



# ADVANCED ENERGY

Lithium Ion Battery

## APPLICATION NOTE

### CLOSED LOOP INTEGRATION WITH XANBUS ENABLED SCHNEIDER ELECTRIC CONEXT PRODUCTS

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## 1. SAFETY

### 1.1 Warnings, Cautions and Notes

▲ WARNING
Death or Injury

▲ CAUTION
Equipment Damage

▲ NOTE
Additional Information

### 1.2 General Warnings

▲ WARNING
<p>HAZARD OF ELECTRICAL SHOCK AND FIRE</p> <ul style="list-style-type: none"><li>• Connect XANbus and AES network to only Safety Extra Low Voltage (SELV) circuits and power sources.</li><li>• All wiring must be completed by qualified personnel to ensure compliance with applicable installation codes and regulations.</li></ul> <p>Failure to follow these instructions can result in death or serious injury.</p>

▲ CAUTION
<p>HAZARD OF EQUIPMENT DAMAGE</p> <ul style="list-style-type: none"><li>• Do not install components outdoors.</li><li>• Do not connect any port of the XANbus or AES network to a network with power over Ethernet (POE) or to a public telecommunication network.</li><li>• Do not run CAT5 cables or other cables connected to XANbus or the AES network through conduit that could be exposed to lightning strikes.</li></ul> <p>Failure to follow these instructions can damage equipment.</p>

## 2. Documentation

There are notable performance and configuration differences when comparing your AES battery installation with that of a conventional lead battery installation.

This Application Note provides information about the integration of Discover AES LiFePO<sub>4</sub> batteries with Xanbus enabled Schneider Electric Conext components.

AES LiFePO<sub>4</sub> batteries with XANbus plug and play communications automatically configure the charge and discharge settings of the Schneider Electric Conext brand of inverters and charge controllers. When AES LiFePO<sub>4</sub> batteries are connected to the Conext system they will automatically configure critical battery related settings and in most cases user configuration is not required.

The AES LiFePO<sub>4</sub> battery BMS provides more accurate battery status readings than the inverter/charger. The AES LiFePO<sub>4</sub> battery will dynamically control the charge characteristics of the inverter/charger and charge controllers by using its internal voltage, current, and temperature measurements. This will reduced charging time and provide for intelligent battery balancing.

### Schneider Electric Documents:

- Schneider Electric 975-0239-01-01 Conext XW+ Installation Guide
- Schneider Electric 975-0800-01-02 Conext XW Pro NA Installation Guide
- Schneider Electric 975-0639-01-01 Conext SW Installation Guide

### Discover Reference Documents:

- Discover Energy 808-0004 42-48-6650 Data Sheet
- Discover Energy 808-0005 44-24-2800 Data Sheet
- Discover Energy 805-0015 AES LiFePO<sub>4</sub> Battery 44-24-2800 42-48-6650 Manual

Visit [discoverbattery.com](https://discoverbattery.com) 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 for any consequences arising out of the use of this material.

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

**Read Schneider manuals for guidance on product features, functions, parameters and how to use the product safely.**

### 3. Overview

#### 3.1 System Overview

XANbus communication unlocks the full potential of a Discover AES LiFePO<sub>4</sub> Battery by enabling the internal Battery Management System (BMS) to optimize the charge and discharge configuration of Schneider Electric's XANbus enable inverter chargers and solar charge controllers in a closed loop configuration.

AES LiFePO<sub>4</sub> batteries must be set up to work with Power Conversion and Monitoring devices in either an Open Loop or Closed Loop configuration. AES LiFePO<sub>4</sub> battery charge and discharge settings in a Open Loop configuration are set up manually through the controller for the Power Conversion device at the time of installation. This is commonly referred to as a 'lead acid drop-in replacement' configuration. In a Closed Loop configuration the Schneider battery charge and discharge rates and settings are dynamically controlled by the BMS of the AES LiFePO<sub>4</sub> Battery over XANbus with the power conversion devices in the network.

