DISCOVER
ENERGY SYSTEMS

AES 210HV INSTALLATION AND COMMISSIONING MANUAL

BATTERY MODEL

AES 210HV

805-0092 REV A

GUIDE FOR UL9540-COMPLIANT INSTALLATIONS

AES 210HV	Description
Unit Model Number	SLL02C2-D1P52S1R8-A01
Maximum capacity per unit	212 kWh
Maximum number of battery packs per unit	4
Minimum separation from other ESS (sides)	No minimum
Minimum separation from other ESS (front to back)	900 mm (35.43 in)
Minimum separation from other ESS (back to back)	500 mm (19.68 in)
Minimum separation from other ESS (front to front)	2700 mm (106.3 in)
Minimum separation from constructions and other structures	900 mm (35.43 in) from non-combustible constructions only
UL9540A Testing organization, report, date	CCIC-CSA International Certification Co., Kunshan Branch Report #: TBD Date:
Additional fire suppression required	No
Additional explosion protection required	No
Suitable for habitable spaces of dwellings?	No
Suitable locations	Non-residential: Indoor floor-mounted or outdoor ground-mounted
Limited access requirements	N/A
Emergency Service Contact Information	Infotrac: 1-800-535-5053 (Account # 115375)

Introduction

The AES 210HV is a four-pack battery cabinet with a nominal output of 665 Vdc. It is a liquid-cooled, outdoor energy storage system designed for seamless integration with C&I inverters. Key features include a multi-level BMS, advanced Thermal Management System (TMS), rugged enclosure, fire detection and suppression, explosion control, and thermal runaway mitigation.

Paralleling C&I hybrid inverters with AES 210HV energy storage cabinets expands power and energy capacity for both grid-connected and off-grid applications. The AES 210HV is optimized for seamless integration with high-voltage hybrid battery inverters.

1. AUDIENCE, MESSAGES, WARNINGS, GENERAL SAFETY, PERSONAL PROTECTIVE EQUIPMENT

1.1 Audience

Configuration, installation, service, and operating tasks should only be performed by qualified personnel in consultation with local authorities having jurisdiction and authorized dealers. Qualified personnel should have training, knowledge, and experience in:

- Installing energy storage systems and associated electrical equipment
- Applying relevant electrical codes and standards for energy storage installations
- Identifying, analyzing, and mitigating electrical hazards, including electric shock and plasma arc flash risks
- Installing, configuring, and commissioning high-voltage battery systems
- Integrating energy storage with C&I hybrid inverters and site power infrastructure
- Working with systems activated by relays and automated controls

Personnel performing these tasks are solely responsible for adhering to all safety regulations, procedures, and manufacturer instructions outlined in this manual. Proper training and compliance with industry best practices are essential to ensuring safe and effective installation.

1.2 Warning, Caution, Notice, and Note Messages

Messages in this manual are formatted according to this structure.

Additional information concerning important procedures and features of the product. Read all the instructions before installation, operation, and maintenance.

Important information regarding hazardous conditions.

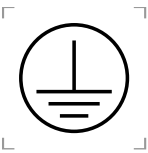
⚠ WARNING
Important information regarding hazardous conditions that may result in personal injury or death.

⚠ CAUTION
Important information regarding hazardous conditions that may result in personal injury.

NOTICE
Important information regarding conditions that may damage the equipment but not result in personal injury.

NOTE
Ad hoc information concerning important procedures and features unrelated to personal injury or equipment damage.

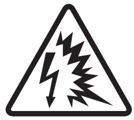
1.3 Symbols

Symbol	Description	Symbol	Description
	Earth Ground		Electrical Hazard
	Explosion Hazard		Warning
	Fire Hazard		Refer to the manual

1.4 General Warnings

Do not crush, disassemble or dispose of the battery in fire or the garbage.

This product is made of recyclable materials and must be recycled.



⚠ DANGER

Arc Flash and shock hazard if cover removed.

To be serviced by Qualified Personnel only.

⚠ WARNING

ELECTRIC SHOCK AND FIRE HAZARD

- This equipment must only be installed as specified.
- Do not install the battery cabinets in series.
- Do not disassemble or modify the components.
- Do not lay tools or other metal parts across the terminals.
- If there is damage to the battery pack case, do not touch exposed contents.

Failure to follow these instructions may result in death or serious injury.

⚠ WARNING

CHEMICAL HAZARD

Do not touch the exposed contents of a Lithium cell.

Failure to follow these instructions may result in death or serious injury.

⚠ WARNING

ELECTRIC SHOCK HAZARD - UNAUTHORIZED ACCESS

- Access to internal systems of this product is restricted to qualified personnel only.
- The main door locks must not be tampered with or bypassed.
- Keys should be securely stored in a lock box and kept out of reach of untrained individuals.

Failure to follow these instructions may result in death or serious injury.

⚠ WARNING

ELECTRIC SHOCK AND FIRE HAZARD

- The AES 210HV energy storage solution is compatible exclusively with approved inverters. Detailed integration guides are available for supported PCS devices.
- Using this product with incompatible inverters may pose safety risks and result in hazardous conditions.

