



Installation & User Guide: eoALM

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1 Introduction

This document details the operation and installation of the Automatic Load Management (ALM) unit for use with the eoBasic and eoMini charging stations – the eoALM

1.1 Overview

The eoALM is a local device which every second will manage the current draw of the electric vehicles on a premise to ensure that the electric vehicles will never cause the site's current limit to be exceeded. It is an ideal companion to charging stations at a site with limited power. It has the following key features:

- Capable of controlling up to 6 charging stations
 - Any combination of eoBasic or eoMini rated at either 16A or 32A
- Two modes of operation –
 - priority mode (first come first served)
 - distribution mode (available current is evenly distributed to all connected vehicles)
- Two different model variants based on power control levels
 - EA001 - High Power – 100A, 80A, 60A or 40A
 - EA002 - Low Power – 40A, 32A, 25A, 20A

Note that the choice of high or low power needs to be defined at the point of order
- Single phase operation
- Premise's current supply measured using a single Current Transformer (CT) Clamp
- Powered through the serial connection to the charging stations
- Low power consumption (12V@50mA).
- Premise's current consumption measured every second
- Enclosure designed so that the configuration settings cannot be changed when the unit has been installed i.e. anti tamper.



Figure 1 - The eoALM

2 Installation

This section details how the ALM unit shall be installed. It details:

- wiring connections to the stations
- connection to the site supply
- Physical Mounting considerations
- Jumper Settings
- LED operation

The overall wiring diagram is as per Figure 2 below:

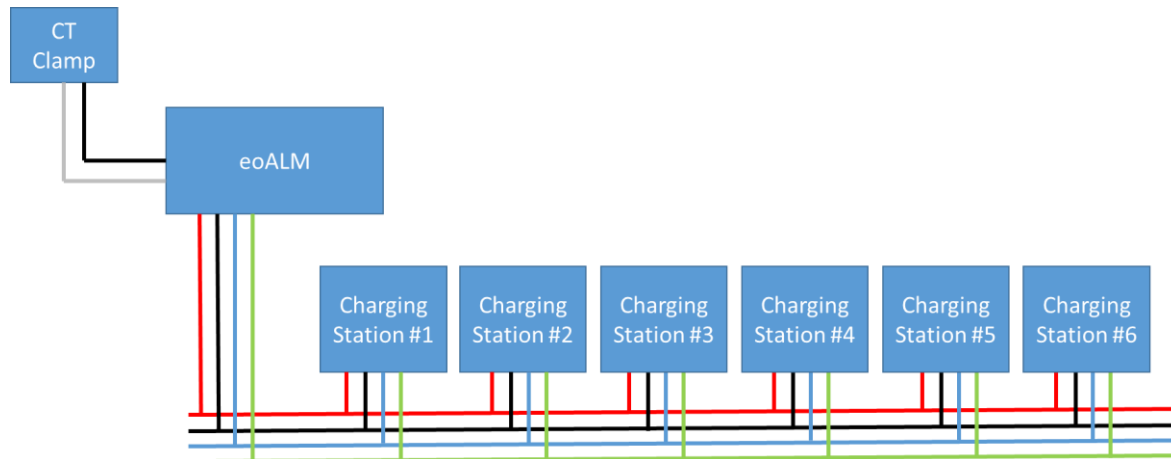


Figure 2 - Wiring Schematic

2.1 Connection to the charging stations

The eoALM communicates to the charging stations via a serial bus and is powered by the charging stations. A four wire bus runs between the stations and the eoALM as shown in Figure 2. The four wires are:

- Red - +12V Power
- Black – GND
- Blue – Comms A
- Green – Comms B

2.1.1 Cable Recommendations

A four core or two pair cable is recommended for connections between the eoALM and the charging stations. If the cable is to be mounted externally to the building then it must be UV rated. If it is going to be included in the trunking with the power cables then the following cable is recommended:

<https://www.elandcables.com/media/39344/belden-9842-lszh-600v-cable-belden-alternative.pdf>

2.1.2 Connecting up the serial bus

It is recommended that lever style connectors be used to join the various components of the serial bus together. Wago connectors come very highly recommended.



Figure 3 - Wago or Lever style connectors

No Termination resistors are required

The maximum cable length is 1000m but it is recommended not to exceed 250m.

2.1.3 Connections of the eoALM

There are six wiring connections to be made in the eoALM:

- 1) CT White
- 2) CT Black
- 3) +12V
- 4) GND
- 5) COMMSA
- 6) COMMSB

NOTE – COMMSA and COMMSB should be a twisted pair cable.

