

Electrical Fuse Schedule (Implementation - Lynx Topology)

As-of date: 2026-02-18

Purpose: define each required fuse by circuit, protected conductor/device, holder/housing method, physical placement, and linked wire gauge assumptions for the approved Phase 1 Lynx architecture with a battery-backed 12V bus.

Related docs:

- Canonical electrical/system baseline: docs/SYSTEMS.md
- Implementation topology and conductor map: docs/ELECTRICAL_overview_diagram.md
- Battery and trunk recalculation record: docs/ELECTRICAL_battery_fuse_wire_recalc_2026-02-18.md
- Decisions/open items tracker: docs/TRACKING.md
- BOM source of truth: bom/bom_estimated_items.csv

Sweep Findings (2026-02-12)

Finding ID	Finding	Impact	Resolution status
FS-001	BB1248120 was modeled in planning docs as 120A on the 48v output.	Alternator-recovery math was materially overstated.	Corrected in bom/bom_estimated_items.csv row 18 and docs/SYSTEMS.md (~1500W, about 26A at 57.6V).
FS-002	Fuse schedule listed fuse values but not a complete housing/holder definition for every fuse family.	Install path and procurement freeze were ambiguous.	Resolved below with explicit holder/housing method and location per fuse ID.
FS-003	Fuse schedule did not tie each fuse to a conductor gauge plan.	Hard to verify "fuse protects conductor" rule at install time.	Resolved below with gauge mapping and assumptions.

Design Basis

- Topology: Victron Lynx Distributor M10 (LYN060102010) with 4 fused 48V branches.
- Battery bank assumption: 3x 48V 100Ah batteries in parallel (3 separate battery-positive conductors leaving batteries).
- 12V distribution assumption: shared 12V bus fed by Orion-Tr Smart 48/12-30 and a 12V 100Ah LiFeP04 buffer battery branch.
- Parallel-bank safety rule: use one Class T fuse per battery-positive conductor leaving the battery. A single shared “bank fuse” does not protect the individual battery leads and does not prevent cross-feed faults between parallel batteries.
- Branch devices on Lynx:
 - MultiPlus-II 48/3000
 - SmartSolar 150/45
 - Sterling BB1248120 output
 - Orion-Tr 48/12-30 input
- 12V buffer battery protection and switching baseline: F-11 (100A class) on battery positive within ~7" of source, then SW-12V-BATT` manual disconnect for service isolation.
- Phase 1 complexity lock: no automatic low-voltage disconnect (LVD) layer in this revision.
- SmartShunt control/power lead note: retain the Victron-supplied fused positive sense/power lead assembly (small-current harness), and avoid substituting lower-voltage automotive fuse components on the 48V system.
- Sterling rating basis used for this revision: BB1248120 output ceiling about 1500W (~26A at 57.6V), with 150A input fuse and 40A output fuse guidance.

Manufacturer References Used

- Victron MultiPlus-II 120V installation page (recommends 125A DC fuse for 48/3000 ; cable table includes AWG 1 to AWG 2/0 by length): https://www.victronenergy.com/media/pg/MultiPlus-II_120V/en/installation.html
- Victron SmartSolar MPPT 150/45 installation/spec pages (50A-63A battery fuse range, terminal limit 16 mm2 / AWG 6): https://www.victronenergy.com/media/pg/Manual_SmartSolar_MPPT_150-35__150-45/en/installation.html and https://www.victronenergy.com/media/pg/Manual_SmartSolar_MPPT_150-35__150-45/en/technical-specifications.html
- Victron Orion-Tr DC-DC Converter (isolated) product page, manual, and datasheet (48V models require external input fuse per manual; 48/12-30 output rating and terminal limits per datasheet): <https://www.victronenergy.com/dc-dc-converters/orion-tr-dc-dc-converters-isolated>
- Victron Lynx Distributor manual (MEGA fuse carrier format): https://www.victronenergy.com/media/pg/Lynx_Distributor/en/installation.html
- Victron Orion-Tr Smart isolated DC-DC installation page (external input fuse guidance): https://www.victronenergy.com/media/pg/Orion-Tr_Smart_DC-DC_Charger_Isolated/en/installation.html
- Victron fuse datasheet (for 48V systems use 58V -class fuses): <https://www.victronenergy.com/upload/documents/Datasheet-Fuses-EN.pdf>
- Sterling BB12V->48V charger references (model list includes BB1248120 , fuse/cable guidance): <https://sterling-power.com/products/battery-to-battery-chargers-12v-to-48v>
- Sterling BB12V->48V charger installation manual PDF (fuse/cable guidance): https://sterling-power.com/cdn/shop/files/bb1230_1240_1260_12120_122430_241230_241240_241260_241280_242430_124810_1248120_241280_242430_b2b_installation_manual.pdf?v=1739450989