#### 3.2 Minimum Battery Capacity

Battery charge and discharge rates are managed automatically by the AES LiFePO<sub>4</sub> Battery over XANbus. Using very large solar arrays with battery banks that are too small can exceed the operating limits of the battery to charge and possibly lead to the BMS triggering over-current protection. Battery capacity must be sized to accept the maximum charge current of the system, or the charging devices must be manually set to curtailed the charge below the operating limit of the installed batteries. This value is derived by adding together the charge capacities of all inverter/chargers and solar charge controllers in the system. Additionally, both the discharge current of the battery and battery peak capacity values must be sized to support the load attached to the inverter. Match the sum of all inverter peak power values with the sum of all battery peak current values. Match the sum of all inverter discharge current values with the sum of all battery discharge current values.

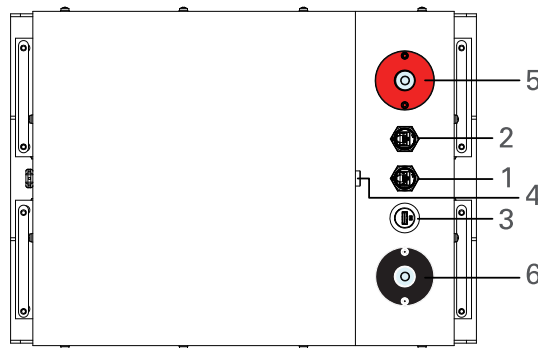
Model	Inverter Peak Amp DC 48V (90% Efficiency)	Discharge Current Amp DC	Max Charge Current Amp DC	Single Phase Minimum 42-48-6650	Three Phase Minimum 42-48-6650
XW+ 8548	278 (1 min)	180	140	2	5
XW+ 7048	220 (1 min)	150	110	2	4
XW Pro 6848	278 (1 min)	180	140	2	5
XW+ 6848	278 (1 min)	180	140	2	5
XW+ 5548	220 (1 min)	150	110	2	4
SW 4048 120 / 240	162 (5 sec)	88	45	1	n/a
SW 4048 230	162 (5 sec)	88	45	1	n/a

Model	Inverter Peak Amp DC 24V (90% Efficiency)	Discharge Current Amp DC	Max Charge Current Amp DC	Single Phase Minimum 44-24-2800
SW 2524 120 / 240	231 (5 sec)	138	65	2
SW 4024 120 / 240	324 (5 sec)	157	90	2
SW 2524 230	231 (5 sec)	138	65	2
SW 4024 230	324 (5 sec)	157	90	2

## 4. XANbus Network

### 4.1 XANbus Connections

ITEM	DESCRIPTION
1	COM1 AEbus - Interface to connect to AEbus enabled devices
2	COM2 XANbus - Interface to connect to XANbus enabled devices
3	USB - interface for PC connectivity (AES Dashboard)
4	On-Off - When battery is enabled blue power light will be illuminated
5	Battery Positive (+) (red) - DC terminal connects to the positive DC bus
6	Battery Negative (-) (black) - DC terminal connects to the negative DC bus



XANbus enabled devices communicate with each other over the XANbus network to share settings, activity and other updates. It is a requirement for one battery from the AES network to be connected to the XANbus network. No more than one battery may be connect to the XANbus network. The AES network of batteries will communicate as 'one battery' providing battery bank settings, activity and real time status to the other devices on the XANbus network. No more than one AES network of batteries may be connected to XANbus.

