Subject: Lithium Batteries and SC300 hardware guide

POATLFeLi-48100F-E

SC300-00 controller

This document is generic in nature and focused on Power On Australia's DC/Telecom backup power solutions, combined with Eaton offered 48Vdc lithium batteries and the Eaton SC300 hardware.

Details discussed in this application note are in reference to the Power On offered 48V (nominal) 16 cell Telco grade lithium (LFP) batteries; POATLFeLi-48100F-E and POATLFeLi-48150F-TB.

Refer to the SC300 handbook and lithium battery manual/s for additional information.

Release Date - 24 August 2023

SC300 Hardware (Comms)

The Eaton SC300 hardware and software are in a constant process of upgrade, including the addition of new features and connectivity. Below table details the current SC300 hardware models offered, at the time of document release.

SC300 hardware release 9001-6631 and all SC200 controllers do not support direct modbus comms to lithium batteries, without the use of the CBMS unit. Simple upgrade of the SCx00 controller hardware to new version is required to support direct communication capability.
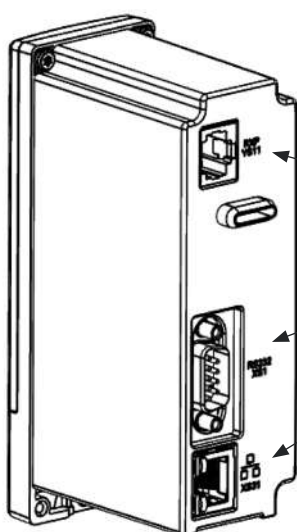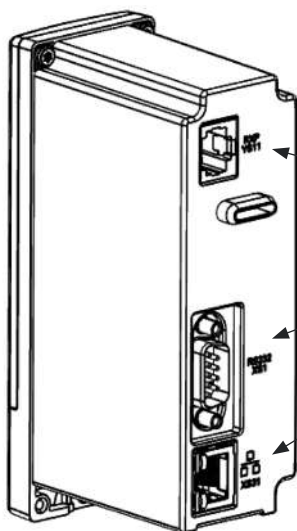
Global Item Number: 9001-6631
Release Period: 2018 - present

YS11 Port (RJ45)
Input Power and RS485 communications to Eaton system peripherals

XS1 Port (DB9)
RS232 Serial Interface

XS31 Port (RJ45)
Ethernet Interface

Global Item Number: 9001-6642
AU/NZ Item Number: 9001-6631L
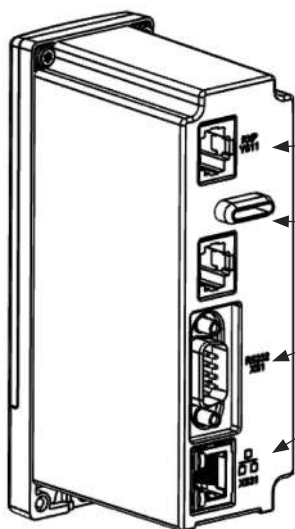Release Period: Q2 2022, special production release only.

YS11 Port (RJ45)
Input Power and RS485 communications to Eaton system peripherals

XS1 Port (DB9)
RS232 and RS485 Serial Interface

XS31 Port (RJ45)
Ethernet Interface

Application Note

Global Item Number: Release Period: 9001-6643
End of 2023 (Date may change)

YS11 Port (RJ45)
Input Power and RS485 communications to Eaton system peripherals

YS12 Port (RJ45)
Dedicated RS485 Port (isolated)

XS1 Port (DB9)
RS232 Serial Interface

XS31 Port (RJ45)
Ethernet Interface

☐ Contact Power On Australia to identify hardware version of power systems as required, quoting the serial number of the system.

Battery Hardware (Comms)

Battery Dry Alarm Contacts

The Power On offered Lithium battery features alarm contacts on the front panel of each bloc. The dry alarm contacts are triggered by the lithium batteries internal BMS CPU. The alarm contacts can be wired to Eaton IOB digital inputs and mapped as appropriate in the SCx00 controller.

☐ BMS alarms are separate to the DC system alarms.

