Discover®
ADVANCED ENERGY
Lithium Ion Battery

APPLICATION NOTE:

AES $LiFePO_4$ Battery
Charging with Delta-Q IC Series

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OVERVIEW

There are some notable differences when configuring the charging of Discover AES versus conventional lead acid batteries.

This Application Note provides information about the charging of Discover AES Lithium batteries with Delta-Q Technologies IC Series Chargers.

Delta-Q Technologies reference documents:

- Delta-Q Technologies IC Series Manual

Discover reference documents:

- Discover Energy Data Sheets
- Discover AES $LiFePO_4$ Battery Manual

Visit discoverbattery.com and for the most recent version of published documents.

Certain configuration, installations, service, and operating tasks should only be performed by qualified personnel in consultation with local utilities and/or authorized dealers. Qualified personnel should have training, knowledge, and experience in:

- Installing electrical equipment
- Applying applicable installation codes
- Analyzing and reducing hazards involved in performing electrical work
- Installing and configuring batteries

No responsibility is assumed by Discover Battery for any consequences arising out of the use of this material.

Read AES Battery Manual and Safety instructions before installing the battery.

Read Delta-Q manuals for guidance on product features, functions, parameters and how to use the product safely.

1. SAFETY

1.1 Warnings, Cautions and Notes

▲ DANGER

Important information regarding hazardous conditions that will result in personal injury or death.

▲ WARNING

Important information regarding hazardous conditions that will result in personal injury.

▲ CAUTION

Important information regarding hazardous conditions that may result in equipment damage.

▲ NOTE

Additional information concerning important procedures and features of the battery not related to physical injury.

1.2 General Warning

This equipment must only be installed and serviced by qualified electrical personnel.

▲ WARNING

ELECTRICAL SHOCK AND FIRE HAZARD

Do not disassemble or modify the battery. If the battery housing is damaged, do not touch exposed contents. Read the User Manuals for both batteries and chargers before installation or operation. Failure to follow these instructions can result in serious injury, or equipment damage.

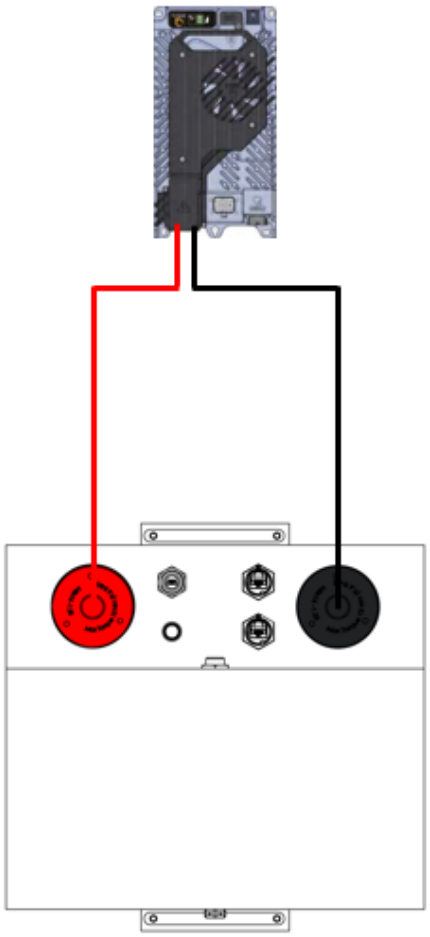
2.0 Overview

2.1 Communication

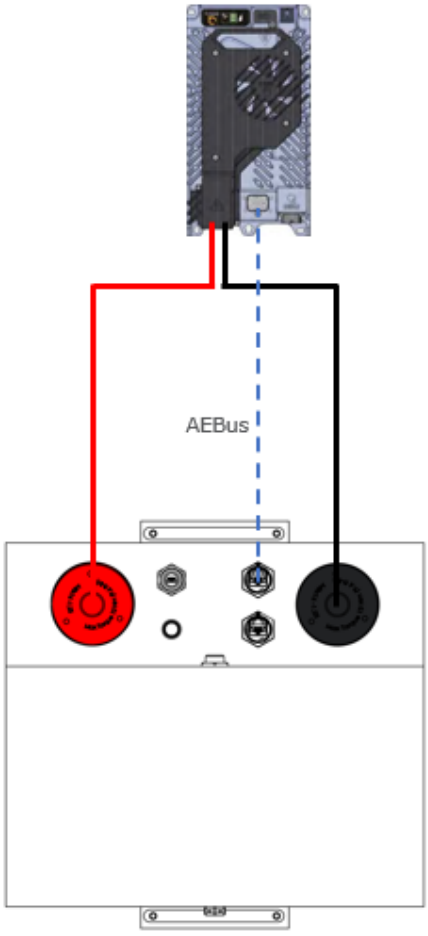
Delta-Q IC chargers may be configured to charge Discover AES batteries in either an open loop or closed loop communication configuration. Closed loop communication will enable superior system and battery performance, and is highly recommended.

An open loop configuration does not use battery-to-charger communication and the manual programing of charging set points for a standard algorithm is necessary.

A closed loop communication configuration allows the battery to dynamically control the charger's voltage and current, no manual programing is necessary.



