aerl CoolMax SRX Charge Controller User Manual

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About Australian Energy Research Laboratories
Australian Energy Research Laboratories (AERL) was founded by Stuart Watkinson (BE Elec. Eng., Grad. M.I.E.A) in 1985 to commercialize the “Power Optimizer”, a revolutionary solution to a complex problem, developed while studying at the University of Queensland in Brisbane, Australia.

Unlike many inventors, Stuart possessed not only a great idea, but also the entrepreneurial skill to turn it in to a commercially viable product. The “Power Optimizer” would eventually come to be known as the AERL MAXIMIZER™, the world’s first truly Universal Maximum Power Point Tracker (MPPT).

Today, AERL manufactures a range of highly reliable and efficient specialized power electronic controllers for use in Solar, Micro Hydro, Micro Wind and Cathodic Protection applications.

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Disclaimer

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Effective Date
January 2022 (01/2022)

Important Safety Information

This Installation Manual contains important safety information and installation instructions for the AERL COOLMAX SRX MPPT Solar Charge Controller.

The following symbols are used throughout this user manual to indicate ideal installation methods, potentially dangerous conditions and important operational information.

IMPORTANT
Indicates information that must be followed to ensure proper operation of the COOLMAX SRX.

CAUTION
Indicates a critical procedure for the safe installation of the COOLMAX SRX. Use extreme caution when performing this task.

About this Manual

IMPORTANT

- This User Manual provides detailed installation and usage instructions for the COOLMAX SRX unit. It is recommended that all of the Instructions and Cautions in this User Manual be read before beginning installation.
- Only qualified electricians and technicians should install the COOLMAX SRX. This manual is intended for all installation technicians and the system owner.
- Do not disassemble or attempt to repair the COOLMAX SRX unless you are a qualified technician and have authority in writing from AERL to do so.
- AERL will not be held responsible in any way for the mishandling of this product or for installation of the product in a manner that does not follow the instructions in this manual or as advised by an AERL technician.

Warranty Conditions

1 Warranty Duration from the Date of Purchase

Warranty Requirements	Total Warranty Duration
1. You are the original purchaser of the CoolMax SRX.	**3 Years**
2. You are the original purchaser and registered your warranty o nline within 60 days of installation.	**5 Years**

Our goods come with guarantees that cannot be excluded under the Australian Consumer Law.

You are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.
AERL will bear the cost of parts and labour to repair any manufacturing faults found within the terms and period of this warranty. For claims under warranty, the faulty product(s) must be returned to AERL's facility at 2/75 Bluestone Circuit, Seventeen Mile Rocks, Australia, after contacting AERL and receiving the appropriate RMA documentation from AERL.

No allowance is made for labour or travelling time required to disconnect or reinstall faulty parts. AERL will pay the cost of freight to return the repaired charge controller to the customer within Australia or New Zealand only. The method of freight will be determined by AERL.
All installation and user conditions as set down in the instruction manual must be strictly adhered to as failure to do so may void your warranty. Any faults or like faults caused by lightning, water or moisture ingress, vermin infestation, improper voltage, faulty installation, use of the product in a manner for which it is not intended, alterations which affect the reliability or performance of the unit but are not attributable to faulty manufacture, failure to act on service warning from the

AERL charge controller, or damage caused by other system components will not be covered under warranty.
In the event of the product being out of service, AERL shall bear no responsibility for any consequential loss or expense. AERL will not be held responsible for any misleading or incorrect information conveyed by anyone not directly employed by AERL.

Visit **https://core.aerl.com.au/register-product/** and fill out the associated form to activate your full AERL warranty.

Note: Warranty conditions remain current until the next revision of this document is published. Proof of purchase is required when making a warranty claim.

Specifications

General Specifications	
Parameter	Typical
Weight	5 kg
Dimensions (L x W x H)	432 x 192 x 89 mm
Enclosure Type	Indoor Type 1 / IP20
Input / Output Power Connectors	Screw Terminals (8 mm^2 -> 42mm^2)

Characteristics	**SRX 600/55-48**	**SRX 600/35-120**
Nominal Battery Voltage / Vdc Range	**24 V** | **48 V** / 20 – 60	**120 V** / 90 – 170
Max Charge Current	55 A	35 A
Nominal PV Power	**3168 W @ 48 V** **1584 W @ 24 V**	**5040 W @ 120 V**