☐ BMS dry alarm contacts are only recommended as a fallback monitoring option. Primary monitoring method recommended is via an SC300 RS485 (modbus) connection.
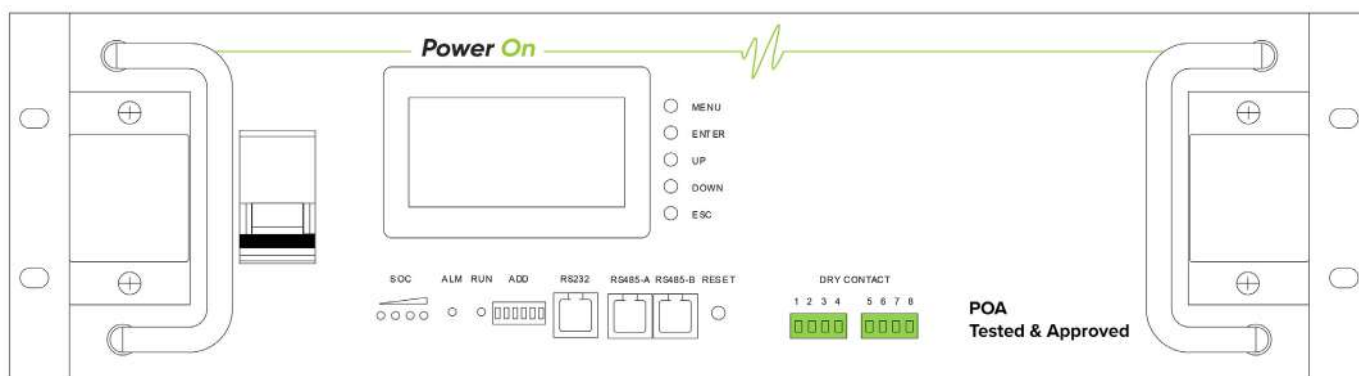
Contact	Contact Contact (Triggered / Active)	Condition / Trigger	Description
Pin 1-2	Normally Open	SOC <20%	Bloc state of charge <20% capacity
Pin 3-4	Normally Open	Anti-theft / G Sensor	Internal gravity (anti-theft) sensor triggered
Pin 5-6	Normally Open	Protection	Protection thresholds are positioned to trigger after an Alarm
Pin 7-8	Normally Open	Alarm	Alarm thresholds are positioned to trigger before Protection

Battery – SC300 Comms Connection (RS485 / Modbus)

The SC300 (9001-6642 [global], 9001-6631L [ANZ] or newer release) features available firmware and RS485 communication capability, enabling the direct modbus polling of information by the SC300 to supported lithium batteries.

☐ Not all lithium battery manufacturers and models will be capable of communicating with the SC300 via modbus. Contact Power On Australia for further information.
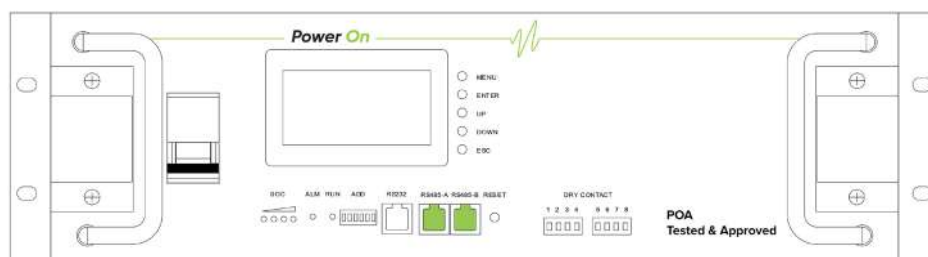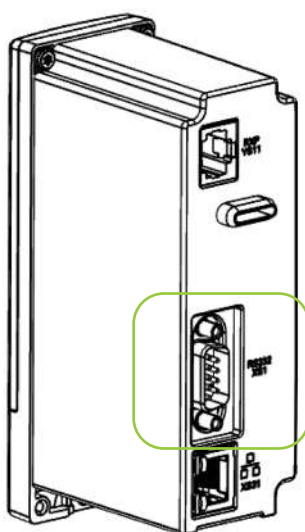
The following pages feature basic diagrams illustrating suggested overview/method to connect the SC300 LFP (RS485) capable hardware, to the Power On offered lithium batteries.

RS485 RS485/RS485 repeaters

As per hardware testing conducted, the use of an RS485 repeater may be required in some cases per below table.

| # RS485 devices	1-10	11-20	21-30	30+
RS485 Repeater	Not likely required	Not likely required	May be required	Likely required

☐ RS485 repeater devices are available in single-in and single-out, as well as single-in and multi-out. The following diagrams show connection methods of each type.

