

User Manual

Temperature-regulated alternator-to-battery charging through Victron Orion XS DC-DC chargers — installation, wiring, setup and everyday use.

1 • How it works

An alternator's safe output is set by its temperature, and that changes all the time: higher at cruise on a cool morning, lower at idle in a hot engine room. Alt2Bat measures the **alternator case temperature** with a probe and runs your Orion XS chargers in Victron's *External Control* mode, sending each unit a fresh current limit every second. Below the setpoint (105 °C by default) the combined limit climbs; near it, it holds; above it, it eases off. The loop settles where heat in balances cooling out — the true sustainable output for the present RPM, airflow and ambient.

The Orion keeps everything else: bulk, absorption and float, the battery preset, the engine-shutdown detection. Alt2Bat only caps the current. If the box ever stops talking, each Orion reverts by itself to the fixed limit stored in its memory within one minute.

Alt2Bat is a charging convenience device, not a safety system. It reduces alternator stress; it does not replace correct fusing, cable sizing and the Orion's own protections.

2 • Safety

High-current DC work. Disconnect both batteries before wiring. Every positive cable is fused at the battery end. Use the cable sizes in §4.1 and crimped, insulated lugs. If in doubt, have a marine electrician make the heavy connections.

- **Never interrupt the alternator output under load.** Alt2Bat never does — every cut-back acts through the Orion's current limit or its remote terminal — and neither should your wiring: no switch or breaker in the alternator-to-starter-battery cable.

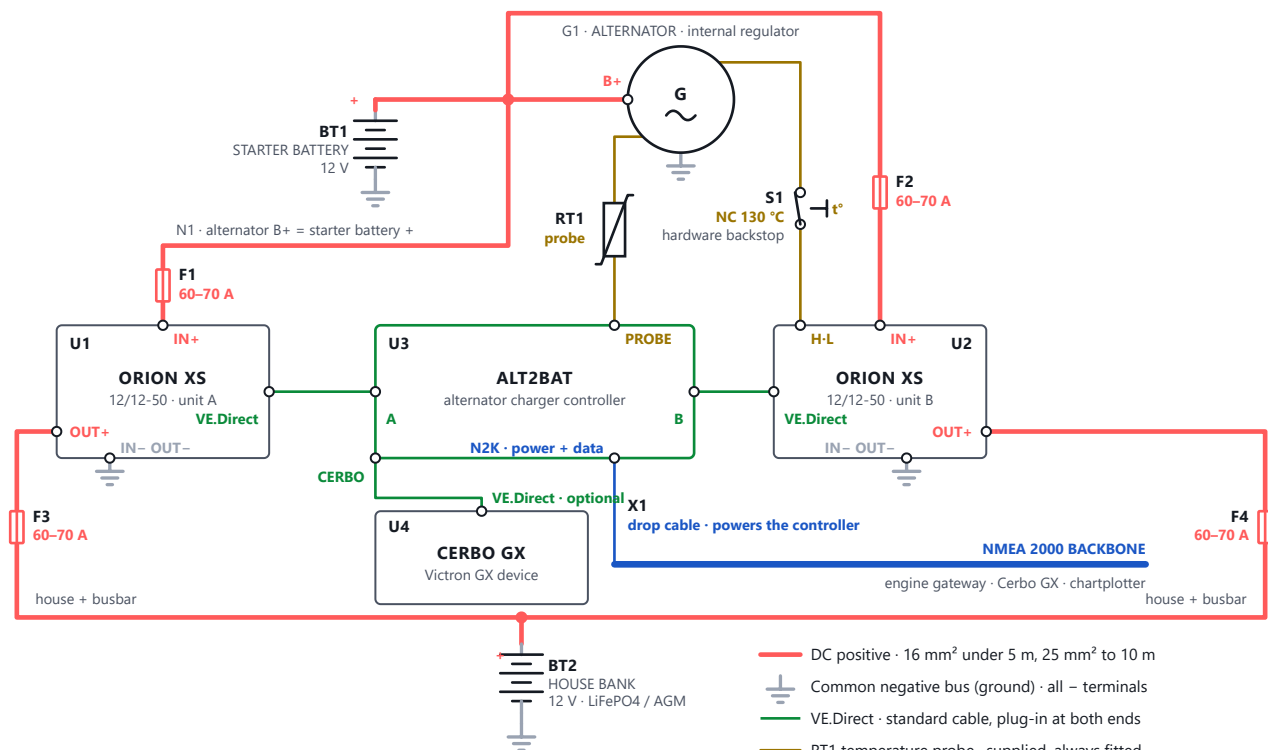
- **Probe fault means zero.** An open, shorted or implausible probe reading cuts the combined limit to 0 A until the reading is good again. Route the probe cable so it cannot chafe or touch the exhaust.
- **Fit the hardware backstop.** A normally-closed 130 °C thermal switch on the alternator, wired to Orion B's remote terminals (\$4.5), protects the alternator with no software in the loop at all.

