APPLICATION NOTE:

CLOSED LOOP INTEGRATION WITH XANBUS ENABLED SCHNEIDER ELECTRIC CONEXT PRODUCTS

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OVERVIEW

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 Xanbus enabled AES batteries with Xanbus enabled Schneider Electric Conext components.

Plug and play communications automatically configure the charge and discharge settings of the Inverters and charge controllers. When AES 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 battery provides more accurate battery status readings than the inverter/charger. The AES battery will dynamically control the charge characteristics by using its internal voltage, current, and temperature measurements. This will reduced charging time and provide for intelligent battery balancing.

Supported Schneider Electric documents:

- Schneider Electric 975-0239-01-01 Conext XW+ 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 810-0016 42-48-6650 Charge Algorithm
- Discover Energy 810-0017 44-24-2800 Charge Algorithm
- Discover Energy 805-0001 GEN 2 Product Manual

Visit 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.
1. SAFETY

1.1 Warnings, Cautions, Notes and Symbols

▲ WARNING
Important information regarding possible personal injury.

▲ CAUTION
Important information regarding possible equipment damage.

▲ NOTE
Additional information concerning important procedures and features of the battery.

1.2 General Warning

▲ CAUTION
It is important to operate the device with care to avoid undesirable consequences.

☒ Do not throw in the garbage. Do not dispose in fire.
☒ Use personal protective equipment when working with batteries.
☒ Additional information concerning important procedures and features of the battery. Read all the instructions before installation, operation and maintenance.
☒ This product must be recycled and is made of recycled products.

▲ CAUTION
Do not disassemble or modify the battery. If the battery housing is damaged, do not touch exposed contents.

1.3 Fire Risk

▲ WARNING
Risk of fire - No user serviceable parts.

- Battery has a Battery Management System (BMS) with integrated solid state relay to reduce fire risk.
- Primary suppression for lithium battery fires is water. Secondary suppression is CO2, powder and halon.

1.4 Electric Shock Risk

▲ WARNING
For wet and electrically uninsulated working conditions, electric shock risk is high, and can cause injury and death.

1.5 Chemical Risk

▲ WARNING
Lithium batteries are a chemical risk if misoperated, mishandled or abused.
1.6 Do’s
- Do protect terminals from short circuit before, during, and after installation
- Do wear electrically insulated gloves
- Do use electrically insulated tools
- Do wear eye protection
- Do wear safety toe boots / shoes
- Do handle battery carefully
- Do secure battery safely
- Do always assume battery terminals are energized

1.7 Do Not’s
- Do not immerse battery in water
- Do not lift or carry the battery during usage or operation
- Do not operate or store battery outside of operating limits
- Do not short circuit battery
- Do not puncture battery
- Do not expose battery to flames, or incinerate
- Do not open battery case or disassemble battery
- Do not wear rings, watches, bracelets or necklaces when handling or working near battery
- Do not drop or crush battery
- Do not lift battery by the terminal cables
- Do not vibrate battery
- Do not expose battery to water or other fluids
- Do not expose battery to direct sunlight
- Do not dispose of battery
- Do not connect with other types of batteries
- Do not expose battery to high temperatures
- Do not install with other battery types or brands

1.8 DC Motor Connection
Without proper safety protection, direct connection to DC motors, motor controllers and external motor voltage clamping systems (such as high power anti-parallel diodes or braking resistor systems) may result in damage to the internal pack protection system which may result in unsafe situations. Please consult Discover technical support before directly connecting any motor loads.

1.9 Transportation
If the battery is not installed in equipment, it must be transported in the original package or equivalent.

Batteries are tested according to UN Handbook of Tests and Criteria, part III, sub section 38.3 (ST/SG/AC. 10/11/Rev.5). For transport the batteries belong to category UN3480, Class 9, Packaging Group II.

2. MAXIMUM OPERATING LIMITS

2.1 Maximum Battery Operating Limits
The battery should not be operated outside these operating limits. The BMS will open its internal relay and disconnect the battery if any of these limits are exceeded.

<table>
<thead>
<tr>
<th>Maximum Operating Limits</th>
<th>44-24-2800</th>
<th>42-48-6650</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous Charge Current*</td>
<td>110 Adc</td>
<td>130 Adc</td>
</tr>
<tr>
<td>Continuous Discharge Current*</td>
<td>110 Adc</td>
<td>130 Adc</td>
</tr>
<tr>
<td>Charge Voltage</td>
<td>27.2 V</td>
<td>54.4 V</td>
</tr>
<tr>
<td>Operating Voltage (Min / Max)</td>
<td>22.4 V / 29.2 V</td>
<td>44.8 V / 58.4 V</td>
</tr>
<tr>
<td>Charge Temperature (Min / Max)</td>
<td>0°C / 45°C (32°F / 113°F)</td>
<td></td>
</tr>
<tr>
<td>Discharge Temperature (Min / Max)</td>
<td>-20°C / 50°C (-4°F / 122°F)</td>
<td></td>
</tr>
<tr>
<td>Storage Temperature (Min / Max)</td>
<td>-20°C / 45°C (-4°F / 113°F)</td>
<td></td>
</tr>
</tbody>
</table>

* Effects of AC Ripple must be taken into consideration when sizing and configuring your system.
### 2.2 Recommended Battery Operating Settings

Although the battery is capable of performing at higher operating limits, the following settings are recommended to maximize battery health and account for unforeseen external conditions.