Failure to follow these instructions may result in death or serious injury.

⚠ CAUTION

ELECTRIC SHOCK HAZARD

- Do not touch the energized surfaces of any electrical component in the battery cabinet.
- Before servicing the battery cabinet, follow all procedures to fully de-energize the system.
- Follow the Safe Handling Procedures below when working with the battery cabinet.

Failure to follow these instructions may result in injury.

1.5 Safe Handling Procedures

Before using the battery, thoroughly read all instructions, safety warnings, and cautionary markings on the unit, as well as all relevant sections of this manual.

- **Preparation Before Use**
  - Read all instructions and cautionary markings.
  - Ensure the battery is used with compatible systems.
- **Personal Protective Equipment (PPE)**
  - Always wear insulated gloves, safety goggles, hearing protection, and appropriately-rated protective clothing.
  - Remove metal jewelry (rings, watches) to avoid short circuits.
- **Lifting & Handling**
  - Use proper lifting techniques or mechanical aids (forklifts/cranes).
  - Transport the cabinet upright.
  - Do not lift when in use.
- **Electrical Connections**
  - Use insulated tools. Do not allow the metal part of any objects near the battery terminals.
  - Assume all terminals are electrically live.
  - Prevent short-circuits by keeping terminals free of conductive materials.
- **Environmental Exposure**
  - Avoid exposure to moisture and temperatures outside of ratings.
  - Do not submerge in water.
  - Do not store in direct sunlight.
- **Damage Response**
  - If damaged (heat, water, impact), stop use and consult a service center.
- **Battery Disposal**
  - Recycle batteries according to local regulations.
  - Do not dispose of the battery packs, components, or cabinet in a fire.
- **Physical Integrity**
  - Do not disassemble, open, crush, bend, deform, puncture, or shred the battery packs.
  - Do not attempt to modify, re-manufacture, or insert foreign objects into the battery pack.
  - Do not pressure wash or shoot water through the battery cabinet vents.
  - Do not immerse or expose the battery pack to water, liquids, fire, explosion risks, or other hazards.
  - If the battery cabinet is damaged (such as due to water exposure, overheating, or physical damage), immediately contact a service center for inspection.

- **Compatibility**
  - Use the battery cabinet only with a compatible Power Conversion System (PCS) as specified in the integration guides. Discover Energy Systems provides detailed integration guides for all approved PCS/inverter solutions, ensuring proper compatibility and performance.
    For the latest documentation, visit: Discover Energy Systems Documentation & Resources.

NOTE
Power Conversion System Compatibility - Review & Approval
If an integration guide for the desired Power Conversion System (PCS) is not available, contact Discover Energy Systems to discuss a potential review and approval process. This ensures proper compatibility, safe operation, and reliable system performance.

1.6 Emergency Procedure

In case of fire or smoke

- **Immediately initiate emergency shutdown.** Use the system's E-stop button to shutdown the battery energy storage system and isolate the battery cabinet from loads. The E-Stop button is designed to immediately isolate the battery cabinet from the inverter (PCS) by opening the high-voltage box's dual redundant contacts for both the positive and negative terminals. Once activated, the battery is completely de-energized and physically disconnected from all external conductors that leave the cabinet for total interruption of current flow.
- **Evacuate the area.** Alert nearby personnel and evacuate to a safe distance.
- **Call emergency services.** Contact the local fire department and inform them of the lithium-ion batteries' presence and location.

In case of battery electrolyte leakage

- **Evacuate and ventilate.** Move all personnel away from the affected area and ensure proper ventilation to disperse potentially hazardous fumes.
- **Avoid contact with leaked material.** Use appropriate PPE (such as gloves, goggles, respirators, and so on) to prevent chemical exposure.
- **Isolate the area.** Cordon off the area to prevent unauthorized personnel from entering.
- **Contact a certified technician.** Arrange for safe cleanup and disposal of leaked materials by a trained professional, following local regulations for hazardous waste.

In case of electric shock

- **Immediately disconnect power (if safe to do so).** Safely reach the E-stop button, trigger the system's emergency shutdown procedure, and cut off power to the affected equipment. Do not touch the victim directly if they are still in contact with a live electrical source.
- **Call emergency medical services.** Seek immediate medical attention for the individual affected.

- **Do not touch the victim with bare hands.** If the power cannot be disconnected, use a non-conductive object (such as a wooden pole) to separate the victim from the electrical source. Ensure your own safety first.