Max PV Input Current	12 A	12 A
Max PV Short Circuit Current	18 A	18 A
Max PV Input Voltage	600 V	600 V
MPP Voltage Range	170 – 540 V	215 – 540 V
Max Conversion Efficiency	97.3%	98.7%
Overload Behaviour	Operating Point Shift (Power Limitation)	Operating Point Shift (Power Limitation)
PV Reverse Polarity Protection	Yes	Yes
Earth Leakage Current Detection	Yes	Yes
Safety Protection Class	I	I
Pollution Degree (Internal)	I	I
Pollution Degree (External)	III	III
Ambient Operating Temperate Range (Full Rated Output up to 40 ° C)	-20 to 60 °C	-20 to 60 °C
Storage Temperature	-30 to 70 °C	-30 to 70 °C
Self-Consumption (Idle)	2 W	2 W
Allowable Relative Humidity	4 – 95% (Non-Condensing)	4-95% (Non-Condensing)
Cooling Method	Active (User Serviceable)	Active (User Serviceable)
Display	Indication LED Strip	Indication LED Strip
Required Cabinet Air Exchange Rate (Intake @ 40 ℃)	14 m^3/hour	14 m^3/hour
Heatsink Temperature @ Full Power	30°C Rise @ STC (25°C)	35°C Rise @ STC (25°C)
Communications	RS485 / CAN Bus	RS485 / CAN Bus

Certifications	IEC62109-1:2010 IEC62509:2010 EN61000.6.3:2012 EN61000.6.4:2012	IEC62109-1:2010 IEC62509:2010 EN61000.6.3:2012 EN61000.6.4:2012

Introduction

Thank-you for purchasing an Australian made CoolMax Series Charge Controller.

CoolMax Charge Controllers offer an efficient and reliable charging process that not only maintains battery efficiency and life but maximizes power generation by utilizing the full potential of your PV array.

Features
CoolMax Charge Controllers utilize an advanced form of Maximum Power Point Tracking (MPPT) technology to extract the maximum power available from your PV array, efficiently charging your batteries and maximizing power generation.

AERL's Maximum Power Point Tracking (MPPT) algorithm has been proven to be highly robust, resistant to local extremes, and results in power losses of less than 0.5% over the whole operating temperature range of a PV Array.

- High Input Voltage for Ease of Install
- On Board Ground Fault Detection
- PV Array Oversizing Support (+33%)
- Superior Peak Power Efficiency
- Built-In Overload and Thermal Protection
- Reverse Polarity and Current Protection
- Master/Slave Operational Mode
- Designed for Long Term Reliability
- Australian Made

Firmware
This installation and operating manual covers CoolMax SRX Control Firmware Revisions v1.00 and above.

Installation

IMPORTANT
The CoolMax SRX must be installed in a clean, dry location away from direct sunlight.
Optimal cooling is achieved when the COOLMAX SRX is mounted vertically. A minimum of 15cm should be kept clear above the COOLMAX SRX to allow for cooling.

CAUTION – Equipment Damage
CoolMax Charge Controllers are not designed to be used in parallel with other Third- Party Ch arge Controllers and this will void your warranty.

Standards & Requirements
All installations must comply with national and local electrical standards and codes of practice. AERL

recommends professional installation.

Grounding
CoolMax Charge Controllers are designed to be installed in floating systems but contain provisions for positive functional earthing for telecom applications if required.

CAUTION – Hazard
DO NOT FUNCTIONALLY EARTH THE ARRAY if a negative earth is used for the batteries, load or DC system.

IMPORTANT
The Chassis Ground (located inside the enclosure) is marked with the following symbol:

CAUTION – Hazard
If damaged or malfunctioning, the AERL controller should only be disassembled and repaired by a qualified service centre. Please contact the local renewable energy dealer/installer for assistance.
Incorrect reassembly risks malfunction, electric shock, or fire.

Mounting the Controller
Use the mounting plate included with the controller to mount the SRX on a vertical surface as demonstrated in Figure 1A below.