☐ If the RS485 repeater does not have RS485 termination resistor/s built in, suggest to add a 120ohm resistor across the A/B comms line on both the input and output side of the device, installed as close as possible to the device.
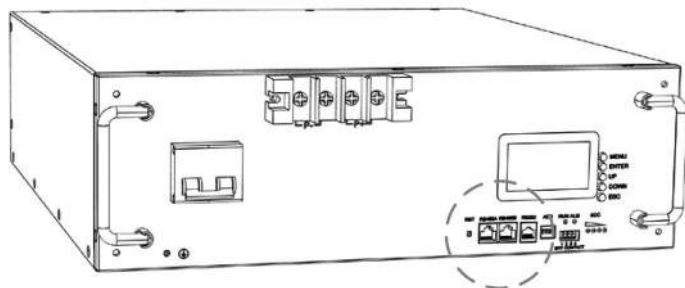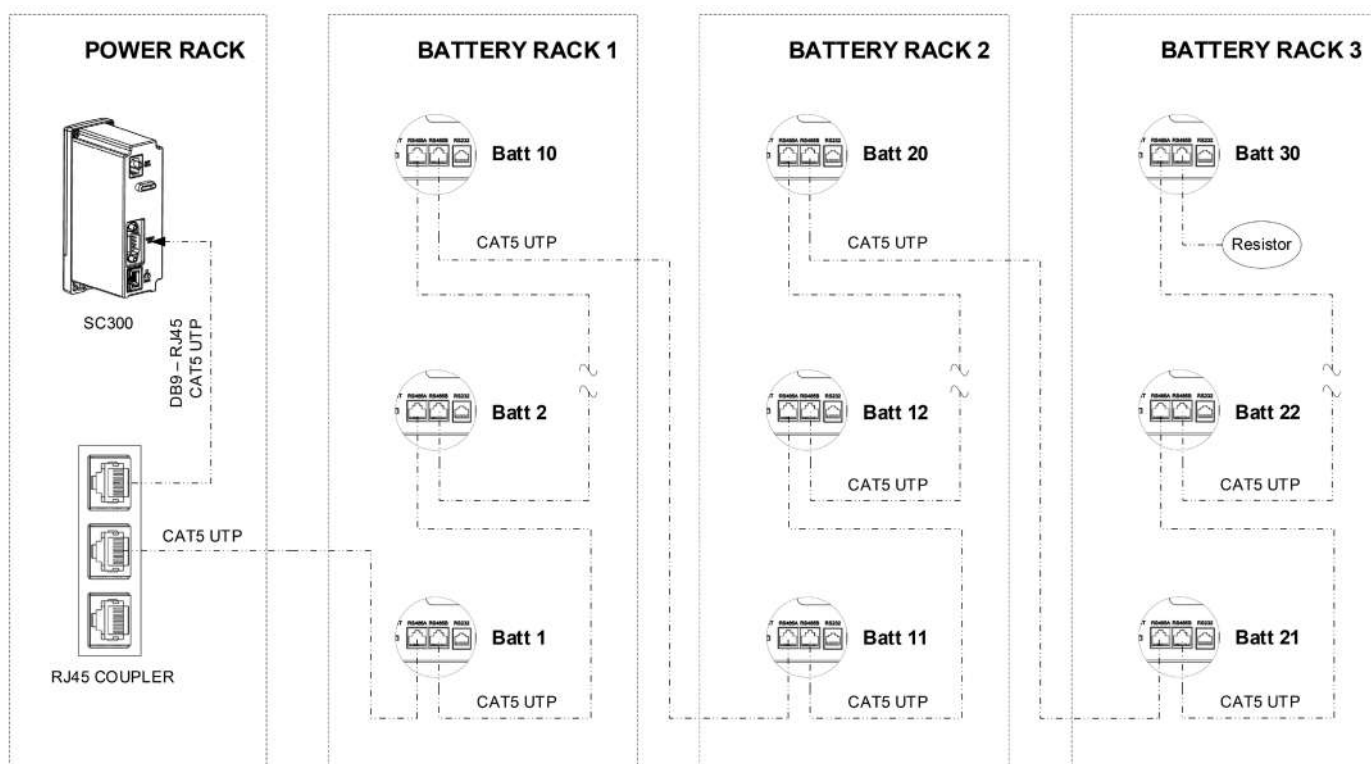
SC300 RS485 (DB9) – Lithium Battery RS485 (RJ45) cable

All unused cores should not be connected to the DB9/RJ45 socket. Unused cores should also be insulated against contact with the terminated cores.

