aerl

USER MANUAL

EarthGuard

Single-Channel Insulation Monitoring Device



EG-600-SC

Installation & Operation

AER12-SC REV 2.0.3, 8 NOV 2026

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Document

Document	Revision	Firmware	Model
AER12-SC	**2.0.3**	**v1.0.4 and above**	**EG-600-SC**

Format

A4 · 18 pages

About AERL

Company & manufacturer information

01

Australian Energy Research Laboratories (AERL) was founded in 1985 by Stuart Watkinson to commercialise the Power Optimizer, which he developed while studying at the University of Queensland. It became the AERL MAXIMIZER™, a universal maximum power point tracker (MPPT).

Today AERL designs, integrates and supports power conversion, lithium energy storage, monitoring and earth-fault detection products for commercial, industrial and off-grid energy systems, including oil and gas, mining and telecommunications sites.

1.1 Contact Information

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1.2 Disclaimer

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Important Safety Information

Symbols, audience, manual scope

02

This manual contains important safety information and installation instructions for the EarthGuard EG-600-SC insulation monitoring device. It uses the following symbols for important operating information and potentially dangerous conditions.

Important
Information you must follow for the EarthGuard to operate correctly.

Caution
A procedure that is critical to installing the EarthGuard safely. Take extreme care when you perform it.

Important — local standards & certified installation
The installation must comply with the electrical standards, codes and wiring rules in force at the site, and must be done by an installer accredited or licensed in your jurisdiction. Standards cited in this manual reflect the design intent at publication; where your current local standards differ, follow them.

2.1 About This Manual

- This manual gives installation and operating instructions for the EarthGuard. Read it before you start the installation.
- Only qualified electricians and technicians may install the EarthGuard. This manual is for installers and the system owner.
- Do not disassemble or attempt to repair the EarthGuard 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.

2.2 Firmware

This manual covers EarthGuard EG-600-SC firmware **v1.0.4 and later**.

Warranty Conditions

Period, start, registration

03

Warranty duration

Warranty requirements	Total duration
You are the original purchaser of the EarthGuard.	**2 years**

The warranty starts 30 days after AERL dispatches the EarthGuard.

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.

Full terms: AERL warranty statement for the EarthGuard EG-600 and EG-600-SC, aerl.com.au.

Register your EarthGuard at aerl.com.au/warranty-registration. Registration does not change the 2-year warranty.

Specifications

Mechanical, LV side, HV side, standards

04

4.1 General

Parameter	Typical
Weight	**250 g**
Dimensions (W × H × D)	**155 × 100 × 35 mm**
Enclosure type	**Indoor Type 1 / IP20**
Operating temperature	**−25 to 60 °C**
Storage temperature	**−25 to 80 °C**
Connection terminals (Test & Earth)	**Lever push-in · 0.2–10 mm² (22–8 AWG)**

4.2 Low-voltage side

Parameter	Value
Input power (DC input)	**12–60 Vdc** fit the BATT/PSU jumper for a 12–15 Vdc supply
Input power (USB-C)	**4.5–5.5 Vdc**
Max power consumption	**2 W**
Alarm indication relay	**1 × signal (dry contact)**

4.3 High-voltage side

Parameter	Value
Voltage range	**40–600 Vdc**
Leakage trip thresholds (±10%)	**30 kΩ → 100 kΩ**
Isolation to LV side	**4 kV (transient)**

4.4 Designed to meet

Domain	Standard
Electrical Safety	**AS/NZS 3100:2017**
EMC	**AS/NZS 61000.6.3:2012**

4.5 Applicable installation standards

(informative)

The EarthGuard EG-600-SC is intended for use in installations designed in accordance with the relevant installation standards in the jurisdiction of use, including (in Australia/New Zealand) **AS/NZS 3000**, **AS/NZS 5033**, and **AS/NZS 5139**.

Introduction

Methodology, detection, compatibility

05

Thank you for purchasing an AERL EarthGuard EG-600-SC.

5.1 Product Description

The AERL EarthGuard EG-600-SC is a single-channel insulation monitoring device. It continuously monitors the insulation of one PV string or battery bus. It is designed to support compliance with the earth fault and insulation monitoring requirements of AS/NZS 5033 (PV arrays), AS/NZS 5139 (battery systems) and other applicable local standards when installed to this manual and those standards. It has an audible and visual alarm and a relay output for external fault notification.