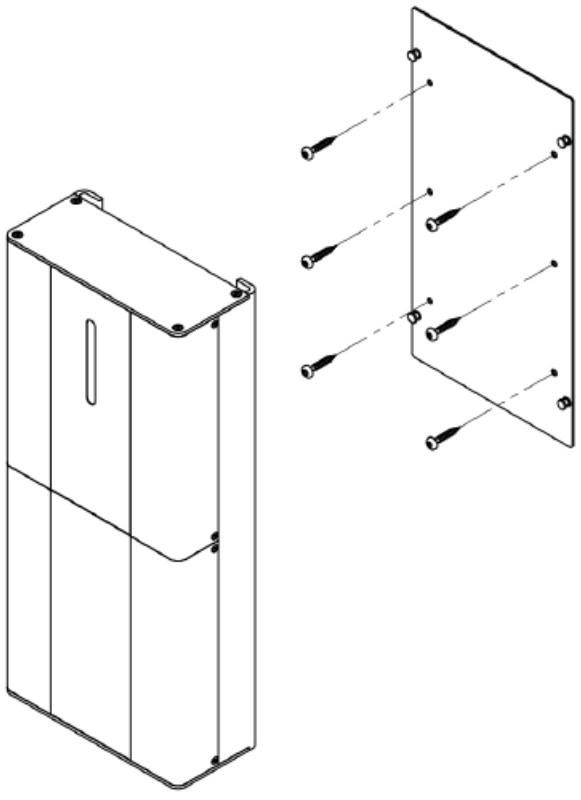


Figure 1A: SRX Mounting Hole Locations

Mounting Clearances
When mounting the SRX, a clearance zone around the device must be adhered to for optimal cooling of the controller under full load. Please refer to the Figure 1B below.

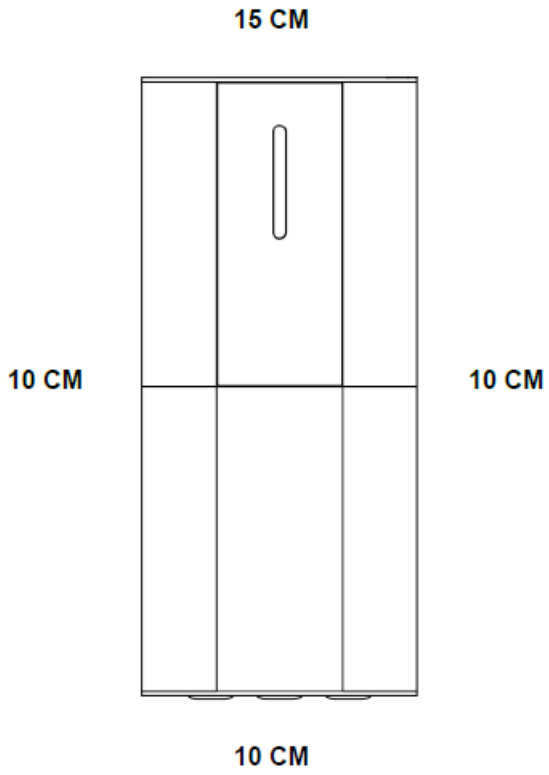


Figure 1B: SRX Mounting Clearances

Wiring Information
This section will provide information and instructions for safely wiring up the CoolMax SRX.

Wire and Disconnect Sizing

IMPORTANT

- Wire sizes must comply with local and national standards. Input conductors and circuit breakers must be rated at 1.56 times the short-circuit current of the PV array.
- Copper wiring must be rated at 75°C or higher.

CoolMax 600/55-48

- The output current limit of the CoolMax 600/55-48 is 55 amps.
- Use a minimum of #6 AWG (16 mm2) wire for the output between the CoolMax and the battery bus bar or termination.
- Use a 63A Non-Polarized DC Circuit Breaker between the controller output and load.
    - Recommended Option: Beny BB1-63 63A 600V 2-Pole Circuit Breaker
- We recommend you use an appropriately sized insulated crimp ferrule when terminating both the input and output connections.
- Torque all CoolMax wire and ground terminals to 1.7 Nm (15 in-lb).

CoolMax 600/35-120

- The output current limit of the CoolMax 600/35-120 is 35 amps.
- Use a minimum of #6 AWG (16 mm2) wire for the output between the CoolMax and the battery bus bar or

termination.

- Use a 50A Non-Polarized DC Circuit Breaker between the controller output and load.
    - Recommended Option: Beny BB1-63 50A 600V 2-Pole Circuit Breaker
- We recommend you use an appropriately sized insulated crimp ferrule when terminating both the input and output connections.
- Torque all CoolMax wire and ground terminals to 1.7 Nm (15 in-lb).

Please refer to the relevant IEC or AS/NZS electrical code for recommendations on PV array cable sizing, length and ampacity.

Wiring Compartment

CAUTION – **Hazard**
All CoolMax SRX wiring must enter the unit through the entry ports located in the base and rear of the enclosure.

Under absolutely no circumstances should holes be drilled anywhere into the unit to make other cable entry points. Doing so can cause metal swarf or fillings to enter the internal electronics and damage the unit once powered up.

Drilling any holes into the unit will void all product warranty.