3 • What you need

Item	Notes
Alt2Bat controller + temperature probe	In the box.
1 or 2 × Victron Orion XS 12/12-50	Not included. One unit works; two share the load. Each has one VE.Direct port, which Alt2Bat uses.
VE.Direct cable per Orion	Standard Victron VE.Direct cable. One end plugs into the Orion, the other into Alt2Bat port A / B (\$4.2).
VE.Direct cable to the Cerbo GX	Optional: from the controller's CERBO socket to a free VE.Direct port on the Cerbo, if you want the Cerbo and VRM to list the two chargers as one Orion XS (\$10.2).
Heavy DC cable and fuses	Per Orion: two cables and two 60–70 A fuses (\$4.1).
NMEA 2000 drop cable + T-piece	Required: it powers the controller, brings engine data for derating and puts the charger on your Cerbo GX / chartplotter.
NC thermal switch, 130 °C	Required hardware backstop on Orion B's remote terminals (\$4.5).

4 • Wiring

The heavy wiring is the standard Orion XS alternator-to-house layout from the Victron manual; Alt2Bat adds only light-gauge connections. Both Orions take their input from the starter battery (the alternator's own battery) and deliver into the house bank.



F1–F4: 60–70 A fuse at the battery end of each Orion cable · the controller is powered from the NMEA 2000 bus, no separate supply

Alt2Bat wiring schematic. Red = heavy DC positive, ground symbol = the boat's common negative, green = VE.Direct, yellow = the temperature probe and the thermal switch, blue = NMEA 2000.

Ref.	Item	Notes
G1	Alternator	As fitted, with its own internal regulator. B+ stays on the starter battery.
BT1	Starter battery	12 V. Feeds both Orion inputs and the controller.
BT2	House bank	12 V, any chemistry the Orion supports.
U1, U2	Victron Orion XS 12/12-50	Unit A on port A, unit B on port B. One unit is enough.
U3	Alt2Bat controller	PROBE, VE.Direct A / B, CERBO (optional), N2K (data and power).
U4	Cerbo GX	Customer's Victron GX device. Not included. Optional — VE.Direct from U3's CERBO socket to a free port on the Cerbo (\$10.2).
RT1	Temperature probe	Supplied. On the alternator case, always fitted.

S1	NC thermal switch 130 °C	Required. Replaces the L–H bridge on U2's remote block; with a single Orion, on that unit.
F1– F4	Fuses 60–70 A	At the battery end of each Orion input and output cable.
X1	NMEA 2000 drop cable	Controller to a T-piece on the backbone. Carries data and the controller's power.
N1	Positive node	Alternator B+ and starter battery + are the same point.

4.1 Power wiring

Connection	How
Alternator B+ → starter battery +	As the engine maker wired it. The alternator's internal regulator keeps looking at the starter battery; nothing changes here.
Starter battery + → Orion IN+ (each unit)	Own cable per Orion, 60–70 A fuse at the battery end.
Orion OUT+ → house bank + (each unit)	Own cable per Orion, 60–70 A fuse at the battery end.
Orion IN– and OUT–	Both to the boat's common negative bus.
Alt2Bat supply	From the NMEA 2000 bus through the drop cable — no separate supply and no fuse of its own (§4.4).

Cable per the Orion XS manual: **16 mm² (6 AWG)** for runs under 5 m, **25 mm² (4 AWG)** for 5–10 m. Mount each Orion vertically on a non-flammable surface with the power terminals facing down and 10 cm of free air around it; a hot engine room reduces its output before Alt2Bat ever does. Mount the controller somewhere dry, away from the engine's heat, within the probe cable's reach of the alternator.