5.2 Product Methodology

The EarthGuard uses resistive earth fault detection. Installed on the battery bus, it covers both the battery bank and the PV array in systems with common-positive or common-negative regulators.

It injects a small test current between the system conductors and earth and measures the resistance. Healthy insulation has a high resistance. When insulation deteriorates or a fault occurs, the resistance falls; when it falls below the configured threshold, the EarthGuard raises an alarm.

In common-positive and common-negative systems the PV array and battery bank share a conductor, so one EarthGuard on the battery bus detects insulation faults in both the battery and PV array circuits.

5.3 Detection Requirements

Non-isolated systems (for example, common-positive or common-negative solar regulators): because the battery bank assumes the PV array's earth-fault potential, a single EarthGuard installed on the battery side can typically provide coverage for both the battery and the PV array circuits. Confirm this is acceptable under your applicable standard.

Galvanically isolated systems: detection requirements differ depending on the decisive voltage class of the battery side; refer to your applicable installation standard and PCE manufacturer documentation.

5.4 Product Compatibility

The EarthGuard monitors DC buses from **40 to 600 Vdc**: 48 V battery systems up to 600 V PV arrays.

All AERL products are verified compatible with the EG-600-SC. Some third-party devices exceed the permissible leakage and trigger a fault as soon as the EarthGuard powers up.

Compatible equipment

- Selectronic SP Pro Series 1, 2 & 2i
- Victron SmartSolar & BlueSolar MPPT Series
- Victron MultiPlus & Quattro Series
- Morningstar TriStar Series

Other equipment

Check the device's earth-leakage specification before installation. If the EarthGuard reports a fault at power-up with no insulation fault present, contact AERL.

Installation

Mounting, wiring, AERL Link, sensitivity

06

6.1 Mounting the Device

> **Important**
> Install the EarthGuard in a clean, dry location, out of direct sunlight and away from moisture.

Fix the EarthGuard to a vertical surface through the mounting holes in the chassis.

Use hardware that suits the surface. Check that the unit is level and every mounting point is secure.

Wire and disconnect sizing

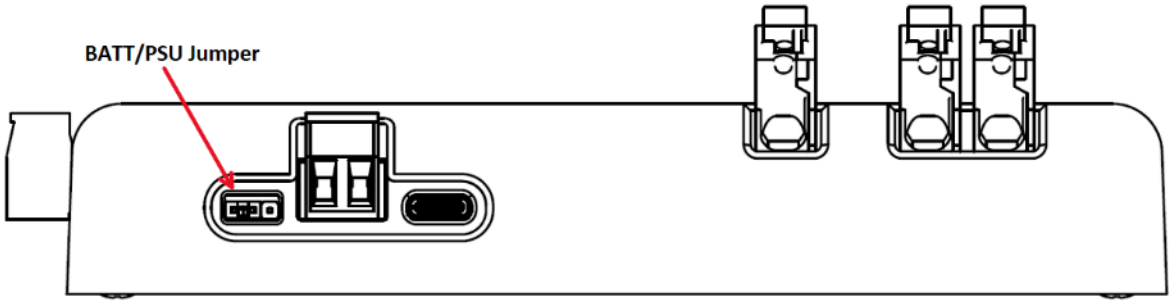
> **Important**
> Wear suitable personal protective equipment (PPE) near live connections, and disconnect all power sources before you change any wiring.

> ⚠ **Caution — hazard**
> Supply the EG-600-SC's 12–60 Vdc input from a current-limited AC–DC or DC–DC power supply. Do not connect it directly to a battery or any other source that is not current-limited: a fault could draw enough current to cause damage or a fire.

- The Test Circuit and Earth terminals are lever push-in, rated **0.2 to 10 mm² (22 to 8 AWG)**.
  - **Lever closed:** solid and stranded conductors at the small end of the range push straight in.
  - **Lever open:** for fine-stranded conductors and larger sizes, lift the lever, insert the conductor, then close the lever.
- Install suitably rated in-line fuses or a circuit breaker between the EG-600-SC's Test Circuit terminals and the DC bus.
- The USB-C (5 Vdc), DC Input (12–60 Vdc) and relay connections are fused internally.

6.2 BATT/PSU Jumper (12–15 V Supplies)

For a 12–15 Vdc supply, fit the **BATT/PSU** jumper. It bypasses the input inrush limiter (marked ICL B/P on the circuit board).