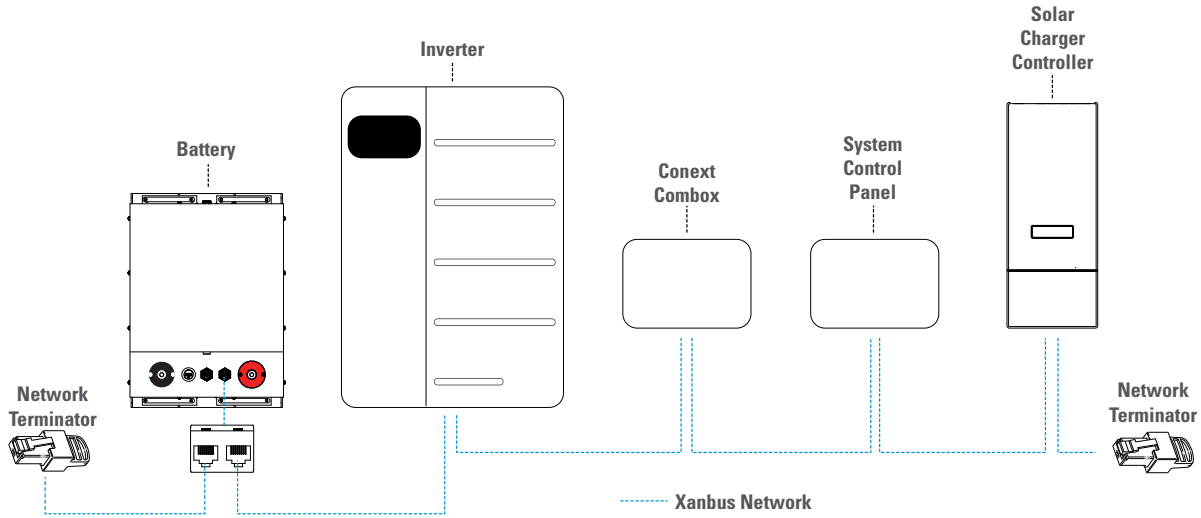
#### ▲ NOTE!

Connect the battery to one end of the XANbus network.

#### ▲ CAUTION

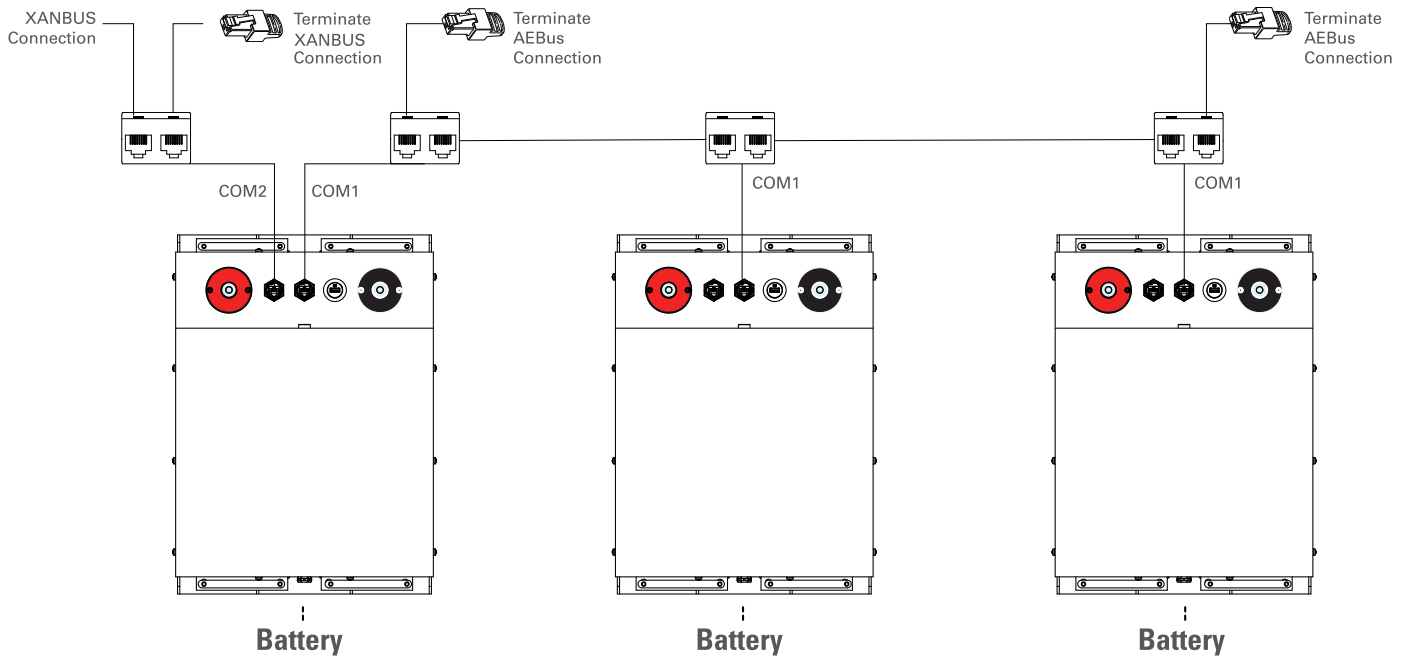
Only one AES battery is required to be connected to the XANbus network. Failure to do so could result in impaired system performance.