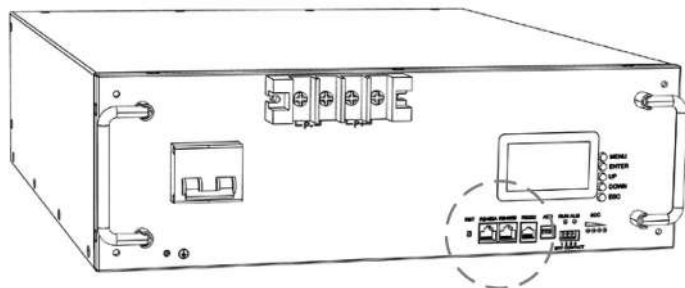Below cable suits the SC300 hardware 9001-6642 / 9001-6631L and Leoch LiB models as detailed on page 1.
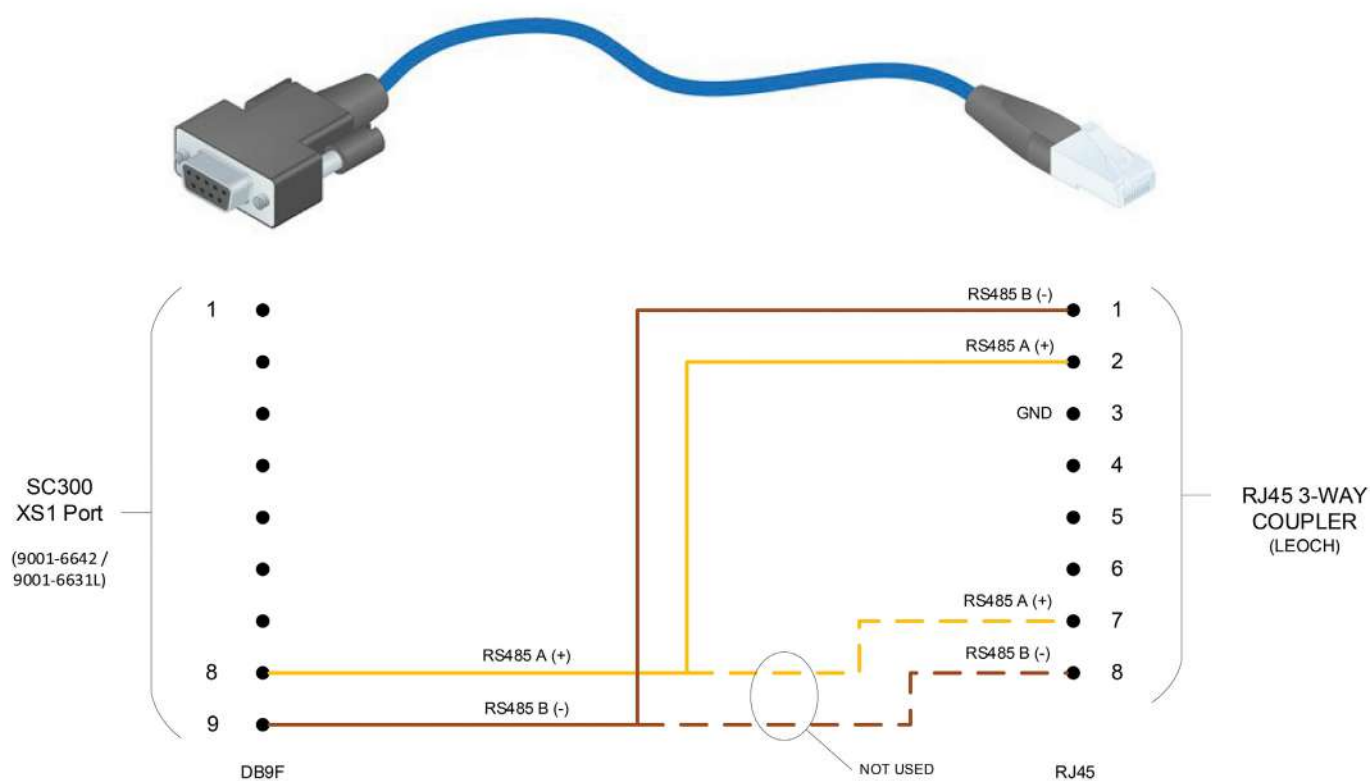
Application Note