To install cabling, the access panel of the COOLMAX SRX must be removed. This is done by removing the two M4 countersunk Phillips screws on the bottom of the enclosure and the four M3 countersunk Phillips screws on either side of the access panel. Refer to Figure 2 below.

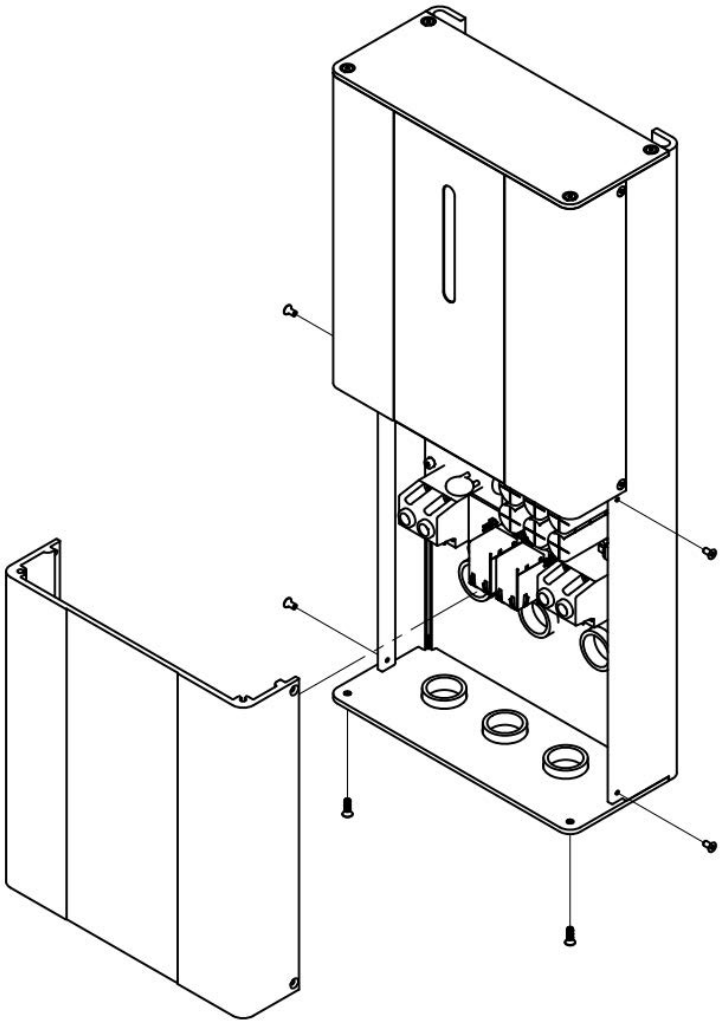


Figure 2: SRX Access Panel Screw Locations

Wiring Polarity

CAUTION – Equipment Damage
Reversing the polarity of either the input or output may damage the CoolMax SRX and void product warranty. Confirm polarity with a multi-meter prior to closing the input and output circuit breakers.

With the access cover removed, the internal I/O terminals will be visible. Refer to Figure 3 below.

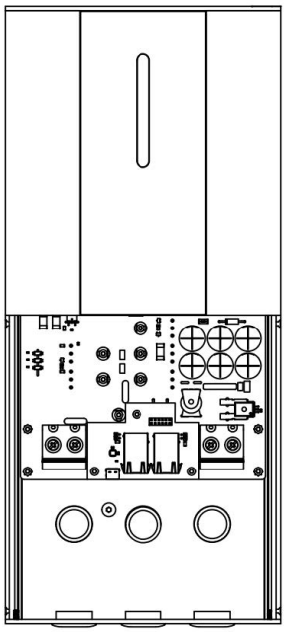


Figure 3: SRX Access Cover Removed

Operation

Powering Up

The CoolMax SRX will power up when a PV voltage above 50Vdc is applied.
When the COOLMAX SRX is first powered the on, the device will run a self-test and then the LED Indication strip will appear yellow to indicate no charge profile has been configured.