Network Terminators are required for proper functioning of the XANbus network.



## 4.2 AEBus Network

The AEBus is utilized by all networked AES batteries to coordinate all voltage, temperature, and current data. Network Terminators are required for proper functioning of the AES network.



## 4.3 Verification of Network Connections

### 4.3.1 Verification of XANbus Network Connections

To verify that all batteries are communicating over XANbus, please review the following steps.

All networked Discover AES LiFePO<sub>4</sub> batteries will appear as a single battery, BattMon 00, in the Select Device screen of the Conext System Control Panel (SCP). To view this screen, follow the steps below:

- **SCP** (System Status screen) → Enter button → (Select Device screen)
- Once in this screen navigate with the ▲ and ▼ buttons to locate the BattMon 00 device. If the BattMon 00 is listed, the Discover AES battery connection was successful.
- If connection is unsuccessful, check that network is correctly terminated and for any damage to the network cabling, terminators and connectors. Confirm all batteries have the same firmware revision. Rectify any problems and verify again.

### 4.3.2 Verification of AEBus Network Connections

To verify that all batteries are communicating over AEBus follow the steps below:

- **SCP** (System Status Screen) → Enter Button → (Select Device Screen) → ▲ and ▼ buttons to select (BattMon 00) → press Enter/▲/▼ buttons at the same time to enable access to → (Advanced Settings Menu)

If the connection was successful, the listed Capacity should be as follows:

Product	44-24-2800	42-48-6650
Capacity	110 Ah x number of batteries	130 Ah x number of batteries

If the connection is unsuccessful, check that network is correctly terminated and for any damage to the network cabling, terminators and connectors. Confirm all batteries have the same firmware revision. Rectify any problems and verify again.

## 5.0 Configuration Settings

### 5.1 Fixed Settings

The settings in the table below are automatically set by AES batteries when they are connected via XANbus. These settings will automatically be overridden and reset by the AES battery if inadvertently adjusted by the user.

Settings	Nominal System Voltage	
	24 V	48 V
Batt Type	Custom	
High Batt Cut Out	29.2 V	58.4 V
Low Batt Cut Out Hyst	1.8 V	3.5 V
High Batt Cut Out Hyst	1.2 V	2.4 V
High Batt Warning	28.8 V	57.6 V
Low Batt Warning	24.8 V	49.6 V
Low Batt Warning Hyst	1.0 V	1.9 V
High Batt Warning Hyst	0.8 V	1.6 V
Float Voltage	26.8 V	53.6 V
Battery Capacity	Determined by number of AES batteries on the AEBus network. e.g. 2x 42-48-6650 = 260Ah	

## 5.2 Dynamically Controlled Settings

These settings are dynamically Configured by AES Batteries Through XANbus Network.