4.2 VE.Direct to each Orion

Alt2Bat has two VE.Direct sockets for the chargers, **A** and **B**, plus a third — **CERBO** — for the optional link below. Plug a standard Victron VE.Direct cable into the Orion and into the controller — nothing to strip, cross or solder. With a single Orion, use port A and connect the 130 °C thermal switch to that unit's remote terminals. With two units the switch goes on unit B, the one it sheds.

An Orion XS has one VE.Direct port, and Alt2Bat occupies it, so the chargers themselves cannot also be cabled to a Cerbo GX. The Cerbo sees them through Alt2Bat instead: as a charger on NMEA 2000, and — over a VE.Direct cable from the controller's **CERBO** socket — as one Orion XS (\$10).

4.3 Temperature probe

1. Fix the probe tip to the alternator's **rear housing** — the end that carries the rectifier and regulator, the hottest part of the case — on a flat metal spot, under a case bolt or with a stainless hose clamp. A dab of thermal paste helps.
2. Route the cable clear of the belt, pulley and exhaust; secure it every 20 cm.
3. Plug it into the **PROBE** socket on the controller.

4.4 NMEA 2000

Connect a standard drop cable from the controller's **N2K** connector to a T-piece on the backbone. Alt2Bat reads engine RPM (PGN 127488) and coolant temperature (PGN 127489) from any engine gateway or ECU that publishes them, and puts the charger itself on the bus (\$10). The controller is **powered from the bus** like any other NMEA 2000 device, so the drop cable is its only supply: with the bus off, Alt2Bat is off and the Orions run on their own stored limits.

No engine gateway on board? Tick Setup item 14 *Ignore N2K engine data*: the loop then runs on temperature alone. Leave it unticked when a gateway is present — if the gateway reports RPM as unavailable, Alt2Bat holds charging at 0 A rather than load a stopped engine, and the Status page names the missing signal.

4.5 Thermal switch

Orion B's remote terminal block (the only Orion's, in a single-unit installation) ships with a wire bridge between its **L** and **H** pins. Replace the bridge with a **normally-closed thermal switch** rated 130 °C, mounted on the alternator case next to the probe. Above its trip point the switch opens, Orion B shuts down on its own, and Alt2Bat simply sees unit B go offline and re-normalises onto unit A. At 130 °C it sits above the software setpoint, so it only ever fires if the loop fails to hold — the protection that needs no software at all. Fit it.

5 • Orion XS setup

Configure each Orion once in **VictronConnect** before connecting Alt2Bat, then leave it alone:

- **Battery preset** and charge voltages for your house bank (LiFePO4, AGM, flooded...). Alt2Bat never touches these.
- **Charger current limit**: the value the unit falls back to on its own if the controller stops talking. Alt2Bat writes this one from its own per-unit *Current limit* setting (Setup tab, 40 A by default) and never commands a unit above it — so set it there rather than in VictronConnect. 40 A per unit is a sensible figure for a 120 A alternator.
- **Engine shutdown detection**: keep it enabled, with the alternator type that matches yours. It, together with the input-voltage lockout, is what stops the Orions from draining the starter battery when the engine is off.

Nothing else needs enabling. When Alt2Bat connects, it switches the unit into External Control itself and starts refreshing the current limit every second. All of the settings above can also be read and edited later from the controller's Setup tab (Orion EEPROM cards), and Alt2Bat records each unit's configuration as a **profile**: if a unit is ever replaced, the profile is written to the new unit automatically. *Sync B from A* copies unit A's settings to unit B.

6 • First start & WiFi

1. Power the NMEA 2000 bus. With no known network in range it starts its own open WiFi network `altcharger`.
2. Connect a phone to it and open `http://altcharger.local` (or `192.168.4.1`).
3. Setup tab → *Network* → add your boat WiFi (up to three networks are stored). The controller joins it; the setup network comes back whenever none of yours is in range.
4. From then on, open `http://altcharger.local` on the boat WiFi.

7 • The web interface

Tab	What's there
Status	Alternator temperature against the setpoint and the combined target; a card per Orion with state, input and output volts/amps/watts, charger temperature, error code and off-reason (tap a card for the unit's identity and stored settings); the engine card with RPM and coolant; the Cerbo card (§10.2); WiFi and bus health. Banners flag a probe fault, stale engine data and active alerts. Refreshes every two seconds.
Graph	The last two hours of alternator temperature, commanded and delivered current and battery voltage, sampled every ten seconds on a clock-time axis.