Open Loop Configuration



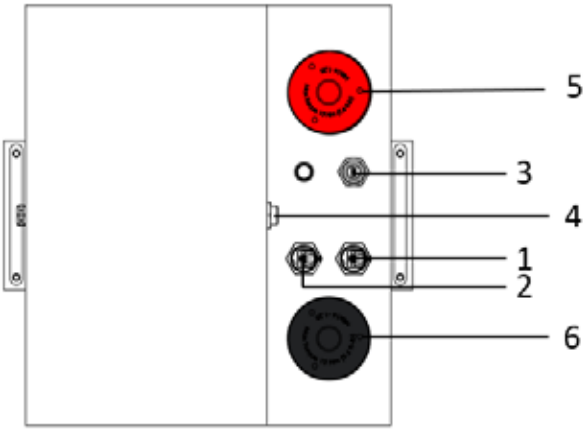
Closed Loop Configuration

2.2 Battery and Charger Interface

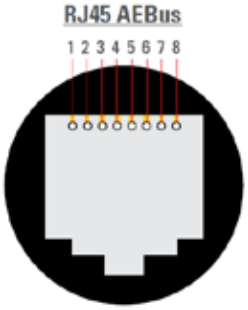
AE bus enabled devices communicate with each other over a CAN bus network to share settings, activity and other updates. If there are more than 1 battery connected on an AE bus network, 1 will be dynamically selected as the master node. The master node will control the charge configuration of attached chargers.

Interface for AES part numbers 14-24-3000 / 14-36-3000 / 14-48-3000

1. AE bus Port - RJ45 - Interface port to connect AE bus enabled devices, such as other AES batteries
2. AE bus Port - RJ45 - Interface port to connect AE bus enabled devices, such as other AES batteries
3. USB Port - interface for PC connectivity to AES Dashboard (Diagnostic Software)
4. ON / OFF Button - When battery is ON (enabled) blue power light will be illuminated
5. Red DC Terminal - Battery Positive (+) connects to the positive DC bus line
6. Black DC Terminal - Battery Negative (-) connects to the negative DC bus line



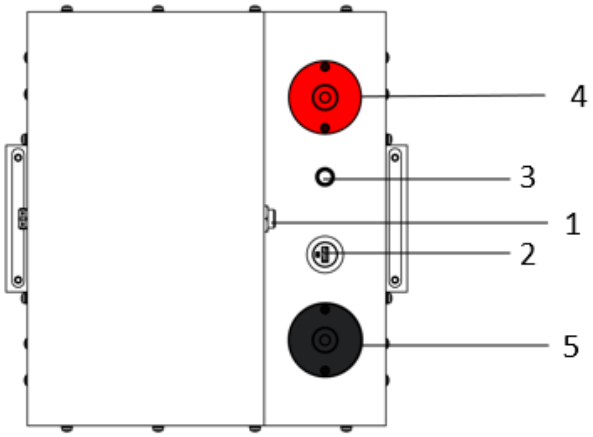
AE bus Port - RJ45 PIN OUT



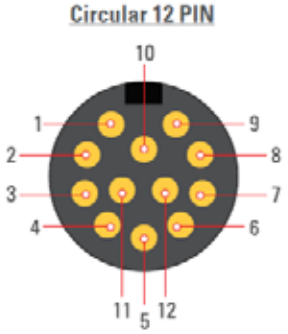
Pin 3	AEBus CAN GND
Pin 4	AEBus CAN Low
Pin 5	AEBus CAN High
Pin 6	AEBus + 5V

Interface for AES part numbers 14-24-2800 / 12-36-6700 / 12-48-6650

1. Circular 12 PIN Port - AE bus interface to connect to AE bus enabled devices
2. USB - interface for PC connectivity (AES Dashboard)
3. On-Off - When battery is enabled blue power light will be illuminated
4. Battery Positive (+) (red) - DC terminal connects to the positive DC bus
5. Battery Negative (-) (black) - DC terminal connects to the negative DC bus

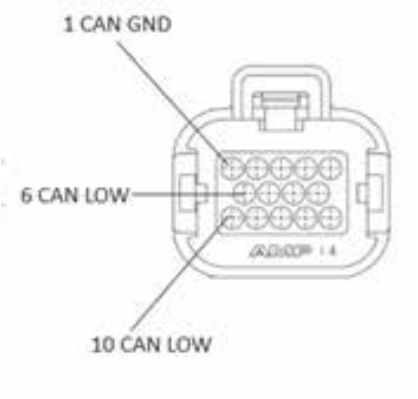


AE bus Port - Circular 12 PIN OUT



Pin 3	AEBus CAN GND
Pin 4	AEBus CAN High
Pin 5	AEBus CAN Low
Pin 6	LED GND
Pin 7	LED +5V
Pin 8	Key/Reset +
Pin 9	Key/Reset -
Pin 11	AEBus CAN +5V

2.3 Delta-Q IC-COMM Communication Interface



3.0 Delta-Q Charing Algorithms

Delta-Q chargers can be programmed utilizing one of a number of battery charging profiles. The active profile is identified as the 'default algo'. The default algorithm can be selected from those stored on the charger and changed at any time by the user. Algorithms stored on the charger can be updated from a USB stick. Refer to the Delta-Q manual for instructions on how to select algorithms. Contact your Delta-Q supplier, or visit delta-q.com, for instructions on how to obtain and load new algorithms.