- Blue Sea Systems guidance (fuse close to source): <https://www.blueseas.com/resources/1437>
- Blue Sea Class T holder-family compatibility (110A-200A vs 225A-400A): https://www.blueseas.com/support/articles/Fuse_Blocks/1438/Selecting_Class_T_Fuses

Battery Branch Re-Baseline (2026-02-18)

- This schedule now uses a gated battery-branch baseline of 200A Class T per battery (F-01A/B/C) as a provisional default.
- Re-baseline method and calculations are documented in docs/ELECTRICAL_battery_fuse_wire_recalc_2026-02-18.md .
- Final lock gate for F-01A/B/C : capture a true 51.2V battery datasheet/manual with validated current and terminal limits before permanent fuse lock.
- Holder-family constraint: battery branch values below 225A require the 110A-200A Class T holder family. Do not pair <225A fuse targets with 225A-400A holder-only hardware.
- If validated battery or terminal limits are lower than current provisional assumptions, move F-01A/B/C to 175A and update BOM row 7 accordingly.

Required Fuse Map (Start-to-Finish, With Housing)

Fuse ID	Circuit (source -> load)	Protected wire/device	Fuse type and voltage class	Amperage	Holder or housing method	Physical location	Planned conductor gauge
F-01A	Battery A + -> bank positive combine/disconnect input	Battery A positive cable leaving battery	Class T (>=125VDC)	200A provisional	Blue Sea Class T fuse block (covered stud mount, 110A-200A family)	Battery compartment, within ~7" of Battery A positive post	2/0 AWG
F-01B	Battery B + -> bank positive combine/disconnect input	Battery B positive cable leaving battery	Class T (>=125VDC)	200A provisional	Blue Sea Class T fuse block (covered stud mount, 110A-200A family)	Battery compartment, within ~7" of Battery B positive post	2/0 AWG
F-01C	Battery C + -> bank positive combine/disconnect input	Battery C positive cable leaving battery	Class T (>=125VDC)	200A provisional	Blue Sea Class T fuse block (covered stud mount, 110A-200A family)	Battery compartment, within ~7" of Battery C positive post	2/0 AWG
F-02	Lynx Slot 1 -> MultiPlus DC+	Main inverter positive feeder	MEGA, 58V OR 80V	125A	Integrated Lynx Distributor fuse slot	Lynx Distributor, Slot 1	2/0 AWG planned (AWG 1 minimum on short run)
F-03	Lynx Slot 2 -> SmartSolar BAT+	MPPT battery-side positive feeder	MEGA, 58V OR 80V	60A	Integrated Lynx Distributor fuse slot	Lynx Distributor, Slot 2	6 AWG
F-04	Lynx Slot 3 -> Sterling 8B1248120 output +	Sterling output feeder to house 48v bus	MEGA, 58V OR 80V	40A	Integrated Lynx Distributor fuse slot	Lynx Distributor, Slot 3	6 AWG planned (10 AWG minimum per Sterling table)
F-05	Lynx Slot 4 -> 48v auxiliary feeder (Orion branch)	Aux feeder from Lynx to Orion-branch fuse point	MEGA, 58V OR 80V	40A	Integrated Lynx Distributor fuse slot	Lynx Distributor, Slot 4	6 AWG
F-06	48v aux feeder -> Orion 48v input +	Orion input lead (device protection)	Inline MIDI/AMI/ANL family rated >=58VDC	20A target (23A if using Victron MIDI family)	Sealed inline fuse holder mounted on backplate	Electrical cabinet, mounted at source end of Orion input lead	6 AWG planned (8 AWG minimum per Orion cable table)
F-07	Orion 12v output + -> 12v fuse panel feed	Main 12v feeder from Orion	Inline MIDI/AMI/ANL family rated >=32VDC	60A	Sealed inline fuse holder mounted on backplate	Electrical cabinet, within ~7" of Orion12V output stud	6 AWG planned (8 AWG minimum per Orion cable table)
F-08	Starter battery + -> Sterling 8B1248120 input +	Vehicle-side charger input cable	MEGA/ANL equivalent rated >=32VDC	150A	Sealed engine-bay fuse holder with high-temp cover	Engine bay, within ~7" of starter battery positive post	2/0 AWG planned (2 AWG minimum per Sterling table)

