CoolMax SRX and SRX-R

DC-Coupled Systems With Battery Inverters



SRX 600/70-48 · SRX 600/30-120 · SRX-R 600/60-48 · SRX-R 600/30-120

DC-Coupling Design Guide

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Audience
System designers, installers and integrators

Controllers
SRX and SRX-R, 48 V and 120 V

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About This Guide

This guide is for designing DC-coupled systems with CoolMax SRX and SRX-R charge controllers and a battery inverter that is not a Selectronic SP PRO: Victron Energy, Deye and other battery inverters. It covers the communication options, the PV array design, the battery charge profile and systems with several controllers. For the Selectronic SP PRO, the AERL documents named in chapter 03 apply.

Installation, wiring and settings are in the CoolMax SRX and SRX-R user manuals. The system design is the designer's responsibility: check it against AS/NZS 5033, AS/NZS 5139, AS/NZS 3000 and the inverter and battery manufacturers' requirements.

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DC Coupling With the CoolMax SRX

01

How it works, the controllers

1.1 How It Works

In a DC-coupled system the CoolMax SRX converts PV power straight to battery charge current. The battery inverter is a separate device on the same battery: it supplies the AC loads from the battery and can also charge it from the grid or a generator. The SRX and the inverter do not need to communicate for the system to work: each follows its own charge settings, and the battery is shared.

> **One type of charge controller**
>
> Do not connect CoolMax controllers in parallel with third-party charge controllers. Several SRX or SRX-R controllers can share a battery (chapter 06).

1.2 The Controllers

Parameter	SRX 600/70-48	SRX-R 600/60-48	SRX 600/30-120	SRX-R 600/30-120
Format	Wall mount	2U rack module	Wall mount	2U rack module
Nominal battery voltage	24 V / 48 V	24 V / 48 V	120 V	120 V
Battery voltage range	18–30 Vdc / 40–60 Vdc	18–30 Vdc / 40–60 Vdc	90–170 Vdc	90–170 Vdc
Max. charge current	70 A	60 A	30 A	30 A
Nominal charge power	2016 W / 4032 W	1728 W / 3456 W	4320 W	4320 W
MPP voltage range (Vmp)	170–540 V	170–540 V	215–540 V	215–540 V
Min. PV voltage (MPPT)	100 V	100 V	200 V	200 V
Max. PV input voltage (Voc)	600 V	600 V	600 V	600 V
Max. PV input current (Imp)	18 A	18 A	18 A	18 A
Max. PV short-circuit current (Isc)	25 A	25 A	25 A	25 A
Max. PV array power	200% at 48 V, 130% at 24 V	200%	200%	200%

The SRX starts once the PV voltage is above 60 V and at least 10 V above the battery voltage. It does not power up from the battery.

Communication Options

Choosing a mode, what the SRX does not do

02

2.1 Choosing a Mode

Mode	What it does	Use it when
Standalone	The SRX charges to the profile set in AERL Link.	Any battery and inverter. The default for Victron, Deye and other inverters.
On the battery's CAN bus	The SRX charges to its own profile and also stops charging when the battery reports an alarm (Pylontech-style frames).	The battery publishes those frames and the bus can take the SRX (section 2.3).
Under a CAN master (EMS)	A controller sends the SRX its charge targets (Power Targets) over CAN.	An AERL Nexus with AERL's EMS firmware (Kakadu 120 systems), or a third-party controller written to the SRX CAN protocol (section 2.4).
Monitoring only	Read-only Modbus RTU over RS485, or AERL Cloud through a Nexus Gateway on the SRX CAN bus.	Any mode, to monitor the SRX.

2.2 What the SRX Does Not Do

- The SRX does not communicate with Victron (VE.Can, VE.Direct, DVCC), Deye or other third-party inverters. A Victron GX device does not see or control it.
- It does not take its charge settings from the battery. It charges to its own configuration, set in AERL Link.
- Its RS485 Modbus interface is read-only: it cannot be controlled over Modbus.

Because the inverter does not see the SRX, check how the inverter measures the battery's state of charge (chapter 03).

2.3 On the Battery's CAN Bus

Where an SRX shares a CAN bus with a battery that publishes the Pylontech-style frame set, it listens for the battery's alarms (frame **0x359**). A high voltage, high temperature, high charge current, BMS internal or cell imbalance alarm stops charging (fault −1305, Battery BMS fault). No configuration is needed and the SRX sends nothing in reply. It still charges to its own profile: set the profile within the battery manufacturer's charge settings (chapter 05).

The bus speed must match: the SRX runs at 500 kbps by default (250 and 125 kbps selectable). Keep the SRX on a bus segment with little unrelated traffic. Before you put an SRX on the CAN bus between a battery and a third-party inverter, check that the inverter's battery port accepts other devices on the bus: a Victron GX device's BMS-Can port, for example, is for the battery. If in doubt, run the SRX standalone and contact AERL.