Programming the Device

The CoolMax SRX is programmed via USB-C port located inside the access cover.
The AERL Link Software that can be downloaded at the URL below with instructions for setting the charge profile located on Page 18.

https://link.aerl.com.au

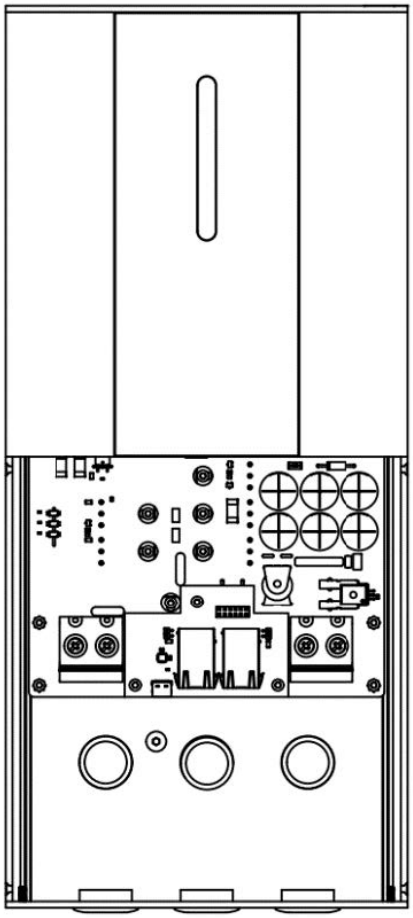
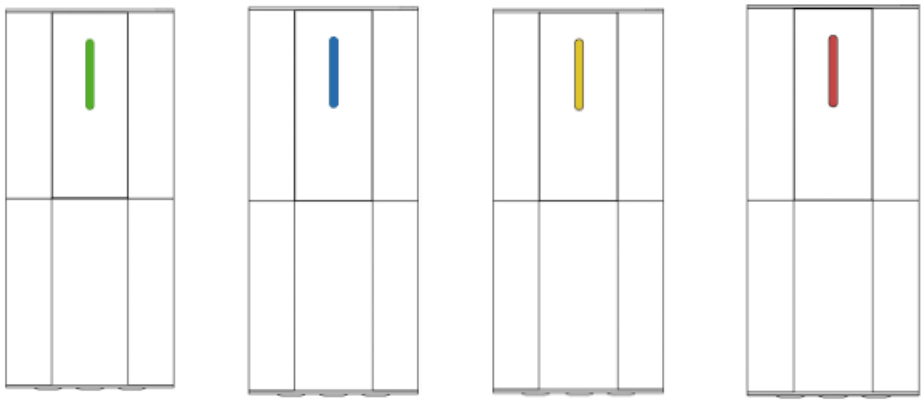


Figure 4: USB-C Programming Port

Device Status Indicator



Green	OK
Blue	START-UP
Yellow	WARNING
Red	FAULT

Figure 5: LED Indication States

IMPORTANT
The CoolMax SRX default charge profile is intended for a generic LiFePo4 battery solution.

AERL supports most other battery chemistries that do not require external BMS communications.

AERL is working with various battery manufacturers to expand out-of-the-box comms support for Lithium batteries that require communication with the Charge Controller.

Please contact AERL support to confirm compatibility prior to installation. Additional battery support will be rolled out via Over-The-Air firmware updates.

The CoolMax SRX charge output will not automatically activate for safety reasons. Prior to activating the charge output, the charge profile must be configured for the relevant battery solution being utilized.

The SRX operates using an advanced three-stage charging process and has pre-set charge voltage profiles for each supported nominal battery voltage. That said, AERL always recommends referring to the battery manufacturers specifications regarding charge voltages for optimal battery life and performance.

These voltages can be adjusted in the charge profile settings. Refer to Page 18 for instructions.