SC300/BATT COMMUNICATION*
No RS485 repeater fitted

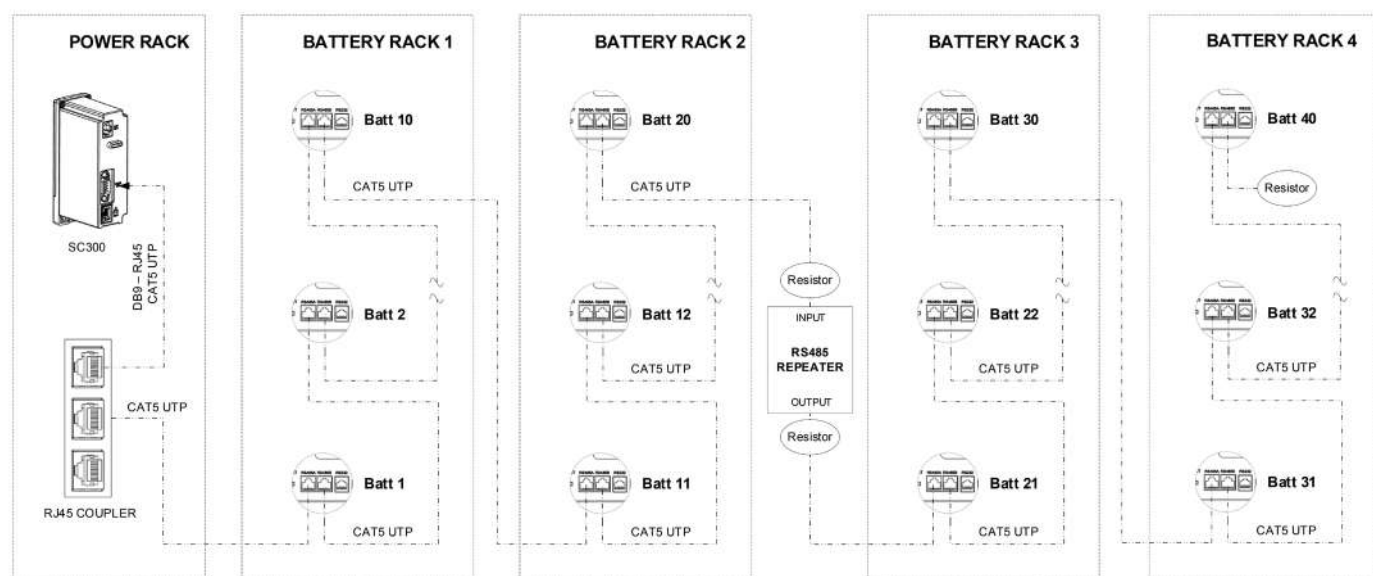*Example for illustration purpose only

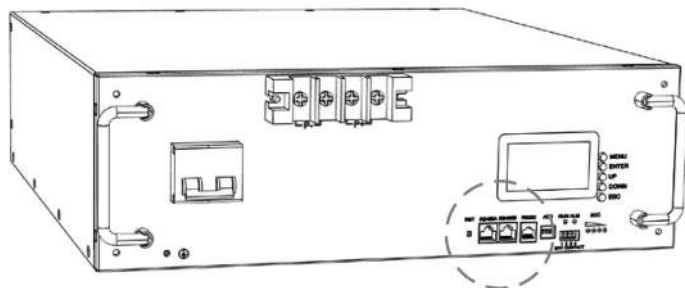**SC300/BATT COMMUNICATION***
Single in / single out RS485 repeater