Setup	Control settings (§8), Orion EEPROM cards and profiles (§5), network, firmware update, port capture (§13).
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8 • Settings reference

Setup tab, saved in the controller and applied immediately. Defaults suit a small marine diesel with a 100–120 A alternator.

#	Setting	Default	Meaning
1	Setpoint (°C)	105	Alternator case temperature the loop aims for. Accepted marine practice is 100–110 °C; the windings run 30–50 °C hotter than the case.
2	Deadband (°C)	2	± band around the setpoint where the current limit holds (103–107 °C by default).
3	Kp (A/°C)	2.0	Proportional gain: amps of limit per degree of error.
4	Ki (A/°C/s)	0.05	Integral gain. Frozen inside the deadband and while the ramp limits act.
5	Ramp up (A/s)	2	Fastest the combined limit may climb.
6	Ramp down (A/s)	5	Fastest it eases off. A probe fault bypasses this and drops to 0 A at once.
7	Max combined A	80	Ceiling for the sum of both units, always bounded by the two per-unit limits. Also settable from VictronConnect or the VRM remote console while linked to a Cerbo GX (§10.2).
8	Probe offset (°C)	0	Offset added to the probe reading. Leave at 0 unless told otherwise.
9	Engine cold (°C)	50	Coolant at or below this → the cold floor applies.
10	Engine normal (°C)	65	Coolant at or above this → full ceiling; linear in between.
11	Cold floor (%)	50	Ceiling fraction while the engine is cold.
12	RPM start	1100	At or below this RPM the belt is left alone (0 A).

13	RPM full	1350	At or above this RPM the full ceiling is available; linear in between.
14	Ignore N2K engine data	off	Tick when no engine gateway is on the bus (§4.4).

If the temperature trace hunts by more than a couple of degrees around the setpoint, lower Kp before touching anything else; a slow plant needs patience, not gain.

9 • Engine-aware charging

With engine data on the bus, the ceiling is derated before the temperature loop sees it: no load at idle (item 12), rising to the full ceiling at cruise RPM (item 13); half the ceiling while the coolant is cold (items 9–11). Ceiling changes follow the same ramp limits as the loop, so an RPM crossing never steps the load. If the engine gateway goes silent for more than ten seconds the derating is lifted, a warning appears, and the loop runs on temperature alone.

10 • Cerbo GX & chartplotter

Alt2Bat reaches a Cerbo GX in two independent ways: as a charger on NMEA 2000 (§10.1), and — if you run a VE.Direct cable to the Cerbo — as one Victron Orion XS charger (§10.2). Use either, or both.

10.1 On NMEA 2000

Alt2Bat is a full NMEA 2000 node: it claims its own address and transmits the standard charger PGNs at 1 Hz — battery status **127508** (alternator volts, amps, temperature), DC detailed status **127506** (type: alternator), charger status **127507** and converter status **127750** — on charger instance 49, battery instance 0. A Cerbo GX (over VE.Can) or a chartplotter lists the alternator as a charger with no VE.Direct cable to the Cerbo required.

Three conditions are raised as NMEA 2000 alerts (**126983** with **126985** text): alternator over-temperature (setpoint + 15 °C, cleared 5 °C lower), a probe fault, and a charger error with the Orion's error code in the text. Converter status reports *Warning* from setpoint + 5 °C. How, and whether, a display shows these alerts is up to the display maker.

10.2 On VE.Direct: both chargers as one

Firmware **0.51** and later. Plug a standard VE.Direct cable into the controller's **CERBO** socket and into a free VE.Direct port on the Cerbo GX. The Cerbo then lists **one Victron Orion XS** — your pair of chargers presented as a single one. On Venus OS 3.79 it registers as an alternator-class device and appears in VRM the same way.

Whose name it carries. The charger the Cerbo lists is Orion A: its serial number, model and firmware version, so it shows up in the Cerbo and in VRM under unit A's name. If Orion A is disconnected while unit B keeps working, the box shows unit B's identity for as long as that lasts — VRM may then list a second device for that period. Reconnect A and the original device comes back.