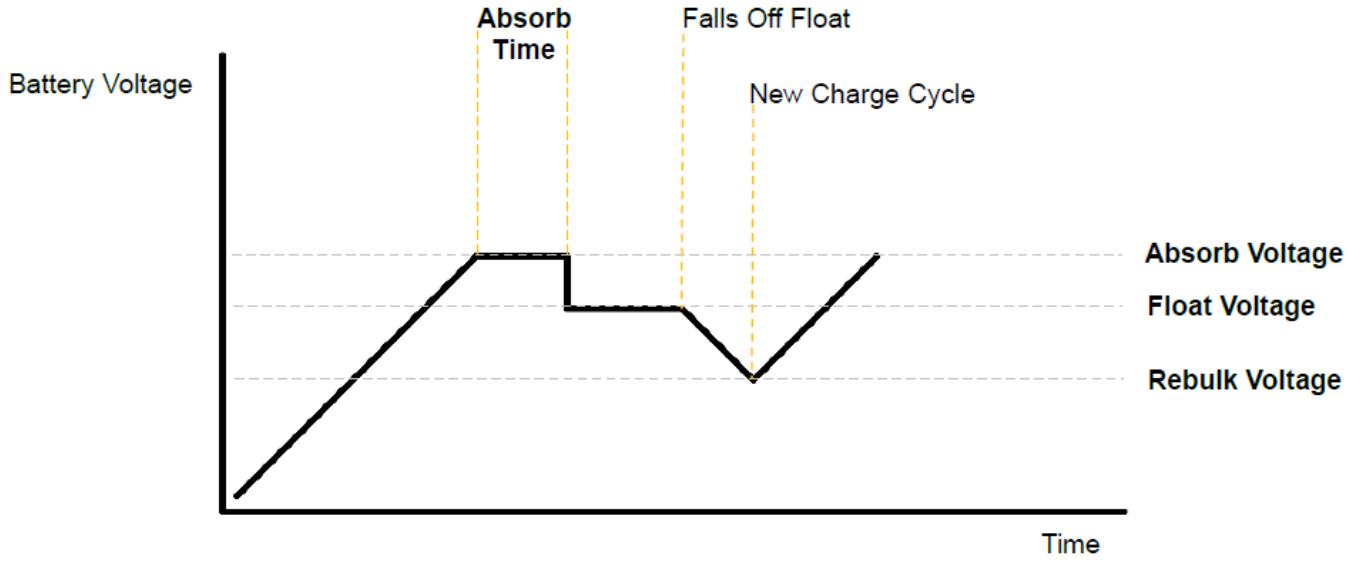


Figure 6: Battery Charge Profile Illustrated

Figure 6: Battery Charge Profile Illustrated

Charge Profile Configuration
The CoolMax SRX allows for extensive flexibility when it comes to charge profile parameters to suit numerous different modern battery chemistries and manufacturers requirements.

Our programmable charge profile allows for the configuration of the Battery Charge Rate, and the Absorb, Float, Re-Bulk, and Equalization voltage points.

IMPORTANT
An Equalization is only normally required for Flooded Lead-Acid cells that experience sulfation as a result of poor charging practices over the lifetime of said cell.

Equalization is not required, nor recommended for LiFePo4 or other lithium-based battery solutions and will likely cause damage unless otherwise advised by the battery manufacturer.

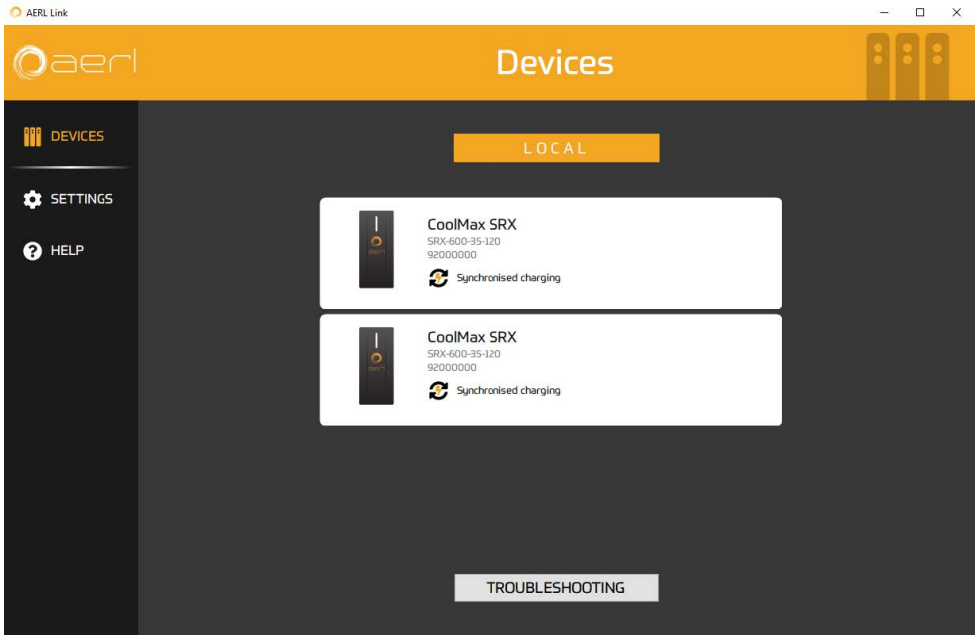
The default charge profile is suitable for most applications but to determine the optimal charge profile for your application, please refer to your battery manufacturer's user manual or datasheet.