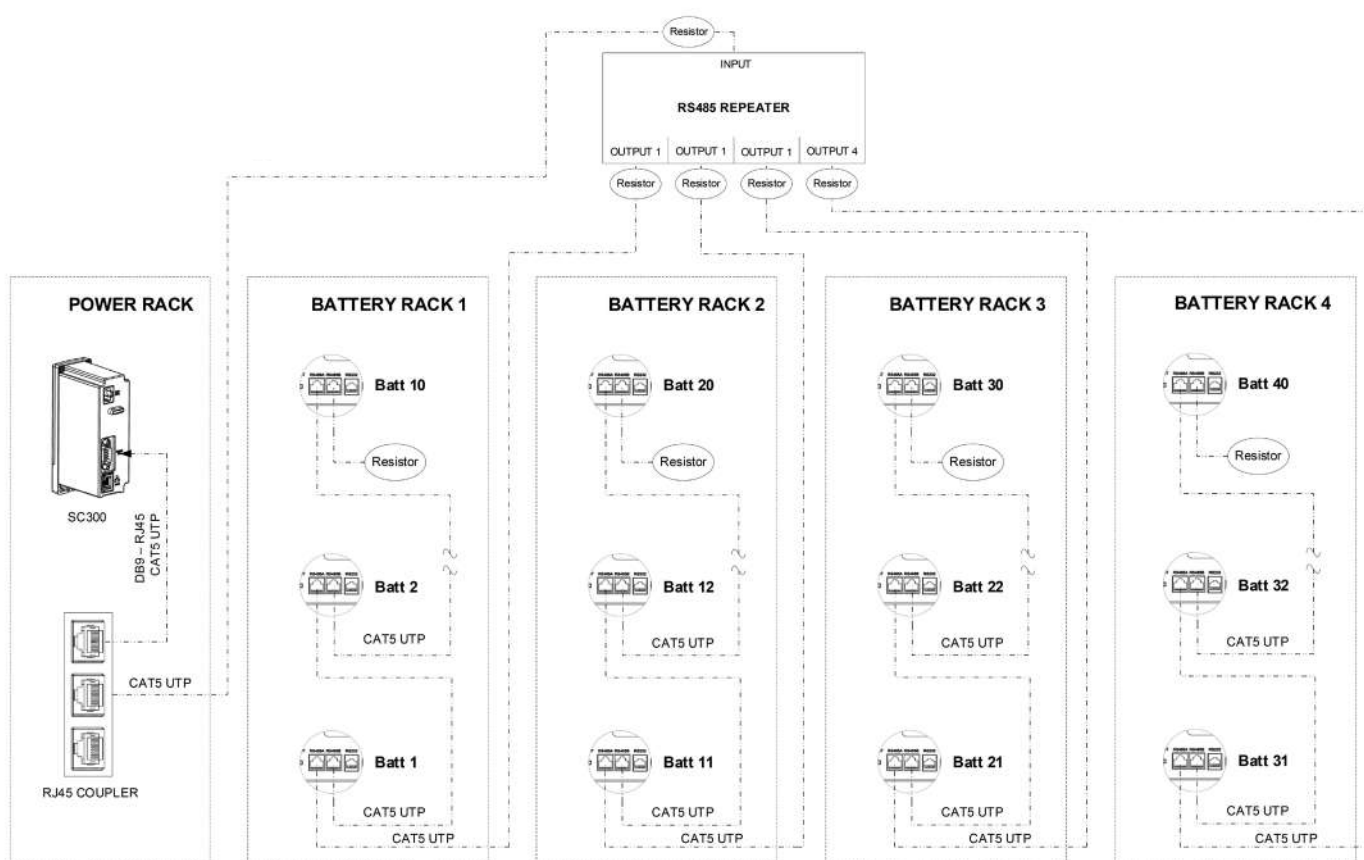*Example for illustration purpose only

SC300/BATT COMMUNICATION*
Single in / multi out RS485 repeater

*Example for illustration purpose only

Application Note

SC300 firmware version / configuration file

Power On DC solutions when purchased as a system solution are typically pre-programmed with correct firmware and configuration files pre-loaded.

☐ Refer to SC300 Handbook and/or discuss with Power On Australia for additional support.

Lithium Battery Programming

When installing the lithium batteries on-site, the installation technician is required to 'program' the lithium batteries modbus position. This can be achieved by setting the dip switches on the front of each battery bloc per the following table.

☐ 'BATT QTY 0' should not be used. First battery of modbus comms bus should commence from 'BATT QTY 1'.

LFP Battery programming (dip switch setting)

BATT QTY	Sw1	Sw2	Sw3	Sw4	Sw5	Sw6
0	off	off	off	off	off	off
1	on	off	off	off	off	off
2	off	on	off	off	off	off
3	on	on	off	off	off	off
4	off	off	on	off	off	off
5	on	off	on	off	off	off
6	off	on	on	off	off	off
7	on	on	on	off	off	off
8	off	off	off	on	off	off
9	on	off	off	on	off	off
10	off	on	off	on	off	off
11	on	on	off	on	off	off
12	off	off	on	on	off	off
13	on	off	on	on	off	off
14	off	on	on	on	off	off
15	on	on	on	on	off	off
16	off	off	off	off	on	off
17	on	off	off	off	on	off
18	off	on	off	off	on	off
19	on	on	off	off	on	off
20	off	off	on	off	on	off
21	on	off	on	off	on	off
22	off	on	on	off	on	off
23	on	on	on	off	on	off
24	off	off	off	on	on	off
25	on	off	off	on	on	off
26	off	on	off	on	on	off
27	on	on	off	on	on	off
28	off	off	on	on	on	off
29	on	off	on	on	on	off
30	off	on	on	on	on	off
31	on	on	on	on	on	off
32	off	off	off	off	off	on
33	on	off	off	off	off	on
34	off	on	off	off	off	on
35	on	on	off	off	off	on
36	off	off	on	off	off	on
37	on	off	on	off	off	on
38	off	on	on	off	off	on
39	on	on	on	off	off	on
40	off	off	off	on	off	on