F-09A/B/C	PV string + leads -> MPPT PV combiner	Each solar string positive conductor and reverse-current path	gPV string fuse (>=150VDC)	15A each (provisional)	10x38 touch-safe PV fuse holders in weatherproof combiner enclosure	Roof-entry combiner near gland/pass-through	10 AWG PV wire
F-10	12v fuse panel branch circuits -> each 12v load	Individual 12v branch conductors and load circuits	ATO/ATC blade fuses (32v class)	Per-circuit	Integrated sockets in Blue Sea 5026/5032 style fuse block	12v fuse panel in electrical cabinet	Per branch (table below)
F-11	12V buffer battery + -> shared 12V bus via SW-12V-BATT	Buffer battery source cable and downstream bus fault exposure	Inline MIDI/AMI/ANL family rated >=32VDC	100A class baseline	Sealed inline holder mounted close to battery positive	Within ~7" of 12V buffer battery positive post	4 AWG planned
OEM-SHUNT	Lynx positive tap -> SmartShunt positive sense/power lead	SmartShunt electronics lead	Victron OEM inline low-current fuse (factory harness)	OEM value (small-current harness fuse)	Integrated inline holder in supplied harness	Electrical cabinet near Lynx positive tap	OEM harness lead

12V Buffer Battery Switching Requirement

- SW-12V-BATT is a manual service disconnect in the 12V buffer battery positive path, installed downstream of F-11 .
- Operational default:
 - SW-12V-BATT closed for battery-backed 12V bus operation.
 - SW-12V-BATT open for service isolation or Orion-only validation mode.
- Keep always-on safety branch (12V-05) unswitched at branch level; isolation is handled at source path controls.

12V Branch Fuse + Gauge Assignments (Initial Build)

Circuit	Planned load	Fuse	Planned wire gauge	Notes
12V-01	Starlink DC power supply	10A	14 AWG duplex	Remote-work load path
12V-02	Fridge (35-50qt)	15A	14 AWG duplex	Current estimate pass flags this as a voltage-drop warning at ~12 ft; hold <=8 ft or move to 12 AWG
12V-03	Diesel heater electrical	15A	14 AWG duplex	Startup surge expected; estimate pass flags tight margin at ~8 ft
12V-04	Water pump	10A	14 AWG duplex	Intermittent duty
12V-05	CO + propane detector	3A	18/2	Always-on safety load
12V-06	LED strips	5A	18/2	Estimate pass flags voltage-drop warning at ~8 ft; shorten run/load or upsize
12V-07	Cerbo GX power feed (assumed via 12v panel)	3A	18/2	Assumption until final harness lock
12V-08	USB PD station branch (office zone)	20A	12 AWG duplex	Keep <=5 ft (estimate-pass assumption) or upsize
12V-09	USB PD station branch (galley zone)	15A	14 AWG duplex	Current estimate pass assumes ~8 ft and ~8A expected load; move to 12 AWG if sustained current rises

Length-Validation Sync (2026-02-18)

- docs/ELECTRICAL_overview_diagram.md now carries one-way estimated lengths and voltage-drop screening for C-01 through C-35 .
- Fuse values are unchanged in this pass; only run-length assumptions and warning flags were updated.
- USB branch baseline is synchronized across docs/BOM: office branch 12 AWG (C-34), galley branch 14 AWG (C-35).

Holder Ecosystem Standard (Procurement Guidance)

Fuse family	Preferred holder style	Why
Class T (F-01A/B/C)	Covered stud-mounted marine block (110A-200A family for current baseline)	High interrupt capacity and robust battery-compartment mounting; holder family must match chosen Class T range
MEGA (58v/80v) in Lynx	Lynx integrated holders only	Eliminates separate branch fuse block and keeps topology locked