The CoolMax SRX Default Charge Profiles are as follows:

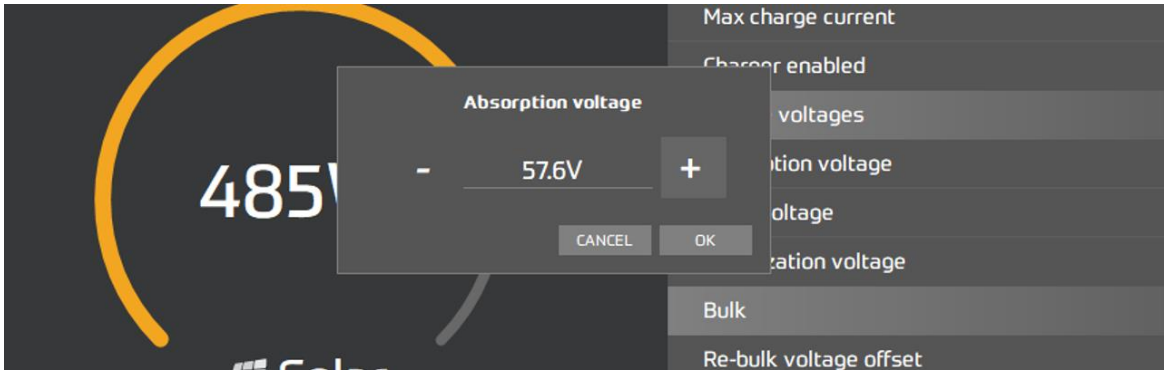
	SRX 600/55-48
Nominal Battery voltage	48 V
Max Charge current	55 A
Absorption voltage	57.6 V
Absorption time	2 Hours
Float Voltage	55.2 V
Re-Bulk Voltage	52 V

	SRX 600/35-120
Nominal Battery voltage	120 V
Max Charge current	35 A
Absorption voltage	144 V
Absorption time	2 Hours
Float Voltage	138 V
Re-Bulk Voltage	126 V

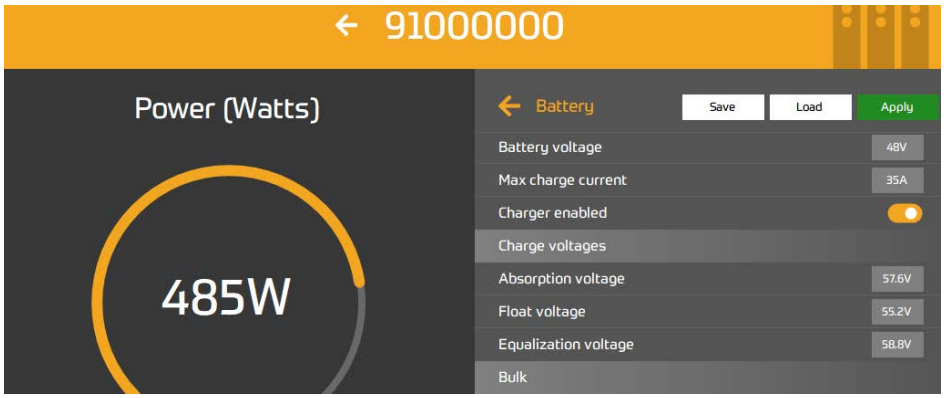
Setting the Battery Charge Profile with AERL Link
Connect to the USB-C Port on the CoolMax and Select the Device from the available local devices list.



Select the Settings button to access the battery charging settings. Charge settings are changed by clicking on the setting value and using the plus/minus arrows or the keyboard to enter a new value.



Once the required settings have been set, Apply the Changes to the CoolMax SRX by clicking on the Apply button.



Note – Further instructions for more complex functionality can be found in the AERL Link User Manual.

Battery Temperature Compensation

IMPORTANT
To utilize the CoolMax SRX battery temperature compensation functionality, an AERL Battery Sense Remote Temperature and Voltage Sensor will be required.
Part Number: BATT-SENSE

Temperature compensation measures the temperature of the batteries and adjusts the float and absorb voltage

set points to the ideal voltage for batteries at that temperature.

Using the temperature of the batteries, the COOLMAX SRX adjusts voltages by a user specified factor in millivolts per C. The temperature compensation factor can be set using the AERL Link Software. The compensation factor is per bank, not per cell.

Please refer to Page 18 of this User Manual for instructions on how to edit settings in the charge profile.

Connecting the Temperature Sensor

IMPORTANT
A temperature compensation value must be set in the charge profile before the CoolMax SRX will begin to utilize the battery temperature.

To connect your remote temperature sensor to the CoolMax SRX, plug the sensor into one of the CAN RJ45 ports labelled “CAN” and located between the power terminals.