<table>
<thead>
<tr>
<th>Recommended Operating Settings</th>
<th>44-24-2800</th>
<th>42-48-6650</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Continuous Charge Current</td>
<td>〈78 A</td>
<td>〈92 A</td>
</tr>
<tr>
<td>Max Continuous Discharge Current</td>
<td>〈78 A</td>
<td>〈92 A</td>
</tr>
<tr>
<td>Charge Voltage (Bulk/Absorb)</td>
<td>27.2 V</td>
<td>54.4 V</td>
</tr>
<tr>
<td>Low Voltage Disconnect</td>
<td>24 V</td>
<td>48 V</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>20°C (68°F)</td>
<td>20°C (68°F)</td>
</tr>
</tbody>
</table>

### 3. INSTALLATION

**WARNING!**

Read Safety Section before installing the battery.

**CAUTION!**

Do not install batteries in series. Select the appropriate AES battery model for the voltage of your system.

### 3.1 Battery DC and Communication Connections

![Discover AES terminal deck](discoverbattery.com)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>COM1 AEBus interface to connect to AES enabled devices</td>
</tr>
<tr>
<td>2</td>
<td>COM2 Xanbus</td>
</tr>
<tr>
<td>3</td>
<td>USB interface for PC connectivity</td>
</tr>
<tr>
<td>4</td>
<td>On-Off when battery is enabled blue power light will be illuminated</td>
</tr>
<tr>
<td>5</td>
<td>Battery Positive (+) (red) DC terminal connects to the positive bus bar of the DC Switchgear</td>
</tr>
<tr>
<td>6</td>
<td>Battery Negative (-) (black) DC terminal connects to the negative bus bar of the DC Switchgear</td>
</tr>
</tbody>
</table>

Figure 1. Discover AES terminal deck.
3.2 Installation

- Check that battery is switched off
- If the battery circuit has a disconnect, open the disconnect to isolate battery
- Clean cable connections. Broken, frayed, brittle, kinked or cut cables should be replaced
- Install and secure battery. Be careful not to ground the terminals to any metal mounting, fixture, or body part
- Connect battery cables. Connect ground cable last to avoid sparks
- Recommended terminal torque is 9.0 Nm (6.64 ft-lb)
- Close circuit disconnect (if open)
- Turn battery switch on

![Terminal stack](image1)

![Proper hardware selection](image2)

▲ NOTE!

All cable ends must be connected to battery terminals without any washers between terminal bushings and cable ends.

Terminal burnout is caused by:

- Discharge currents exceeding allowable limits
- Improper cable installation
- Improper cable sizing
- Improper terminal torque

▲ NOTE!

Without exception, product experiencing terminal burn out will not be warranted.

3.3 Battery Location

Locate the batteries close to the inverter in order to minimize the length of the battery cables. However, care should be taken to ensure adequate clearance above the batteries is maintained for access to both battery and inverter connections and disconnects.

Battery performance and service life will be optimized when operating in an ambient temperature of 15°C to 25°C (59°F to 77°F). Care should be taken to ensure that the battery's temperature is > 0°C (32°F) during charging.
3.4 Battery Connection and Parallel Wiring

To ensure proper balancing and load sharing between parallel batteries refer to the wiring diagram below. Actual wiring requirements may vary. Consult with your local authority having jurisdiction.

4. NETWORKING

4.1 Xanbus Network

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.
Network Terminators are required for proper functioning of the Xanbus network. Care should be taken to ensure they are installed.

▲ CAUTION

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

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. Care should be taken to ensure they are installed.

Figure 4. Xanbus Network

Figure 5. The AESbus Network connected to Xanbus Network
4.3 Verify Network Connections

4.3.1 Verify Network Connections
To verify that all batteries are communicating over Xanbus, please review the following steps.

All networked Discover AES Lithium 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 Verify AEBus Connection
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:

<table>
<thead>
<tr>
<th>Product</th>
<th>44-24-2800</th>
<th>42-48-6650</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>110 Ah x number of batteries</td>
<td>130 Ah x number of batteries</td>
</tr>
</tbody>
</table>

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 reset by the AES battery if inadvertently adjusted by the user.