The connections are shown in Figure 4 below:

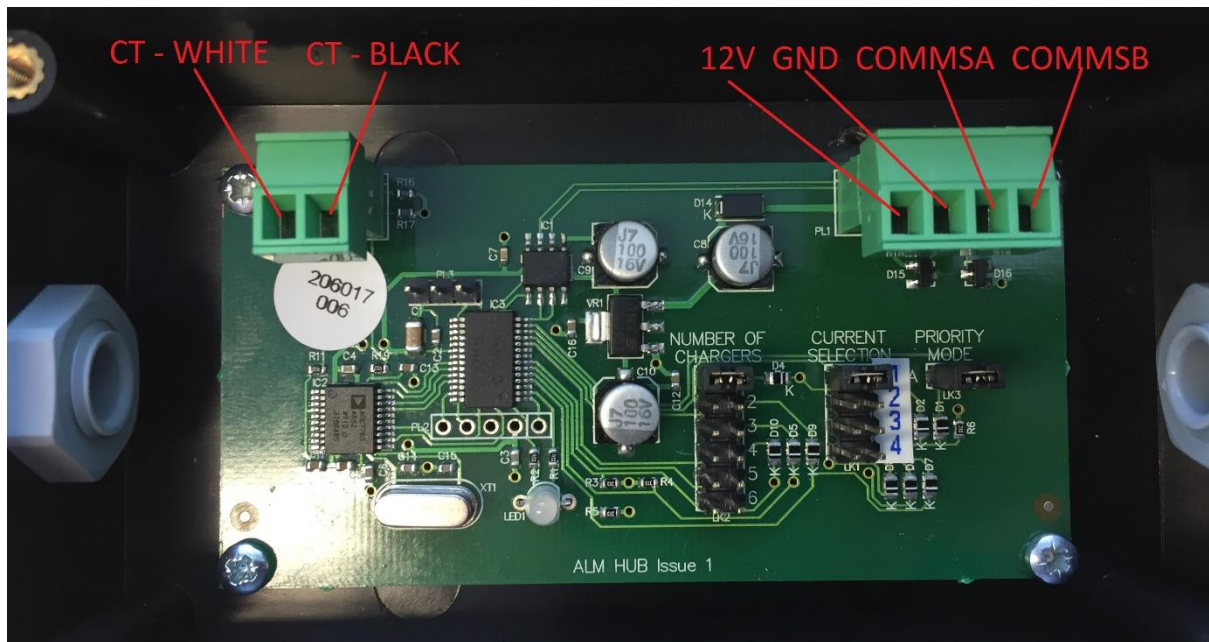


Figure 4 - wiring connections of eoALM

2.1.4 Connection to eoMini

In order to connect the eoMini to the serial bus, the following steps should be taken:

- 1) Ensure that the power is removed from the eoMini
- 2) Remove the four screws from the cover of the eoMini
- 3) Note the 4 pin green socket and plug on the bottom left hand corner of the eoMini
- 4) The socket should be wired up in the following manner



Figure 5 - Wiring connection for the eoMini

2.2 Connection to eoBasic

The standard eoBasic is a sealed unit and therefore it is not possible to connect this to the eoALM. Therefore a specific variant of the eoBasic must be used to connect to the eoALM. Please refer to hello@eocharging.com for more information about which variant to order.

The eoBasic that is ALM ready is the standard eoBasic form factor but with a serial cable exposed (this is in the same manner as an eoGenius). Therefore the following cables are available:

- Red - +12V
- Black – GND
- White – CommsA
- Green - CommsB

These wires need be connected to eoALM serial bus. Again, ensure that power is removed from the station before connecting to the serial bus.

2.3 CT Clamp

The CT clamp shall be mounted on the tail of the electricity meter. It should be mounted as close as possible to the meter itself. There are two wires from the CT Clamp – White and Black. The connections are shown in Figure 4.

NOTE

- 1) the eoALM should be mounted within 2m of the CT Clamp.
- 2) In order for a DNO to consider this as a Load Management device then the following recommendations are made for the wiring of CT clamp
 - a. Anti Tamper seals are placed on the CT clamp to indicate if it has been removed
 - b. The CT cabling should be contained (for example in a flexible conduit)

2.4 Physical mounting

In order to commission the eoALM, the following steps should be taken:

- 1) Remove the unit from the packaging
- 2) Unscrew the four screws from the base of the unit and remove the backing plate
- 3) Set the jumper configurations (refer to section 2.5 below)
- 4) Feed in the serial cable and the CT cable through the two glands on the side of the units
- 5) Connect the serial cable and the CT cable to the plugs on the eoALM circuit board
- 6) Apply power to the stations and verify the LED operation (section 2.6)
- 7) Attach the backing plate to the eoALM unit
- 8) Mount the eoALM unit to the wall using four mounting screws (not supplied)

