



ADVANCED ENERGY

Lithium Ion Battery

APPLICATION NOTE:

OPEN LOOP INTEGRATION WITH MIDNITE SOLAR

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OVERVIEW

There are some notable differences when configuring your Discover AES installation versus conventional lead acid batteries. This Application Note provides information about the integration of Discover AES Lithium batteries with MidNite Solar Inc. systems and related components.

MidNite reference documents:

- Classic Owner's Manual

Discover reference documents:

- Discover Energy 808-0004 42-48-6650 Data Sheet
- Discover Energy 808-0005 44-24-2800 Data Sheet
- Discover Energy 805-0001 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 Battery 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

Direct connection to DC motors without proper safety protection, 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.

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

* Effects of AC Ripple must be taken into consideration when sizing and configuring your system.

▲ NOTE!

Intentional bypassing of BMS to operate battery outside maximum and minimum limits voids warranty.

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.

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

3. Installation

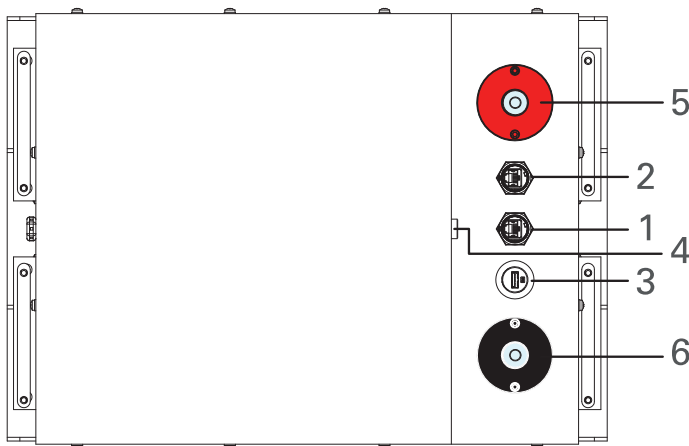
▲ WARNING!

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



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

Figure 1. Discover AES terminal deck.

3.2 Installation

- Check that battery is switched off
- If the battery circuit has a disconnect, open 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

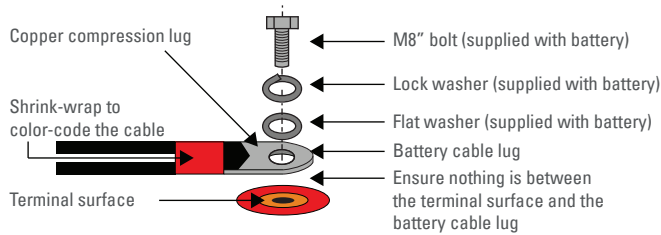


Figure 2. Terminal stack.

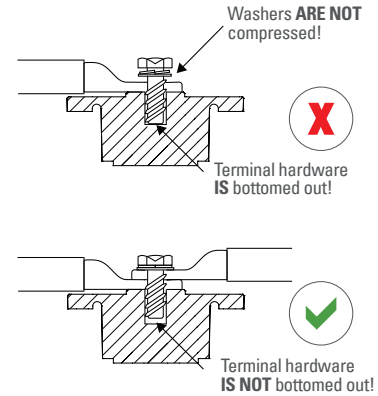


Figure 3. Proper hardware selection.

▲ 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.

The batteries performance and service life will be optimized when operating in an ambient temperature of 15°C-25°C (59°F-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.

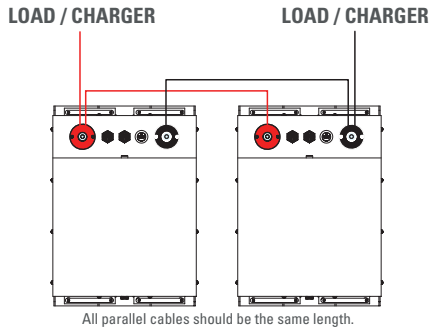


Figure 4. Two parallel batteries.

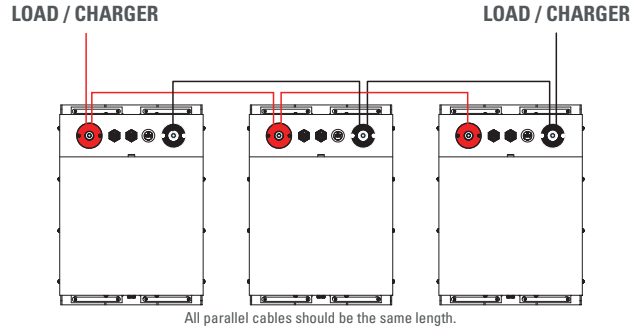


Figure 5. Three parallel batteries.

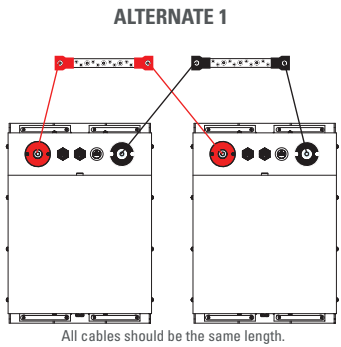


Figure 6. Two parallel batteries with DC terminal blocks.