☐ Battery Modbus address' require to be unique for each battery bloc and in sequential order from B1.
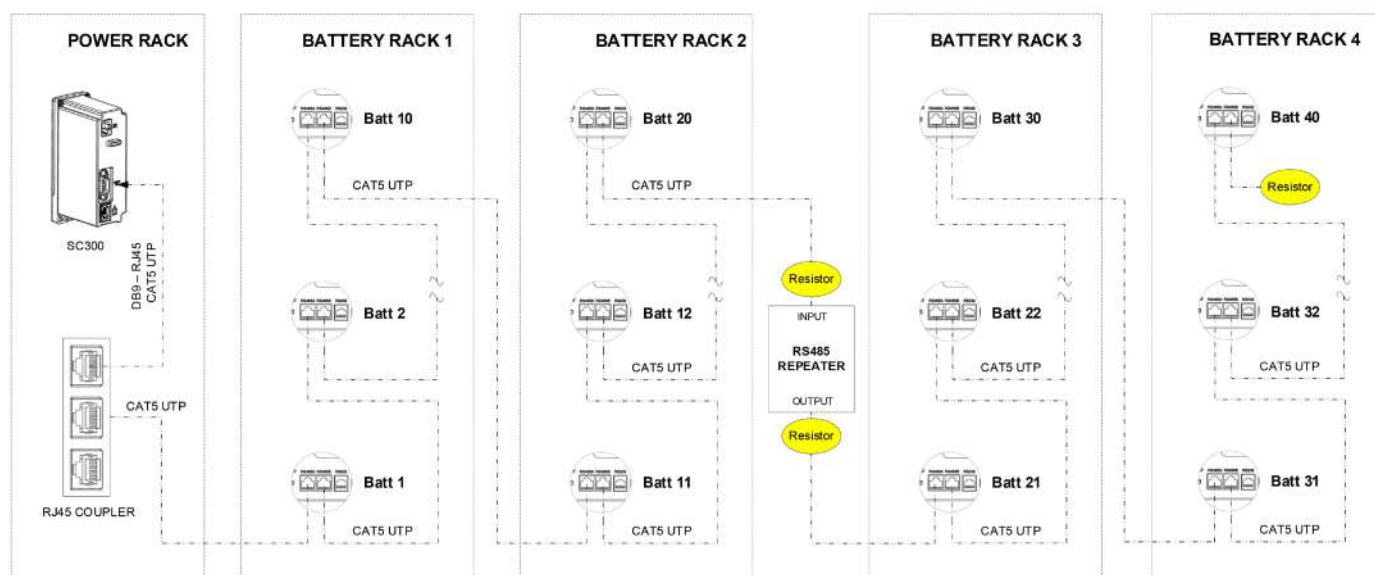
Application Note

RS485 Termination Resistor/s

RS485 termination resistor/s should be installed at the start and end of RS485 comms line/s. The purpose is to ensure a clean and stable communication line for the RS485 devices (SC300 / Lithium Batteries / other hardware) communicating on the RS485 modbus communications bus.

☐ Suggest that an RS485 termination resistor is installed for applications with >10 batteries.