Settings	Nominal System Voltage	
	24 V	48 V
Bulk Voltage	Max is 28.4 V to charge and balance efficiently without causing over voltage fault	Max is 56.8 V to charge and balance efficiently without causing over voltage fault
Absorption Voltage		
Low Batt Cut Out (LBCO)	Min is 21.6V to allow for maximum discharge without causing under voltage fault	Min is 43.2 V to allow for maximum discharge without causing under voltage fault

**▲ NOTE!**

Fixed settings and dynamically controlled settings are configured by the AES battery. No user configuration is necessary. These settings are automatically overridden and reset by the AES battery if adjusted by the user.

## 5.3 Recommended User-Adjustable Battery Related Settings

Recommended User-Adjustable Settings for XW+ Inverter/Charger.

Settings	Description	Nominal System Voltage (48V)
Grid Supp Volts (GSV)	Setting GSV below 51.5V will likely cause under voltage protection before LBCO setting.	53.6V
Max Sell Amps	Adjust to match PV array size. PV array rated Watts (STC) / Local AC Voltage. (240 V split phase 60Hz, 120 V single phase 60 Hz, or 230 V 50 Hz)	
ReCharge Volts	Setting ReCharge Volts higher allows for more back-up capacity. Setting lower helps maximize self consumption.	52.8 V
Max Chg Rate	Limited to maximum battery bank current ( $\leq 1C$ ). <sup>1</sup>	Number of installed batteries x 130A
Charge Cycle	2-Stage.	

Recommended User-Adjustable Settings for the SW Inverter/Charger.

Settings	Description	Nominal System Voltage	
		24V	48V
AC Supp on SoC	Enables the SOC monitoring for AC support mode.	Enabled	Enabled
AC Supp Start SoC	Sets high SOC value required for AC support to engage.	80%	80%
AC Supp Stop SoC	Sets low SoC value for AC support to disengage.	20%	20%
ReCharge Volts	Setting ReCharge Volts Higher allows for more back-up capacity. Setting lower helps maximize self consumption.	26.4 V	52.8 V
Max Chg Rate	Limited to maximum battery bank current ( $\leq 1C$ ). <sup>1</sup>	Number of installed batteries x 110A	Number of installed batteries x 130A
Charge Cycle	2-Stage.		

<sup>1</sup> The max charge rate of each inverter charger should be set to the allowable battery bank current, divided by the total number of inverter chargers in parallel.

**▲ NOTE!**

User-Adjustable settings are configured by the user.



Recommended User-Adjustable Settings for Solar Charge Controllers.

Settings	Description	Nominal System Voltage	
		24 V	48 V
Max Chg Rate	Limited to maximum battery bank current ( $\leq 1C$ ). <sup>1</sup>	Number of installed batteries x 130A	Number of installed batteries x 130A
Charge Cycle	3-Stage		
Recharge Volts	For grid support, set higher to force charge controller to remain in bulk charge mode.	27 V	54 V

<sup>1</sup>The max charge rate of each inverter charger should be set to the allowable battery bank current, divided by the total number of inverter chargers in parallel.

Recommended User-Adjustable Settings for Automatic Generator Start (AGS).

AGS Triggers	Nominal System Voltage	
	24 V	48 V
Start DCV 30 sec	25 V (LBCO +1V)	49 V (LBCO +1 V)
Stop Absorb	Disabled	Disabled
Start SoC	> 10%	> 10%
Stop SoC	< 95%	< 95%

ReCharge Voltage Setting Guidance

Remaining Capacity	Nominal System Voltage	
	24 V	48 V
10-15% <sup>2</sup>	24.5 V	49 V
15-20%	25 V	50 V
20-30%	25.8 V	51.5 V
40-50%	26 V	52 V
80-90%	26.3 V	52.5 V
90-100%	27 V	54 V

<sup>2</sup>Not recommended. Inverter may display Low Battery Warning.