3.1 Setting the Charging Algorithm

Before charging for the first time, verify which AES Lithium algorithm has been selected by pressing the charger's button.

▲ NOTE

The Delta-Q IC 650 / 900 / 1200 BASE or COMM models can both use algorithm number 261 for open loop charging.

▲ NOTE

The Delta-Q IC 650/ 900 / 1200 COMM model is required for closed loop charging using algorithm 311. Delta-Q COMM models are equipped with CAN bus communications.

To select one of the AES Lithium algorithms:

1. Disconnect the battery from the charger, or set the battery to OFF by pressing the ON OFF button.
   Note: The AES battery's blue LED light will be extinguished when the AES battery is set to OFF.
2. Connect AC Input to the charger.
3. Confirm the active charge profile is set to the correct AES Lithium algorithm (261, or 311) by pressing the button with the wrench icon on the charger.
4. The charger display will indicate "P" followed by a three-digit number (eg. P-2-6-1 for the AES Lithium Open loop charge algorithm).

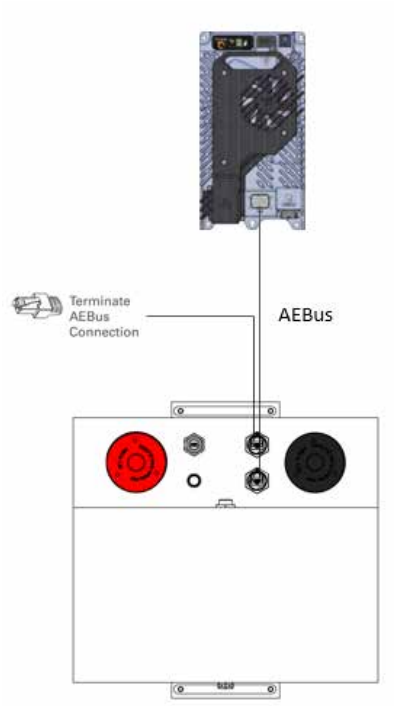
4.0 Networking AES Batteries with Delta-Q Chargers

AES batteries are networked together by linking the AE bus ports using CAT 5 cable. Networking of all AES batteries with the Delta-Q charger is required for closed loop communication. The AE bus network must be terminated at both ends. The Delta-Q charger is positioned at one end of the AE bus and provides termination of one end of the network. Use one of the AES terminator plugs supplied with the AES battery to terminate the other end of the network. Refer to the AES battery manual for detailed instructions.

▲ NOTE

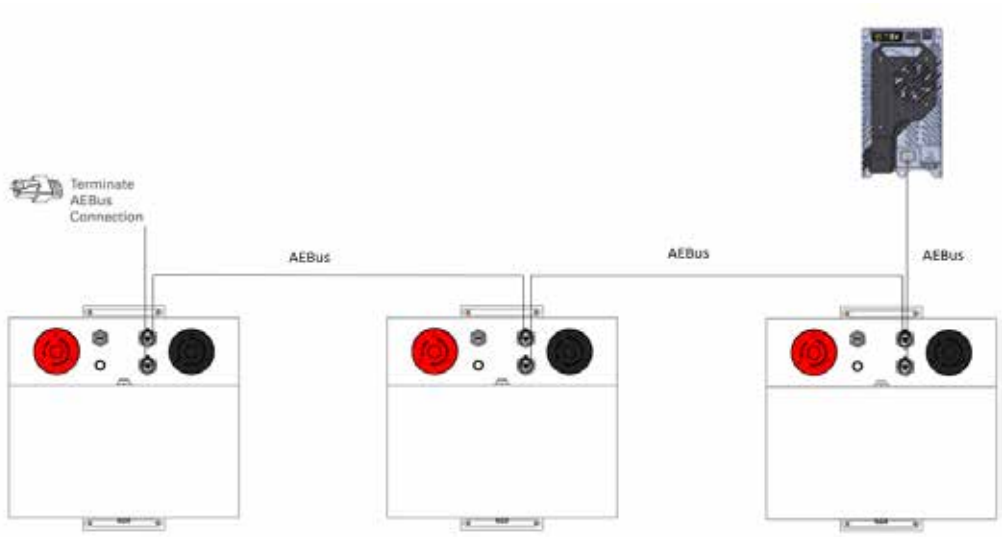
Ensure that AES Battery firmware is at least 3.8.0.0 or higher for closed loop charging with multiple chargers per battery bank.

4.1 Single AES Battery, Single Delta-Q Charger



4.2 Multiple AES Batteries, Single Delta-Q Charger

In a network with multiple batteries a master battery will be dynamically selected as the master node. The master node will control the charge configuration of attached charger.



4.3 Multiple AES Batteries, Multiple Delta-Q Chargers

In a network with multiple batteries a master battery will be dynamically selected as the master node. The master node will control the charge configuration of the attached chargers.