BATT/PSU jumper location

BATT/PSU jumper	Input range
Removed (default)	**15–60 Vdc supply**
Fitted	**12–15 Vdc supply**



Default
BATT/PSU jumper removed



Bypass · 12 V
BATT/PSU jumper fitted

> ⚠ **Caution — hazard**
> Do not fit the BATT/PSU jumper on a supply above 15 Vdc: it damages the unit or arcs the supply contacts when the supply is connected.

6.3 Wiring Diagram

Figure 1 shows an example wiring configuration.

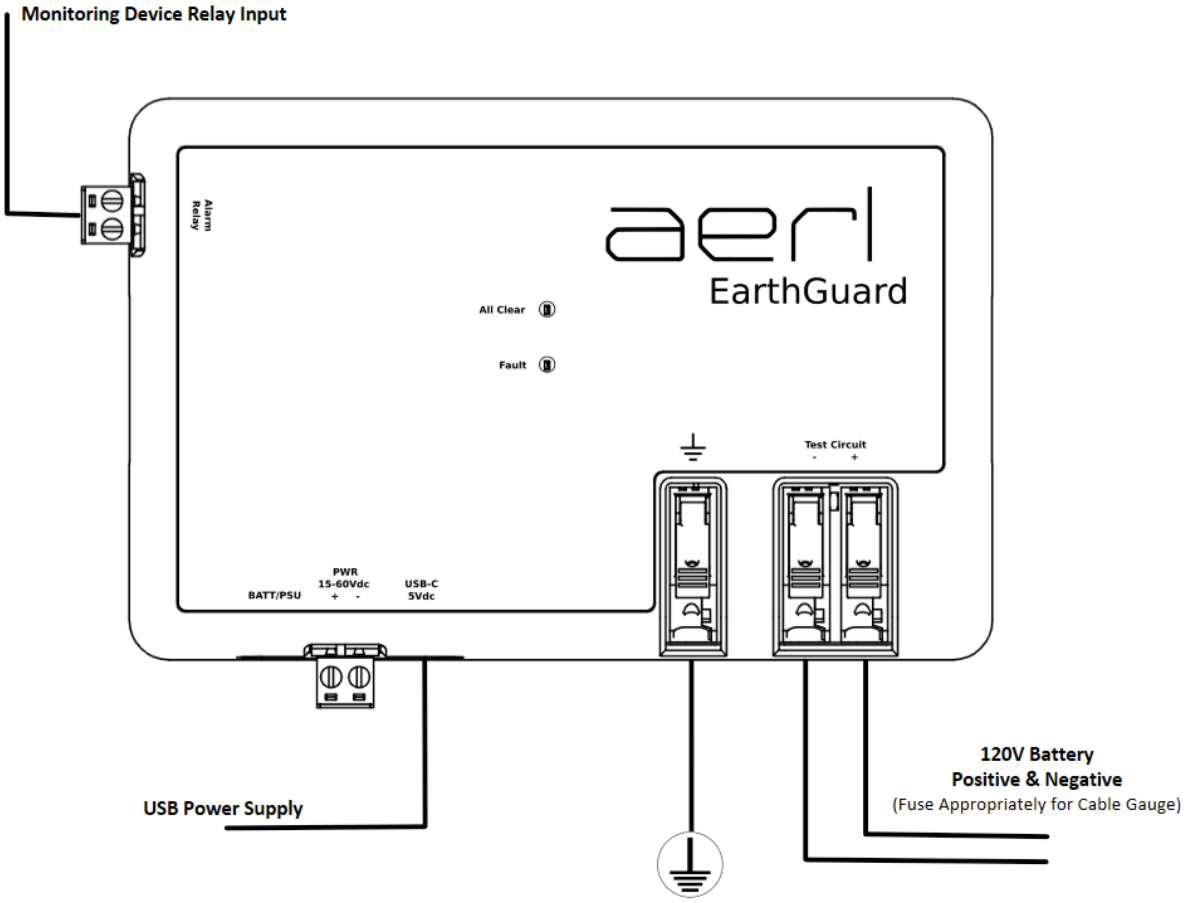


Figure 1 · EG-600-SC wiring diagram — example connections (shown with a 120 V battery; any DC bus from 40 to 600 Vdc)

6.4 Front-Panel Terminal / Indicator Layout

Left edge

Alarm Relay	Dry-contact pluggable terminal

Bottom edge — power

DC Input	12–60 Vdc
USB-C	5 Vdc

Bottom edge — jumper

BATT/PSU	Jumper for a 12–15 Vdc supply (see above)

Face LEDs

All Clear	Green status indicator
Fault	Red fault indicator

Bottom edge — terminals

⏚ Earth	Reference earth terminal
Test (– / +)	Test circuit terminals

6.5 Connecting with AERL Link

Connect a PC to the USB-C port and use AERL Link to view measurements, set the sensitivity and update the firmware.