Inline 48v Orion input (F-06)	Sealed MIDI/AMI-compatible holder on interior backplate	Keeps source-end protection near branch takeoff
Inline 12v Orion output (F-07)	Sealed MIDI/AMI-compatible holder at Orion output	Protects full panel feeder length
12V buffer battery main (F-11)	Sealed MIDI/AMI/ANL holder near battery	Protects shared 12V bus source path from battery fault current
12V battery disconnect (SW-12V-BATT)	Sealed rotary DC switch near distribution cabinet access	Provides simple service isolation without adding LVD complexity
Engine-bay Sterling input (F-08)	Sealed MEGA/ANL holder, high-temp/engine-bay suitable	Environmental robustness and source-proximate protection
PV string fuses (F-09)	DIN-rail 10x38 gPV holders in weatherproof combiner	Proper PV-voltage insulation and serviceable string isolation
12V branches (F-10)	Integrated blade sockets in marine fuse block	Fast field service and clear branch labeling
SmartShunt positive lead (factory harness)	Keep Victron-supplied inline fused lead assembly	Preserves vendor-qualified low-current protection path for shunt electronics

Spare Fuse Inventory

Fuse type	Installed qty	Spare qty to carry	Notes
Class T 200A (provisional installed)	3	3	One spare per installed battery fuse while 200A baseline is active
Class T 175A (alternate pending final battery datasheet lock)	0	3 optional	Optional non-regret alternate set if budget allows; install only if final lock gate requires lower value
MEGA 125A (58V/80V)	1	2	MultiPlus branch
MEGA 60A (58V/80V)	1	2	MPPT branch
MEGA 40A (58V/80V)	2	3	Sterling + Orion feeder branches
Orion input fuse (20A target / 23A MIDI)	1	2	Match installed holder family
Orion output fuse 60A (32V+)	1	2	Main 12v feeder protection
12V buffer battery main fuse (100A class)	1	2	Keep exact spare value matched to final F-11 holder family
Sterling input fuse 150A (32V+)	1	1	Vehicle-side charger input
PV string fuse 15A gPV	3	3	One spare per string
SmartShunt OEM harness fuse	1	1	Keep OEM-equivalent spare if the fuse is field-replaceable on final harness
ATO/ATC branch fuses	variable	2 each used value	Keep mixed kit onboard

BOM Row Mapping

Fuse scope	BOM row(s)
Main battery Class T protection (F-01A/F-01B/F-01C) + Class T spares	bom/bom_estimated_items.csv ROW 7
Lynx branch MEGA fuses installed (F-02 to F-05)	bom/bom_estimated_items.csv ROW 10
Inline Orion/Sterling installed fuse hardware (F-06, F-07, F-08)	bom/bom_estimated_items.csv ROW 11
12V buffer battery and main fuse (F-11)	bom/bom_estimated_items.csv ROW 21
12V branch panel and blade fuses (F-10)	bom/bom_estimated_items.csv ROW 16
SmartShunt OEM fused lead (OEM-SHUNT)	bom/bom_estimated_items.csv ROW 23 (included with SmartShunt kit)
High-current spare fuse kit (MEGA/MIDI/150A)	bom/bom_estimated_items.csv ROW 105
PV string fuses + holder (F-09A/B/C) and spares	bom/bom_estimated_items.csv ROW 106

Assumptions and Open Items

1. Wire sizing above assumes copper conductors, enclosed vehicle routing, and the one-way run-length estimate set in `docs/ELECTRICAL_overview_diagram.md` (`2026-02-18` pass).
2. `F-09A/B/C` remains provisional at `15A` pending final solar module datasheet max-series-fuse confirmation.
3. Final SKU lock is still required for inline holders used by `F-06` , `F-07` , `F-08` , and `F-11` , plus `SW-12V-BATT` .
4. If Orion run lengths exceed the short/medium assumption, keep `F-06` / `F-07` and upsize conductors before energizing.
5. Do not use `32V` automotive MEGA fuses on `48V` house circuits; use `58V` / `80V` DC-rated fuses only.
6. Keep the SmartShunt fused lead as an OEM harness item unless an equivalent voltage-rated replacement is fully validated.
7. `SW-12V-BATT` is manual-only in Phase 1; no automatic LVD behavior is assumed in this schedule.
8. Battery listing data (`<=200A` current limit) is currently treated as provisional because the provided screenshot includes `14.6V/14.2V` values that are not a `51.2V` profile; final lock requires validated `51.2V` battery documentation.
9. If final battery current or terminal limits are lower than current assumptions, down-select `F-01A/B/C` to `175A` and keep fuse-to-conductor coordination synchronized with `docs/ELECTRICAL_overview_diagram.md` and `bom/bom_estimated_items.csv` .