2.5 Jumper Settings

There are three configuration settings of the eoALM that are determined by placing jumpers on the relevant pins:

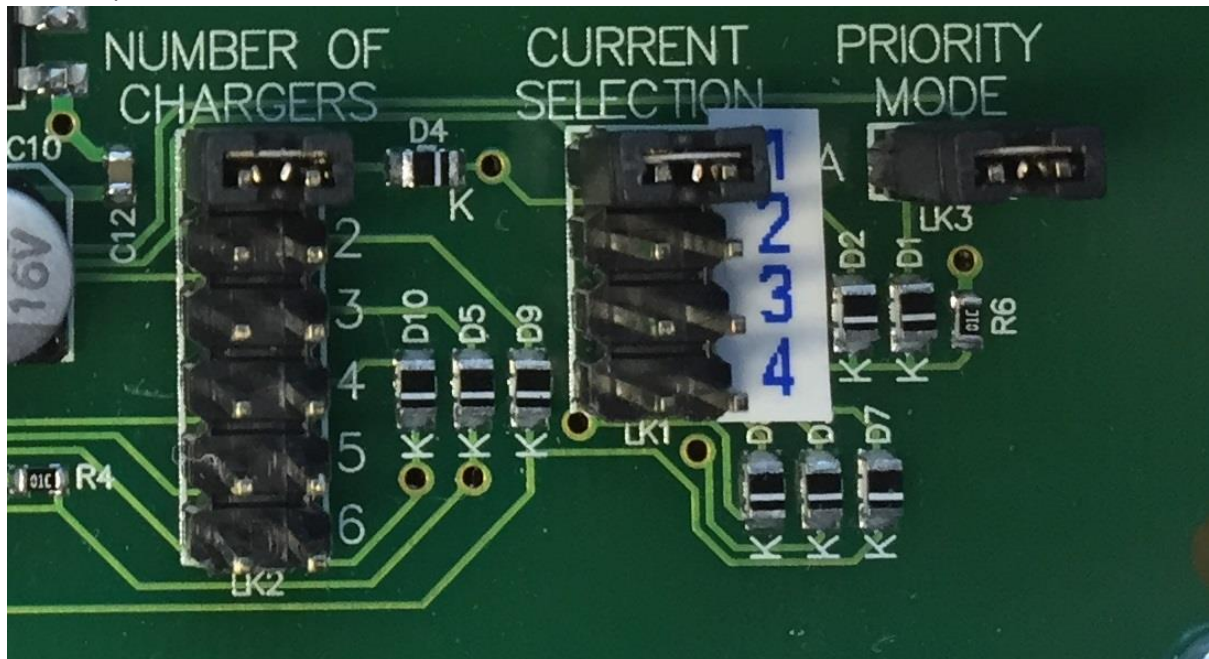


Figure 6 - eoALM Jumpers

- Number of charging stations connected (1 to 6)
- Current Selection

Jumper Option	High Power Mode	Low Power Mode
1	100A	40A
2	80A	32A
3	60A	25A
4	40A	20A

The current rating is confirmed by a sticker on the backing plate as shown below in Figure 7. Note that the high power version (EA001) is shown rather than the lower power version

(EA002).