2.4 Under a CAN Master

A CAN master (an EMS) controls every SRX on the bus with Power Targets (a voltage target and a current limit). AERL's Nexus with EMS firmware does this in the Kakadu 120 system (Kakadu Commissioning Guide). A third-party controller must be written to the CoolMax SRX CAN Bus Communications protocol and the CoolMax SRX CAN Integration Guide, available from AERL on request: contact AERL before you design one.

Inverter Integrations

Selectronic SP PRO, Victron Energy, Deye

03

3.1 Selectronic SP PRO

AERL documents two ways to DC-couple the SRX with an SP PRO:

- **48 V systems:** a current shunt (typically 100–200 A) in the SRX output feeds an SP PRO shunt input, so the SP PRO measures the solar charge current; the SP PRO's SOC resets to 100% on a voltage offset (SP PRO with CoolMax SRX Integration Guide; Selectronic DC Coupled Example System).
- **120 V systems with the Kakadu 120:** the Nexus EMS directs the SRX (Kakadu Commissioning Guide).

3.2 Victron Energy

The SRX runs standalone; the Victron inverter/charger and the battery are set up as Victron and the battery manufacturer instruct.

- **Managed battery (for example the LiFe² 5120S through a GX device):** the GX device uses the battery's own SOC, so the solar current from the SRX is counted. The battery's charge limits control the Victron chargers only: set the SRX profile within the battery's charge settings (chapter 05).
- **Battery without communication:** Victron's GX documentation says that DC chargers not integrated with the GX make the inverter/charger's SOC inaccurate, and that such systems need a dedicated battery monitor (BMV, SmartShunt or Lynx Shunt VE.Can). Fit one, so that the SRX's current is measured.
- Do not use Victron solar charge controllers on the same battery as CoolMax controllers.

3.3 Deye

The SRX runs standalone. With a managed battery in Lithium mode (for the LiFe² 5120S, Lithium Mode 00), the Deye takes the battery's SOC from its BMS, so the SRX's charge is counted. Set the SRX profile within the battery's charge settings.

3.4 Other Battery Inverters

Any battery inverter that shares a battery with a charge controller can be DC-coupled with the SRX standalone, within the battery voltage range of the SRX model. Check that the inverter's SOC accounts for current it does not measure itself: a managed battery's own SOC, or a battery monitor in the battery circuit.

3.5 Charge Voltages of Two Charge Sources

When the inverter also charges the battery (from the grid or a generator), its charge voltages and the SRX's must not work against each other. The rule AERL publishes for the SP PRO: decide which source has charging priority. If the system is mainly DC-coupled, set the inverter's charge voltages (absorb, float) 0.2 V below the SRX's; if it is mainly AC-charged, set the SRX's 0.2 V below the inverter's. For other inverters, apply the same principle within the battery manufacturer's limits, or contact AERL.

PV Array Design

Limits, string sizing, isolators, breakers and cables

04

4.1 Limits

Limit	48 V models	120 V models
String Vmp at the hottest cell temperature	At least 170 V	At least 215 V
String Vmp at the coldest cell temperature	At most 540 V	At most 540 V
String Voc at the lowest cell temperature	At most 600 V	At most 600 V
Array Imp per controller	At most 18 A	At most 18 A
Array Isc per controller	At most 25 A	At most 25 A
Array power per controller	SRX: 8064 W at 48 V (200%), 2621 W at 24 V (130%). SRX-R: 6912 W at 48 V (200%)	8640 W (200%)

The array power limit is the controller's nominal charge power times its oversizing ratio. When the array delivers more than the nominal power, the controller limits its output.

4.2 String Sizing

1. **Maximum modules in series:** $V_{max} = N \times V_{oc} \times [1 + \beta_{Voc} \times (T_{min} - 25\ °C)]$ must not exceed 600 V, where β_{Voc} is the module's (negative) Voc temperature coefficient and T_{min} the lowest expected cell temperature (the site's record low). A string above 600 V on a cold morning stops the SRX (fault −1152, High PV voltage).
2. **Minimum modules in series:** the string's Vmp at the hottest expected cell temperature must stay above 170 V (48 V models) or 215 V (120 V models).
3. **Parallel strings:** the strings' combined Imp must not exceed 18 A and their combined Isc must not exceed 25 A. With most current modules this means one string per controller.
4. **Each controller has its own array:** never connect one string to two controllers.