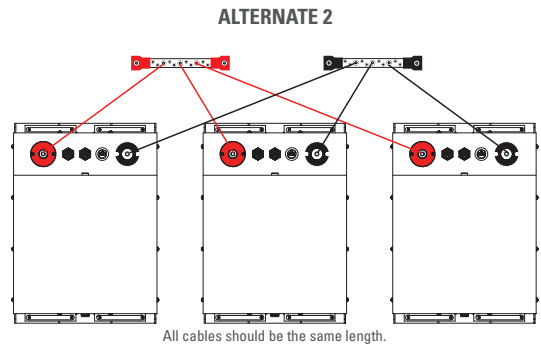


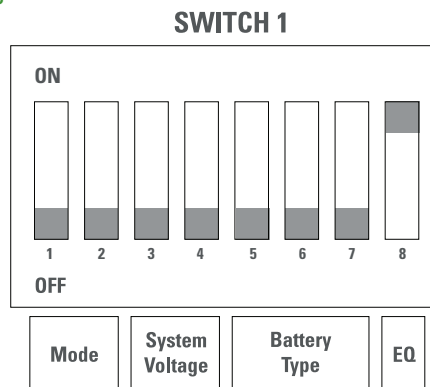
Figure 7. Three parallel batteries with DC terminal blocks.

4. Configuration Settings

▲ CAUTION!

The Battery Temperature Sensor (BTS) should not be used with Discover AES Lithium batteries as the temperature compensation functions may exceed the battery operating limits

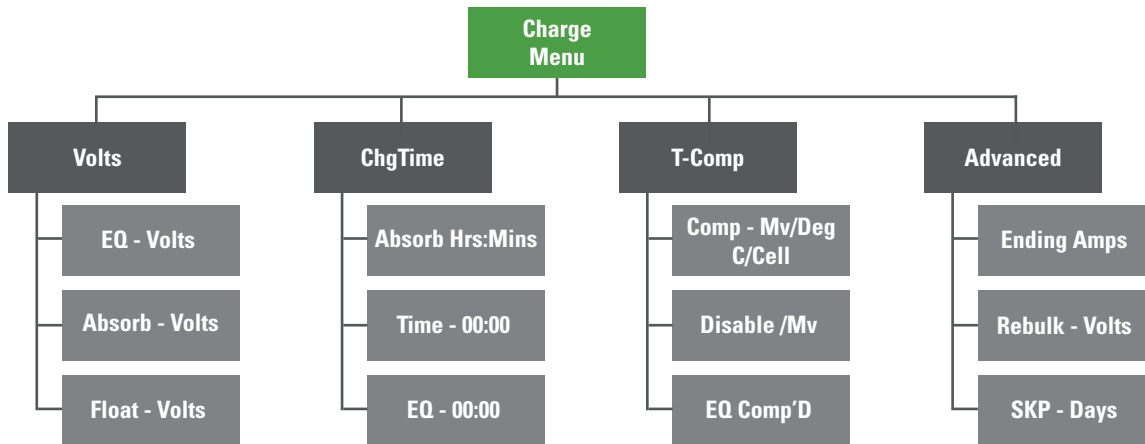
4.1 Charge Controller Dip Switch Settings



Function	Switch Number	Pin Number	44-24-2800	42-48-6650
Nominal System Voltage	Section 1	3	Off	On
		4	On	Off
5		On (Custom)		
Battery Type		6	On (Custom)	
		7	On (Custom)	
Auto Equilize		8	Off (Disable)	

4.2 MidNite Classic Menu Map

▲ NOTE!
The MidNite Classic Lite does not have a graphics display and will require either a computer tool or a MidNite Solar MNGP Graphis Panel.



4.3 Charge Controller Programming Settings

The MidNite Classic charge controller should enter the Quick Start screen on first power up. If the unit needs to be reprogrammed or this screen does not appear a factory reset may be performed by following the steps below:

- With the MidNite Classic powered off, press and hold the Left and Right Arrow buttons
- Power on the MidNite Classic and continue to hold the Left and Right Arrow buttons until the setup screen is displayed

Charge Controller	Charge Menu - Sub Menu	44-24-2800	42-48-6650
EQ - Volts	Volts	27.6 V	55.2 V
Absorb - Volts	Volts	27.6 V	55.2 V
Float - Volts	Volts	26.8 V	53.6 V
Absorb Hrs:Mns	ChgTime	00:01	
EQ - 00:00	ChgTime	0 (Disabled)	
Comp - Mv/Deg C/Cell	T-Comp	0 mV	
EQ Comp'D	T-Comp	No	
Equalization Menu	EQ	0 (Disabled)	
Ending Amps	Advanced	0.1 A	
Rebulk - Volts	Advanced	25.2 V	50.4 V