☐ If the stability of the RS485 comms at a particular site appears unstable, the presence of external 'noise' or excess loading may be affecting the RS485 signal and termination resistor/s may be required, as well as the possible need for RS485 repeater/s.
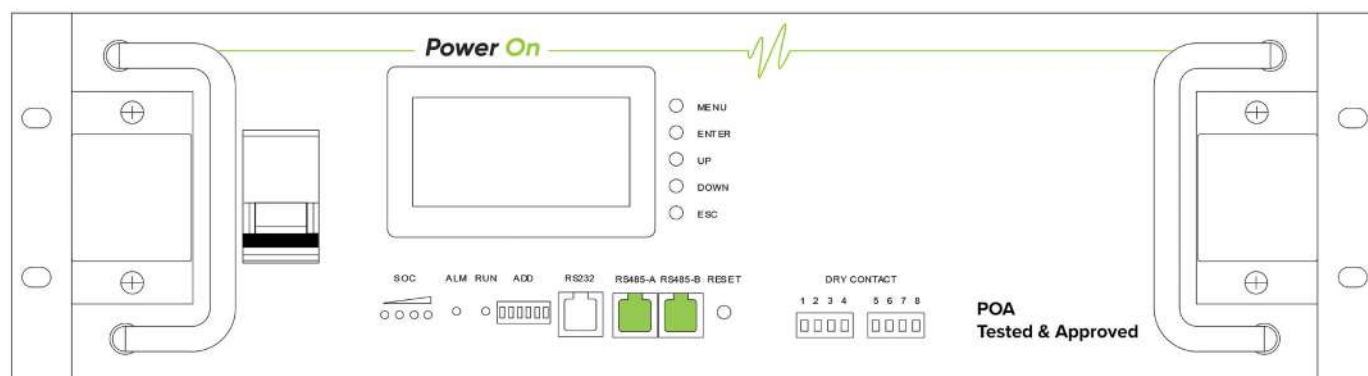
Application Note

RS485 End of Line Resistor – RJ45 stub assembly

It is suggested to use a single 120ohm resistor per 'stub', assembled as per below. This is to plug into the unoccupied RS485 port, of the last battery in any communications bus as discussed earlier in this document.

☐ The length of the stub should be made as short as possible (<5cm).

☐ Pre-manufactured stubs are available

**LFP BATTERY RS485**
End of line resistor stub
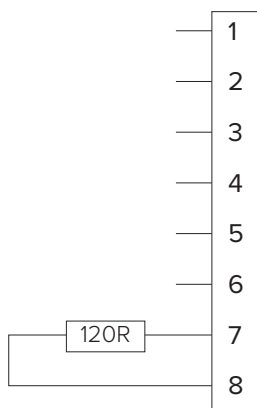
Notes:

1. Unused wires to be electrically insulated, including against each other.
2. Resistor to be electrically insulated.

Below is the Power On Australia offered Lithium Battery RS485 (RJ45) pinout; POATLFeLi-48100F-E and POATLFeLi-48150F-TB.

Suggest using Pins 1&2 only for RS485 comms to SC300.

Pin Configuration:

Pins definition is as below figure
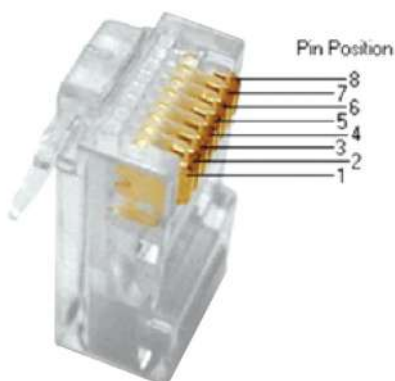
Pin 1:   RS485 B- (T/R-)

Pin 2:   RS485 A+ (T/R+)

Pin 3:   GND

Pin 4:   Reserved

Pin 5:   Reserved

Pin 6:   GND

Pin 7:   RS485 A+ (T/R+)

Pin 8:   RS485 B- (T/R-)

Note/s

- Engineering and construction of large capacity backup power systems featuring lithium battery banks requires intimate knowledge of the relationship of the power system, and the specific technology, voltage and quantity of lithium battery blocs used.

- This guide serves to act as general in nature, discussing the typical communications method of the SC300 based power systems and Power On Australia offered lithium batteries. It is not a guide on system design, nor a recommendation of suitability of number of batteries that can be installed in parallel, without Power On Australia Engineering assistance with the overall feasibility/design.

- The Power On offered POATLFeLi-48150F-TBT (48V 150Ah) battery supports the same communication capability as the POATLFeLi-48100F-E (48V 100Ah), with only slight variation to the port positions on the front panel. For this reason, it is not necessary to discuss both models separately with regards to the RS485 comms bus. Installation technicians can replicate the methods discussed within this document for both models.

- In environments that may have significant 'noise' that may disrupt a stable RS485 communication, it may be necessary to use shielded cabling. Discuss with Power On Australia the method to ground the shield prior to connection, to prevent inadvertent equipment damage.

- For longer communication cable runs or large banks of lithium batteries, it may be necessary to use an RS485 repeater.

- This document is not generated for the purpose of being a single point source of information for RS485 Modbus communications. It is prepared to serve as a low-level guide and as required, customers and end users should refer to separate RS485 technical documentation and best practice guides.

For more information, contact us at

📞 **1300 662 435**   ✉ **sales@poweronaustralia.com.au**