4.3 Isolators, Breakers and Cables

- **PV conductors, isolators and breakers:** rated for at least 1.56 × the array's short-circuit current. For example, a 25 A PV isolator suits an array with an Isc of 16 A or less; for an Isc up to 25 A, fit an isolator of at least 40 A.
- **Copper wiring** rated for 75 °C or more. Keep the voltage drop to 2% or less.
- **Output to the battery:**

Controller	Output cable (minimum)	Output breaker (non-polarised DC)
SRX 600/70-48	16 mm² (#5 AWG)	80–125 A (Beny BDM-125 recommended)
SRX 600/30-120	16 mm² (#5 AWG)	40 A
SRX-R 600/60-48	50 mm² (1/0 AWG) per 2U shelf	160 A per shelf of two modules (Noark Ex9MD 160 A recommended)
SRX-R 600/30-120	16 mm² (#5 AWG)	40 A

4.4 Example: SRX 600/70-48

An example module (use your module's own datasheet): 550 W, V_{oc} 49.6 V, V_{mp} 41.6 V, I_{sc} 14.0 A, I_{mp} 13.2 A, β_{Voc} −0.25%/°C, β_{Pmax} −0.35%/°C. Site record low −5 °C; hottest cell temperature 70 °C.

Check	Working
Voc at −5 °C, per module	49.6 × [1 + (−0.0025 × −30)] = 53.3 V
Maximum in series	600 ÷ 53.3 = 11.3, so up to **11 modules** (586 V at −5 °C)
Vmp at 70 °C	11 × 41.6 × [1 + (−0.0035 × 45)] = 385 V, above 170 V
Current	One string: Imp 13.2 A (limit 18 A), Isc 14.0 A (limit 25 A). A second string in parallel would exceed 25 A Isc.
Array power	11 × 550 W = 6050 W, within 8064 W (200% of 4032 W)
PV isolator	At least 1.56 × 14.0 A = 21.8 A: a 25 A isolator

The Vmp line uses the power coefficient as an estimate of the voltage coefficient; use the module's Vmp coefficient where its datasheet gives one.

Battery Charge Profiles

05

The profile, profiles for shared batteries, lead-acid batteries

5.1 The Profile

The SRX charges in three stages (constant current, then constant voltage: bulk, absorb, float). It does not charge until a profile is set for the connected battery. Set it in AERL Link (OUTPUT tab):

Setting	What it does
Battery charge rate	The SRX's maximum charge current
Absorb voltage and absorb time	The constant-voltage stage
Tail current	The current at which absorption ends
Float voltage	The voltage held once the battery is full
Re-bulk voltage	The voltage at which a new charge cycle starts
Equalisation	Only for flooded lead-acid batteries with sulfation. Not for LiFePO4 or other lithium batteries
Temperature compensation	Default 50 mV/°C. Needs a battery temperature, from an AERL Battery Sense
Low-temperature charge cutoff	Stops charging below a set temperature. Disabled by default; needs a battery temperature

The **Battery Preset** list holds AERL's recommended profiles for common batteries. The default profile suits a generic LiFePO4 battery. For any other battery, use the battery manufacturer's charge settings.

5.2 Profiles for Shared Batteries

- **Charge voltage:** the SRX's absorb and float voltages must not exceed the battery manufacturer's charge voltage. For the LiFe² 5120S that is 56 V (LiFe² PCE Integration Guide, §2.1).
- **Charge current:** set each SRX's charge rate so that all charge sources together stay within the battery's charge current limit. For the LiFe² 5120S in Self-Managed operation that is 70 A per module; in Managed operation the battery's own limit (up to 100 A per module at 25 °C, less in the cold) also caps the inverter's charging.

5.3 Lead-Acid Batteries

Lead-acid banks do not report their temperature: fit an AERL Battery Sense to the SRX's CAN port (with the SRX's CANBUS 5 V switch on). It gives the SRX the battery temperature and voltage for temperature compensation and the low-temperature cutoff.

Several Controllers

Sharing one battery, CAN bus, RS485 Modbus

06

6.1 Sharing One Battery

Several SRX or SRX-R controllers can charge one battery. Each has its own PV array, its own PV isolator and its own output breaker to the battery bus. Set the same charge profile on every controller.

For SRX-R modules, the recommended setup in the SRX-R manual is two modules in one 2U shelf as the only charge controllers on the battery bus, with a 160 A breaker on the shelf output (48 V). For several shelves or mixed controllers, contact AERL.

6.2 CAN Bus

Item	Rule
Topology	Daisy-chain the controllers through their two CANBUS sockets. A Nexus or a battery can sit on the same bus.
Termination	120 Ω at each end of the bus only. Each SRX and each SRX-R shelf has a CANBUS 120 Ω switch: on at an end of the bus, off in the middle. The Nexus has no built-in termination: at an end, fit a 120 Ω plug in its spare socket.
CAN IDs	Units ship at CAN ID 10. On a shared bus each unit takes a free ID from 10 to 60 automatically, skipping 24 and 56 (their frames would alias battery identifiers); 62 means not yet assigned. Identify units by serial number, not by ID.
Speed	Every device on the bus at the same speed: 500 kbps default. The Nexus runs only at 500 kbps.