> **Important**
> AERL Link runs on Windows 10 and 11. Download it from the address below.

`aerl.com.au/professionals`

AERL Link shows the circuit voltage and the earth resistance (+ and −) in MΩ, with the device status and firmware version.

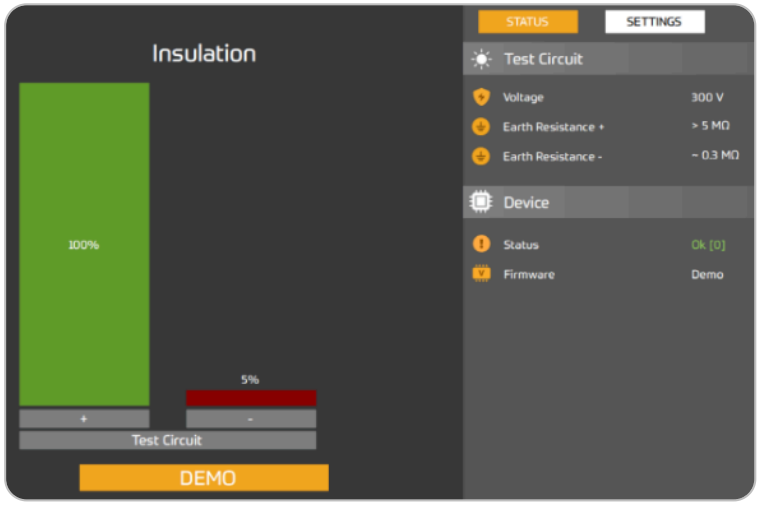


Figure 2 · AERL Link — Status tab

6.6 Trip Sensitivity Configuration

Choose one of three trip sensitivity levels under “Settings” in AERL Link (Figure 3):

High	Mid	Low
< 100 kΩ	< 50 kΩ	< 30 kΩ **Default**

The default is **Low (30 kΩ)**.

6.7 Ground Fault Mode

Set the mode in AERL Link to match how the DC bus is referenced to earth.

Mode	When to use	Detection behaviour
Floating (default)	**The DC bus is not bonded to earth at any point**	**Both DC+ and DC− poles are monitored against earth**
Positive Earth	**DC+ is bonded to earth elsewhere in the system**	**Only DC− is monitored against earth**
Negative Earth	**DC− is bonded to earth elsewhere in the system**	**Only DC+ is monitored against earth**

> **Important**
>
> Positive Earth and Negative Earth modes disable monitoring on the bonded pole. Use them only when that pole is deliberately and permanently bonded to earth at another point in the installation; otherwise leave the circuit on Floating.



Figure 3 · AERL Link — Settings tab (Earth Fault Sensitivity & Earth Type)

6.8 Remote Monitoring

A dry-contact signal relay connects to an external monitor (for example a Victron Venus GX) where the local alarm cannot be heard.

The contact is **Normally Open (NO)** and **energise-to-close (fail-safe)**: the coil is energised in normal operation, holding the contact closed. On an earth fault or loss of power the coil de-energises and the contact opens, so an earth fault, a power loss and a broken cable all show the external monitor the same open contact.

Relay summary

- **Operation:** contact closed in normal operation; opens on an earth fault or loss of power
- **Location:** pluggable terminal on the left edge, near the top
- **Configuration:** Normally Open (NO), energise-to-close (fail-safe)

Operation

LED indicators, troubleshooting

07

The EG-600-SC continuously monitors the insulation between each pole of the test circuit and reference earth. When it confirms a fault, it:

- lights the Fault LED
- sounds the buzzer
- opens the alarm relay.

7.1 LED Indicators

The two LEDs on the front panel show the device state:

All Clear (green)	Fault (red)	Meaning
Solid on	Off	Normal operation. Insulation resistance is above the configured trip threshold on both poles.
Off	Flashing (2 Hz)	Warning. A possible fault has been measured; the unit takes several more readings to confirm it. The relay and buzzer are not yet active.
Off	Solid on	Confirmed earth fault. The buzzer sounds and the alarm relay opens (see Remote monitoring). The fault clears automatically once the insulation resistance is back above the trip threshold.