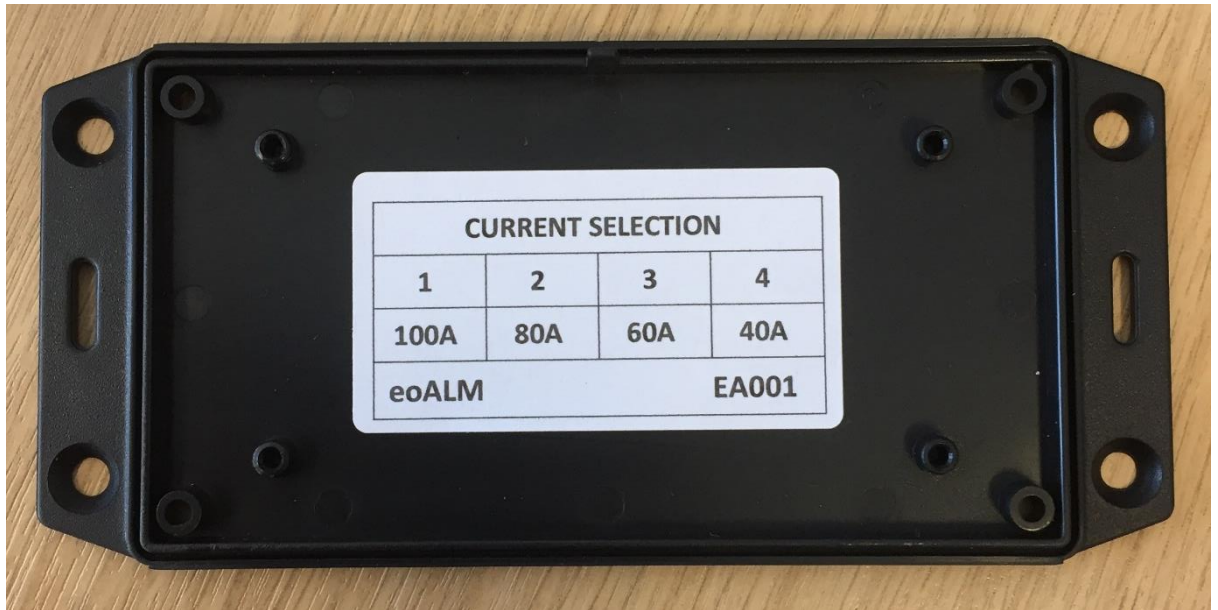


Figure 7 - current rating sticker on the eoALM backing plate

- Mode of Operation
 - Jumper ON = Priority Mode
 - Jumper OFF = Distribution Mode
-

2.6 LED Operation

The LED displays the charging station status and fault information to the installer before final sealing of the unit. The LED is not visible to the end customer and is only visible at the point of installation before the cover is secured. The LED gives the following information

- In Normal operation, the LED will flash Green with a pause. The number of flashes indicates the number of Chargers connected to it.
- IF No chargers are connected then the LED will show orange.
- If a charger is missing the ALM will give a number of green flashes indicating the number of chargers identified then a number of red flashes indicating the number of chargers missing
 - i.e. if the jumper is set to three chargers and there are only two on the network then there will be two green flashes followed by one red flash.
- If the number of chargers is set to less than the number of charging stations that are on the network then the ALM will not be able to operate as it does not know what to do.

The sequence of LED flashes is shown in the following pattern:

0.5sec delay	Flash for over charger count	Flash for charging station on-line	Flash for missing charging stations
	■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■

Consider the following examples:

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- Jumper set to three stations but four connected
 - LED sequence = 1RED,3GREEN



- Jumper set to three stations but two connected
 - LED sequence = 2GREEN,1RED



- Jumper set to three stations and three connected
 - LED sequence = 3GREEN



3 Operation

At the point of installation, the following configuration choices must be made:

- Number of charging stations connected (1 to 6)
- Current limit of the Premise
- Mode of operation

There are two options for mode of operation – Distribution Mode OR Priority Mode. The behaviour of both modes is quite distinct and is detailed below:

3.1 Distribution Mode

In Distribution Mode, the available current is divided equally amongst all of the available charging stations. For example, if 40A is available (to the charging stations) and two charging stations are connected, then each station would be allocated 20A each.

3.2 Priority Mode

In Priority Mode, the available current is NOT divided equally amongst all of the available charging stations. The first vehicle connected would be allocated as much as possible. If any current capacity is left, then the remainder would be given to the other charging stations. For example if 40A is available (to the charging stations) and two (32A) charging stations are connected then the first vehicle connected would receive 32A whilst the second vehicle would receive 8A.

3.3 Low power scenarios & Vehicle behaviour

When there is limited power available for the EVs, then it is important to consider the behaviour of the vehicles when sizing the number of charging stations to be connected to the ALM unit. The smallest amount of current that can be allocated to a vehicle is 6A (indeed experience shows that some vehicles do not charge below 10A). If 6A is not available then the charging station is put into a pause state and the vehicle may enter a sleep mode. If when power becomes available, the vehicle may or may not wake up and take the 6+Amps. The ALM unit is designed to manage the current capacity of the connected vehicles, it is not designed to be a queuing system.

3.4 Normal Operation

Under normal operating conditions, the ALM unit is simply a black box that is invisible to the user. The ALM will simply instruct the charging station what power is available, it is then up to the vehicle to pull the advertised rate.

3.5 Operation in fault conditions

If the CT clamp is removed or the eoALM unit fails then the load management functionality of the eoALM will not be operational. Under those scenarios, only a suitable load should be applied relevant to fuse rating of the premise.

4 Further Technical Support

All EO Charging technical documentation is published in the EO Resource Centre, this is found at:
<https://www.eocharging.com/service-support/>

The EO Support team can be reached at:

- Email: support@eocharging.com
- Phone: +44 (0) 333 77 20383