6.3 RS485 Modbus

Each SRX on a Modbus segment needs its own Modbus ID (1–90, default 20), and every device on the segment the same speed (9600 baud default). Daisy-chain the controllers through their MODBUS sockets, with the master at one end; terminate both ends with 120 Ω (the last SRX's termination switch on).

Worked Examples

Example 1: Victron with a Managed LiFe² battery

07

The loads and module values in these examples are illustrative.

7.1 Example 1: Victron With a Managed LiFe² Battery

A single-phase off-grid site: a Victron MultiPlus-II 48/5000/70-50 with a GX device, and LiFe² 5120S batteries in Managed mode (LiFe² Managed Battery Integration Guide, chapter 03). Two SRX 600/70-48 controllers, each with the 11-module string of chapter 04.

Item	Design
PV	2 × 6050 W = 12.1 kWp, one string per SRX
Charge current	SRX: up to 2 × 70 A = 140 A. MultiPlus-II charger: 70 A. Together 210 A
Battery	At least 3 LiFe² 5120S modules to take 210 A at 100 A per module (more for a cold site), and at least the MultiPlus-II's minimum (single-phase off-grid: 2). Energy decides the rest (LiFe² System Sizing Guide)
SRX mode	Standalone: profile set within the LiFe² 5120S charge voltage (56 V)
GX device	Battery monitor set to the LiFe² battery, so the GX uses the battery's SOC
Monitoring	An AERL Nexus on the two SRX controllers' CAN bus (SRX at one end with its 120 Ω switch on; Nexus at the other with a termination plug) for AERL Cloud

7.2 Example 2: Deye With a Managed LiFe² Battery

A Deye SUN-8K-SG05LP1-EU with LiFe² 5120S batteries in Managed mode (Lithium Mode 00), and one SRX 600/70-48.

Item	Design
Battery	At least 3 modules (the SUN-8K-SG05LP1-EU minimum, LiFe² System Sizing Guide)
SRX mode	Standalone: profile within the LiFe² 5120S charge voltage (56 V); charge rate 70 A

Item	Design
Charge current	The SRX (up to 70 A) and the Deye's battery charging (its maximum charge current, from the Deye datasheet) can charge at the same time: together they must stay within the battery's limit, 3 × 100 A = 300 A at 25 °C and less in the cold (LiFe² System Sizing Guide, Step 3). The BMS limit caps the Deye's charging only: set the SRX charge rate and the Deye's battery charge current so that the total fits
SOC	The Deye reads the battery's SOC from its BMS (Li-BMS page), which includes the SRX's charge

7.3 Example 3: Generic 48 V Inverter, Lead-Acid Battery

A battery inverter with no battery communication, a 48 V flooded lead-acid bank and one SRX 600/70-48.

Item	Design
SRX mode	Standalone, with the battery manufacturer's absorb, float and equalisation settings
Battery temperature	An AERL Battery Sense on the SRX's CAN port, for temperature compensation
SOC	A battery monitor or shunt in the battery circuit, so that the inverter or monitor sees the SRX's charge current
Charge voltages	Decide which source has priority and offset the other by 0.2 V (section 3.5)

Firmware and Support

Firmware, warranty, support, change log

08

8.1 Firmware

Version	Needed for
v2.15.8 or later	The SRX and SRX-R user manuals

Install the current firmware release with the latest AERL Link, from aerl.com.au/professionals.

8.2 Warranty

The CoolMax SRX and SRX-R warranty is 2 years, or 5 years when registered within 60 days of installation, with an optional Plus 5 extension to 10 years. Register at **aerl.com.au/warranty-registration**. Conditions apply: see the CoolMax SRX and SRX-R warranty statements, at aerl.com.au.

8.3 Support

For a design this guide does not cover, contact AERL support on 1800 950 865 or support@aerl.com.au with the inverter, battery and PV module details.

8.4 Change Log

Revision	Date	Change
1.0.0	11 / 2026	First issue.

Thank You for Choosing AERL

If you have any questions or need support, contact AERL.

Sincerely,

The AERL Team

AERL Pty Ltd · 1/75 Bluestone Circuit, Seventeen Mile Rocks QLD 4073 · 1800 950 865 · support@aerl.com.au · aerl.com.au

Australian Energy Research Laboratories

ADDRESS

1/75 Bluestone Circuit
Seventeen Mile Rocks QLD 4073
Australia

CONTACT

sales@aerl.com.au
support@aerl.com.au

aerl.com.au

Phone
1800 950 865

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