<table>
<thead>
<tr>
<th>Settings</th>
<th>Nominal System Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24V</td>
</tr>
<tr>
<td>Batt Type</td>
<td>Custom</td>
</tr>
<tr>
<td>High Batt Cut Out</td>
<td>29.2V</td>
</tr>
<tr>
<td>Low Batt Cut Out Hyst</td>
<td>1.8V</td>
</tr>
<tr>
<td>High Batt Cut Out Hyst</td>
<td>1.2V</td>
</tr>
<tr>
<td>High Batt Warning</td>
<td>28.8V</td>
</tr>
<tr>
<td>Low Batt Warning</td>
<td>24.8V</td>
</tr>
<tr>
<td>Low Batt Warning Hyst</td>
<td>1V</td>
</tr>
<tr>
<td>High Batt Warning Hyst</td>
<td>0.8V</td>
</tr>
<tr>
<td>Float Voltage</td>
<td>26.8V</td>
</tr>
<tr>
<td>Battery Capacity</td>
<td>Determined by number of AES batteries on the AEBus network. Eg. 2x 42-48-6650 = 260Ah</td>
</tr>
</tbody>
</table>
5.2 Dynamically Controlled Settings
These settings are dynamically Configured by AES Batteries Through Xanbus Network.

<table>
<thead>
<tr>
<th>Settings</th>
<th>Nominal System Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk Voltage</td>
<td>Max 28.4V to charge and balance efficiently without causing over voltage fault</td>
</tr>
<tr>
<td>Absorption Voltage</td>
<td>Max 56.8V to charge and balance efficiently without causing over voltage fault</td>
</tr>
<tr>
<td>Low Batt Cut Out (LBCO)</td>
<td>24 V</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Settings</th>
<th>Description</th>
<th>Nominal System Voltage (48V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid Supp Volts (GSV)</td>
<td>Setting GSV below 51.5V will likely cause under voltage protection before LBCO setting, Set above Conext MPPT Solar Charge Controllers equalization voltage for enhanced grid support</td>
<td>64V</td>
</tr>
<tr>
<td>ReCharge Volts</td>
<td>Setting ReCharge Volts higher allows for more back-up capacity. Setting lower helps maximize self consumption. See Table 15 for further guidance</td>
<td>Min 51.5 V</td>
</tr>
<tr>
<td>Max Chg Rate</td>
<td>Limited to maximum battery bank current</td>
<td>1C</td>
</tr>
<tr>
<td>Charge Cycle</td>
<td>2-Stage</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Settings</th>
<th>Description</th>
<th>Nominal System Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Supp on SoC</td>
<td>Enables the SOC monitoring for AC support mode</td>
<td>Enabled</td>
</tr>
<tr>
<td>AC Supp Start SoC</td>
<td>Sets high SOC value required for AC support to engage</td>
<td>80%</td>
</tr>
<tr>
<td>AC Supp Stop SoC</td>
<td>Sets low SOC value for AC support to disengage</td>
<td>20%</td>
</tr>
<tr>
<td>ReCharge Volts</td>
<td>Setting ReCharge Volts Higher allows for more back-up capacity. Setting lower helps maximize self consumption</td>
<td>Min 25.8V</td>
</tr>
<tr>
<td>Max Chg Rate</td>
<td>Limited to maximum battery bank current</td>
<td>&lt; 1C</td>
</tr>
<tr>
<td>Charge Cycle</td>
<td>2-Stage</td>
<td></td>
</tr>
</tbody>
</table>

▲ NOTE!
User-Adjustable settings are configured by the user.
Recommended User-Adjustable Settings for Solar Charge Controllers.

<table>
<thead>
<tr>
<th>Settings</th>
<th>Description</th>
<th>Nominal System Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>24V</td>
</tr>
<tr>
<td>Max Chg Rate</td>
<td>Limited to maximum battery bank current</td>
<td>&lt; 1C</td>
</tr>
<tr>
<td>Charge Cycle</td>
<td>2-Stage</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>AGS Triggers</th>
<th>Nominal System Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start DCV 30 sec</td>
<td>24V 25V (LCBO +1V)</td>
</tr>
<tr>
<td>Stop Absorb</td>
<td>Disabled</td>
</tr>
<tr>
<td>Start SoC</td>
<td>&gt; 10%</td>
</tr>
<tr>
<td>Stop SoC</td>
<td>&lt; 95%</td>
</tr>
</tbody>
</table>

ReCharge Voltage Setting Guidance

<table>
<thead>
<tr>
<th>Remaining Capacity</th>
<th>Nominal System Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-15%*</td>
<td>24.5V* 49V*</td>
</tr>
<tr>
<td>15-20%</td>
<td>25V 50V</td>
</tr>
<tr>
<td>20-30%</td>
<td>25.8V 51.5V</td>
</tr>
<tr>
<td>40-50%</td>
<td>26V 52V</td>
</tr>
<tr>
<td>80-90%</td>
<td>26.3V 52.5V</td>
</tr>
<tr>
<td>90-100%</td>
<td>27V 54V</td>
</tr>
</tbody>
</table>

* Not recommended. Inverter may display Low Batt Warning.

Figure 6. Grid Support Load Shave Mode.