7.2 Troubleshooting a Fault

1 **Prepare:**

a. Wear PPE (insulated gloves, safety glasses).

b. Follow your electrical isolation procedure.

c. Use rated test equipment.

2 **Shut down the system:**

a. Turn off the inverter and charge controllers.

b. Open the battery circuit breakers.

c. Open the PV array isolators.

d. Power down the EarthGuard.

e. Confirm zero voltage with a multimeter.

3 **Inspect for:**

a. damaged cables (including rodent damage)

b. degraded PV module back sheets.

4 **Segment and test:**

a. Measure the resistance between the battery positive conductor and earth.

b. Measure the resistance between the battery negative conductor and earth.

Once the fault is fixed, the EG-600-SC returns to All Clear.

Simulating a Fault

Test procedure, support contact

08

> ⚠ **Caution — potential hazard**
>
> An earth fault can damage power conversion equipment (PCE) and connected components. Ask the PCE manufacturer before you simulate an earth fault. AERL takes no responsibility for damage caused by simulating an earth fault.

To check that the EG-600-SC is working, follow this procedure with **extreme caution**.

8.1 Setting up the Test

1. **Isolation procedure:**
   a. Disconnect all PCE from the EarthGuard.
   b. Disconnect the chargers and inverters from the battery bus.
   c. Check that the whole system is powered down.
   d. Confirm all equipment is isolated.

2. Fit a **10–12 kΩ** resistor (**20 kΩ maximum**; not supplied) between the Test Circuit + or – terminal and the Earth terminal (Figure 4). Push its leads fully into the terminals.
   Any resistance below the trip threshold trips the unit, so 10–12 kΩ trips at all three sensitivity levels (see *Trip sensitivity configuration*).

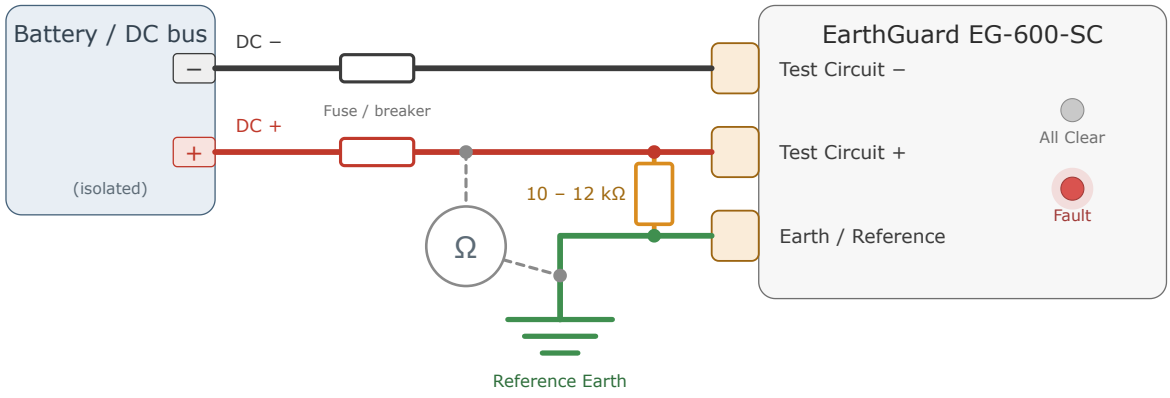


Figure 4 · Fault simulation wiring

8.2 Performing the Test

1. With a multimeter, measure the resistance between the battery positive (or negative) and a separate earth point, for example at the PCE isolator. You should read the test resistor's value.

2. **Run the test:**
   a. Reconnect the battery to the Test Circuit terminals.
   b. Restore power to the EarthGuard.
   c. Wait 15 seconds and confirm the EarthGuard reports a fault (Fault LED solid red, buzzer active, relay opened).

3. Power down the system, remove the test resistor and reconnect the equipment.

8.3 If No Fault Is Reported

a. Check that the EarthGuard is powered: one of its LEDs is lit.
b. Check that you can measure the resistor (step 1 above), then repeat the test.

If the test still does not trip the EarthGuard, or your installation is not covered here, contact AERL support at **support@aerl.com.au** or on **1800 950 865**.



Australian Energy Research Laboratories

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