers/test points UART, reset, rails, trips, buses and inhibit test access	\$5.00	\$5.00	OPEN Amazon	Allowance: Planning allowance Serviceability requirement
27	H1-H2	Assembly	1	2 x 15 Nano socket/header set Replaceable Nano Every carrier socket	\$3.50	\$3.50	OPEN Amazon	Allowance: Planning allowance Preserves USB service access
28	Sockets	Assembly	1	DIP sockets / SOIC adapters Sockets and breakout adapters for prototype ICs	\$6.00	\$6.00	OPEN Amazon	Allowance: Planning allowance RevA prototype convenience
29	R*, C*, D*	Passives	1	Assorted 1% resistors, ceramics, electrolytics, signal diodes Pull-ups, pull-downs, series resistors, filters, LED resistors and decoupling	\$12.00	\$12.00	OPEN Amazon	Allowance: Planning allowance Threshold/divider values marked TBD where baseline defers them
31	BB1-BB3	Prototype construction	3	830-point solderless breadboard, 3-pack Controller, panel I/O and machine I/O breadboard carriers	\$6.00	\$18.00	OPEN Amazon	Allowance: Canadian retail listing Breadboard-first RevA; dedicated PCB fabrication remains deferred
32	JW*	Prototype construction	1	Breadboard jumper wire assortment Male/male, male/female and female/female logic-level jumpers	\$10.00	\$10.00	OPEN Amazon	Allowance: Planning allowance Loopback and simulator wiring; no high-current conductors
33	Harness	Harness	1	Hook-up wire, heat-shrink and labels Low-voltage internal wiring and identification materials	\$15.00	\$15.00	OPEN Amazon	Allowance: Planning allowance Small bench quantity only; final harness fabrication is deferred

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Deferred connectorization and optional/DNP population

These parts remain represented for KiCad consolidation and later integration, but are not included in the immediate breadboard planning total.

Item	Refs	Category	Qty	Part / description	Unit CAD	Ext. CAD	Listing	Basis / note
22	J1	Interconnect	1	IDC 2 x 10 set Boxed header, cable receptacle and short ribbon cable	\$8.50	\$8.50	OPEN Amazon	Deferred: Planning allowance J-PNL; buy after connector and enclosure details are frozen
23	J2	Interconnect	1	Micro-Fit 3.0 12-circuit set PCB header, plug housing and crimp contacts	\$14.00	\$14.00	OPEN DK search	Deferred: Planning allowance J-PWR conditioned machine interface; buy after connector and enclosure details are frozen
24	J3	Interconnect	1	Micro-Fit 3.0 8-circuit set PCB header, plug housing and crimp contacts	\$11.00	\$11.00	OPEN DK search	Deferred: Planning allowance J-HND low-voltage handpiece signals only; buy after connector and enclosure details are frozen
25	J4	Interconnect	1	JST-XH 6-circuit set Header, housing and contacts	\$3.50	\$3.50	OPEN Amazon	Deferred: Planning allowance J-AUX enclosure/service; buy after connector and enclosure details are frozen
30	PS1	Power	1	Qualified 5 V buck module Protected control-power conversion module	\$10.00	\$10.00	OPEN Amazon	Deferred: Planning allowance May be omitted when bench-powered from regulated 5 V/USB; buy after connector and enclosure details are frozen
34	Mechanical	Mechanical	1	Standoffs, fasteners, panel stock and test-fixture hardware RevA bench mock-up hardware	\$15.00	\$15.00	OPEN Amazon	Deferred: Planning allowance Final enclosure mechanics remain deferred; buy after connector and enclosure details are frozen
O1	U17	DNP/Optional	1	TPS3431/TPS3823 family Independent external watchdog	\$3.00	\$3.00	OPEN DK search	DNP: Planning allowance Optional RevB/C supervision
O2	U18	DNP/Optional	1	ADS7953SBDBT 16-channel, 12-bit SPI ADC	\$15.00	\$15.00	OPEN DK search	DNP: Planning allowance RevB/C production migration target
O3	U19	DNP/Optional	1	PCA9306 Bidirectional I2C level shifter	\$1.50	\$1.50	OPEN DK search	DNP: Planning allowance Fit only for a true 3.3 V target
O4	U20	DNP/Optional	1	ISO1540 I2C isolator	\$7.00	\$7.00	OPEN DK search	DNP: Planning allowance Do not fit unless I2C leaves the local enclosure
O5	U21	DNP/Optional	1	TLV75533 3.3 V auxiliary LDO	\$1.50	\$1.50	OPEN DK search	DNP: Planning allowance Mixed-voltage option only
O6	U22	DNP/Optional	1	RTC module at 0x68 Real-time clock	\$4.00	\$4.00	OPEN Amazon	DNP: Planning allowance Fit only if wall-clock evidence is required
O7	U23	DNP/Optional	1	SN74HC148 Hardware fault priority encoder	\$1.50	\$1.50	OPEN DK search	DNP: Planning allowance Optional immediate cause classification
O8	U24	DNP/Optional	1	MCP9700A Local analog temperature sensor	\$1.00	\$1.00	OPEN DK search	DNP: Planning allowance Optional ACE-board temperature

Deferred / optional planning value: \$96.50

Scope boundary

This BOM stops at the frozen RevA low-voltage ACE boundary. It excludes the energy-storage bank, high-current switch, charge converter, raw power conductors, high-current handpiece wiring and final enclosure. Connectorized harnesses, the control-power buck and final mechanical hardware are retained as deferred references rather than immediate breadboard purchases.

Procurement and configuration notes

- Use the three MCP23017 devices at addresses 0x20, 0x21 and 0x22 exactly as frozen.
- Verify that the OLED listing provides 128 x 64 pixels, an SSD1309-class controller and a usable I2C mode at address 0x3C before ordering.
- The FRAM line intentionally uses a breakout for RevA. A later carrier PCB may replace it with the bare SOIC-8 device.
- The comparator threshold networks, analog scaling and monostable timing components remain bench-characterization items; no listing link freezes those values.
- Immediate assembly is on solderless breadboards. Final IDC, Micro-Fit and JST connectorization is deferred until the physical interfaces and shell/keying variants are frozen.
- Exact supplier inventory and prices can change. The links are included for faster shopping and part-number verification; the CAD values remain a planning snapshot rather than a live cart.

Link legend

DigiKey	Direct authorized-distributor product page for a frozen exact part number.
DK search	DigiKey Canada search because the BOM specifies a family, equivalent or still-deferred package choice.
Amazon	Direct retail listing for the selected OLED or a Canadian search for generic bench hardware and assortments.

Controlled source

NanoArc Master Technical Architecture and Configuration Baseline, NA-MASTER-001, RevA Freeze / Master Revision 1.2, dated 2026-06-26.