What the Cerbo shows	Where it comes from
Output current, output power, input current	The two units added together.
Temperature	The hotter of the two chargers — never the alternator probe.
Error	The worse of the two units' errors.
State (bulk, absorption, float...)	The more active of the two.
Battery and input voltage, off reason, charge-voltage set-point	The unit whose name is being shown (normally Orion A).
History: charged Ah, operating time, cycles	Both units' own lifetime counters added together.

What the Cerbo can change — and nothing else. The chargers' own settings (battery preset, charge voltages, engine-shutdown detection) are never written by the Cerbo.

- **On / off.** Switching the charger off on the Cerbo's device page ramps charging down to zero in the normal way. The Status page then shows **CHARGING OFF BY CERBO** with a *Resume* button that puts it back on. Nothing is stored: after any power-up the box starts ON.
- **Charge current limit.** The Cerbo's device page for this charger offers only On/Off — Venus OS shows no current-limit entry for an alternator-class device, so there is nothing to set there. The limit is instead set from **VictronConnect** (or the VRM remote console) connected to the box's own Bluetooth or WiFi, or directly from Setup item 7 *Max combined A*. Either way it is the combined ceiling for both units together, saved like any other setting and bounded by the two per-unit *Current limit* settings — it never rewrites a charger's own EEPROM current limit, which stays whatever was set in §5.
- **DVCC.** Alt2Bat is the DVCC master for its two Orion XS chargers, not the Cerbo. A charge current limit the Cerbo sends over DVCC is acknowledged so the Cerbo sees no error, but it

is not applied — Max combined A and the per-unit limits keep control. Under *Settings* > *DVCC* the Cerbo's own *Maximum charge current* has no effect on this box.

All the ceilings apply together and the lowest wins: the temperature loop, the engine derating and Max combined A.

The Cerbo card on the Status page shows what is going on over that link: *Identity* (which unit, its serial and firmware — or "compiled-in" before any unit has been read), *Limit from Cerbo* (the value shown to the Cerbo and the Max combined A it comes from), and the CHARGING OFF BY CERBO banner with its Resume button.

11 • Firmware updates

Setup tab → *Firmware* → *Check for update*. The controller also checks by itself every ten minutes and installs the assigned version — but only while it is idle: engine off and no charge current. A new version that fails to settle rolls back on its own. Requires the boat WiFi to reach the internet.

12 • Troubleshooting

Symptom	Meaning / fix
Orion card shows <i>offline</i>	No VE.Direct traffic for 5 s. Check that the VE.Direct cable is seated at both ends and plugged into the right port. Alt2Bat pings the port every 2 s and reconnects automatically.
Target 0 A, banner <i>probe fault</i>	Probe open, shorted or reading outside –10...150 °C. Check the plug and the cable.
Target 0 A, banner <i>no engine data</i> while the engine runs	The gateway is silent or sends RPM as unavailable (some gateways lose the tach signal at idle — the banner says which). Raise idle briefly, fix the gateway, or tick item 14 if you prefer temperature-only control.
Charging stays low although the alternator is cool	Look at the ceiling: cold coolant (item 11), low RPM (items 12–13), the per-unit limits, or an Orion in absorption/float because the house bank is nearly full.
Temperature hunts around the setpoint	Lower Kp (item 3); widen the deadband a little if needed.

Orion charges at its fixed limit, ignores the box	The unit is in its 1-minute fallback: the VE.Direct link is down. See the first row.
Unit B keeps dropping out at high temperature	The thermal switch is doing its job — the software setpoint or the maximum current is too high for this alternator in this engine room.
Status shows <i>CHARGING OFF BY CERBO</i>	The charger was switched off on the Cerbo's device page. Press <i>Resume</i> on the Cerbo card, or switch it back on at the Cerbo; a power-up also clears it (§10.2).
<i>Max combined A</i> changed on its own	A charge current limit was set from VictronConnect or the VRM remote console — not the Cerbo's device page, which offers only On/Off (§10.2).
VRM lists a second Orion	Orion A was offline for a while, so the box carried unit B's identity for that period (§10.2).
<code>altcharger.local</code> does not open	Use the IP from your router, or join the <code>altcharger</code> setup network if the boat WiFi is not in range.

13 • Support

Questions, wiring checks, tuning help: admin@pixelmast.com. For a unit that misbehaves, Setup → *Capture ports* records ten seconds of raw traffic on both Orion ports and uploads it to us — the fastest way to show what is going on.