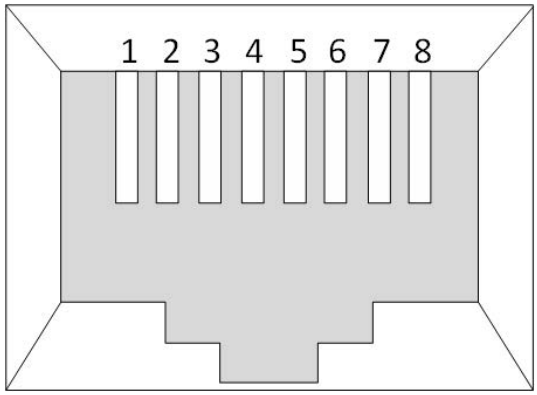
Insert the remote temperature sensor connector into the RJ45 connection (Make sure the orientation is correct and do not force the connection).
Once the connector is inserted, it will click into place.

Temperature Sensor Location
The CoolMax SRX remote temperature sensor must be in close proximity to the battery cells for accurate results. Securing the temperature sensor in a central location near the top of the bank is recommended.

CAUTION – Equipment Damage
Do not place the Battery Sense Remote Temperature and Voltage Sensor in a location where it may be exposed to water, moisture, direct sunlight or chemical material.

Communications Protocols
The CoolMax SRX features both Controller Area Network (CAN bus) and ModBus RTU (RS485) capabilities for remote monitoring and control functionality. The relevant protocol registry maps for integration are available from AERL on request.

Both networking protocols can be accessed via the RJ45 connectors located inside the access cover.
The pin-outs for these connections are demonstrated in Figure 9 below.



Pin	RS485 Connector
1	+5V
3	RS485 Low
6	RS485 High
8	GND

Pin	CAN Connector
1	+5V
4	CAN High
7	CAN Low
8	GND

Figure 11: Comms Connector Pin-Outs

Troubleshooting – Error Codes

If the CoolMax SRX detects an issue, an alarm will be triggered.

Please refer to the table below for Warning Codes and the table located on Pg. 23 for Fault Codes.

Warning Code	Warning	Description	Recommended Action
-26	Device Not Configured	The initial setup process has not been completed and the device will not begin charging.	Connect and configure the device with the AERL Link Software. Refer to Page 14.
-1158	Low Input Voltage Detected	The PV input voltage is not adequate for the selected battery voltage or PV obstructed.	Confirm PV String Configuration is appropriate for the device and the sun is shining.
-1304	Battery Sense Not Detected	The remote voltage and temperature sensor is either unplugged or faulty.	Refer to Battery Sense User Manual for troubleshooting.
-1301	CAN Master Lost	The device has not received information from the Master within the allowed time-out window.	Confirm your RJ45 connection has not been interrupted and the Master device is still active.
-1160	Set Points Out of Bounds	Set Point configuration is outside limits and may be dangerous for selected nominal battery voltage.	Confirm the Charge Profile is appropriate for the battery being charged. Refer to the Battery Manufacturer’s recommendations.

Please refer to the table below for Fault Codes.

Fault Code	Error	Description	Recommended Action
-1	Generic Hardware Fault	A hardware fault has been detected.	Please contact your distributor to organize a warranty replacement.
-1100	Internal Temperature Critical	The device's internal systems have reached a critical temperature and shutdown to prevent system damage.	The device will automatically restart when it's safe to do so.
-1159	Low Output Voltage	Low output voltage has been detected.	Confirm the battery is connected to the controller.
-1154	High Output Voltage	High output voltage has been detected.	Battery may be being charged from a secondary source. Confirm all system battery charge parameters.
-1157	High Output Current	High output current has been detected.	Confirm no short circuit is present on the output of the controller.
-1152	High PV Voltage	High PV Voltage has been detected. The device has shutdown to prevent system damage.	Confirm PV String Configuration is appropriate for the device.
-1156	High PV Current	High PV input current has been detected.	Confirm PV String Configuration is appropriate for the device.

Fault Code	Error	Description	Recommended Action
- 1102	High Battery Temperature Detected	The battery temperature sensor has detected high battery temperature. Operating the battery at a high temperature will greatly reduce its life span.	Consider increasing the battery temperature compensation factor with the AERL Link Software.
- 1161	Earth Fault (Positive)	An Earth Fault has been detected on the Positive Connection.	Disconnect the device, confirm the fault with a Megger, and repair the system.
- 1162	Earth Fault (Negative)	An Earth Fault has been detected on the Negative Connection.	Disconnect the device, confirm the fault with a Megger, and repair the system.

Note: The CoolMax troubleshooting guide and documentation is being improved regularly. If the relevant situation is not documented, please contact AERL.

Documents / Resources

	aerl CoolMax SRX Charge Controller [pdf] User Manual CoolMax SRX, Charge Controller, CoolMax SRX Charge Controller, Controller