1.7 Lockout Tag-out Procedures

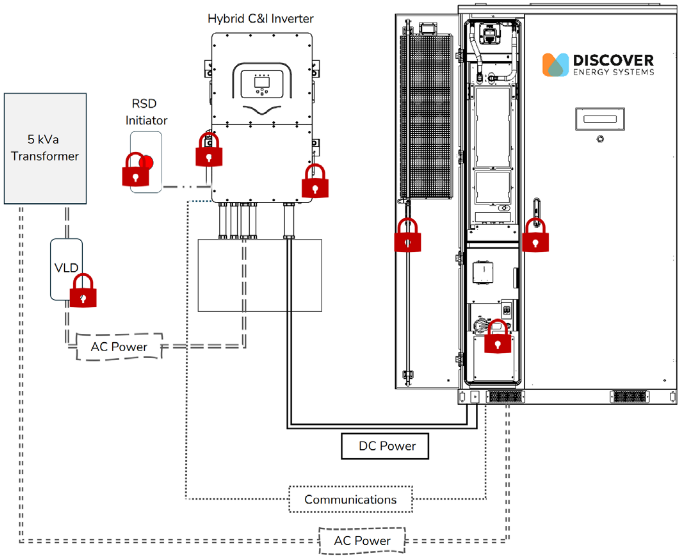


Figure 1. Designated Lockout Points and the Components Disconnected

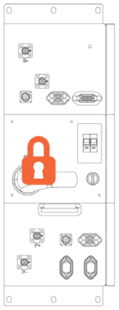


Figure 2. AES 210HV Lock Out and Tag Out

1. **Prepare for Shutdown**
   - Notify all affected personnel of the intended shutdown of the battery cabinet.
   - Identify all energy sources connected to the battery cabinet, such as electrical, DC, and AC.
2. **Shutdown Battery Cabinet**

- Turn off the battery cabinet using the standard shutdown procedure. (8.4 Normal Shutdown Procedure)

3. **Isolate Energy Sources**
   - To fully isolate the battery cabinet from all sources, disconnect or turn off all energy sources, such as AC disconnects (VLD), AC breakers, and DC disconnect switches. Remove the battery pack Manual Service Disconnect (MSD) from each battery pack to completely isolate the batteries.
4. **Apply Lockout Devices**
   - Attach lockout devices to all energy isolation points of the system. Shut and lock all cabinet doors where necessary.
   - Ensure each lock is uniquely keyed and accessible only by the person performing the lockout.
5. **Apply Tags**
   - Attach a tag at each isolation point indicating the reason for the lockout, the responsible person, and the date/time.
   - Ensure tags are durable and highly visible.
6. **Verify Isolation**
   - Use a voltmeter or other voltage sensing device to verify that terminals are no longer electrically live (AC, DC, etc)
7. **Perform Maintenance/Service**
   - Conduct the necessary maintenance or service while the battery cabinet remains locked out.
8. **Restore Power**
   - After completing all work, remove all tools and ensure the area around the battery cabinet is clear.
   - Have the person who installed the locks remove them in reverse order.
   - Restore power to the battery cabinet and notify personnel that it is back in operation.

2. ITEMS SHIPPED IN THE BOX

Upon receiving the shipment, ensure that the following items are included. If any item is missing or damaged, contact customer support immediately.

Table 2-1, AES 210HV Accessories Box Contents

Description	Quantity
AC Auxiliary Power Cable	1
Inverter DC+ Power Cable (pre-wired to DC Distributor) 1/0 AWG (50 mm^2)	1
Inverter DC- Power Cable (pre-wired to DC Distributor) 1/0 AWG (50 mm^2)	1
DC Distribution Panel with Cover (includes 8 fuses)	1
Manual Service Disconnect (MSD)	4
LYNK II Communication Cable	1
CAN Interface Dongle and Harness	1
LYNK II Communication Gateway	1
Lifting Lugs	4

3. SPECIFICATIONS

All specifications in this document are published @25°C / 77°F. Where appropriate ratings are based on C/4 Charge or Discharge rates.

3.1 Electrical Specifications

Table 3-1, AES 210HV Cabinet Electrical Specifications

Electrical Specifications	AES 210HV
Chemistry	$LiFePO_4$ (LFP)
Nominal Voltage	665.6 V
Cabinet Battery Pack Configuration	4 Packs
Nominal Energy	213 kWh
Usable Energy	209 kWh
Nominal Capacity	320 Ah
Usable Capacity	314 Ah
BMS High Voltage Shutdown	759.2 V
Charge Voltage Stop	748.8 V
Charge Voltage Limit	738.4 V
Discharge Voltage Limit	603.2 V
Discharge Voltage Stop	582.4 V
Low Voltage Disconnect	624.0 V
BMS Low Voltage Shutdown	540.8 V
Maximum Continuous Current	160 A
Maximum Current	200 A
DC Over Current Protection	315 A fuses (+ / -)
AC Input Protection	32 A 2P Breaker
Maximum short circuit fault current (IBF / ½ IBF)	9900 A (1.28 ms) / 4950 A (1.28 ms)
Arc Flash Incident Energy IEm	0.1371 Cal/cm^2
Arc Flash Protection Boundary (AFB)	165 mm (6.496 in)

Table 3-2, AES 210HV Battery Pack Electrical Specifications

Electrical Specifications	AES 210HV / SLL02C2-D1P52S1R8-A01
Pack model	PLL02C2-D1P52S-A01
Cell model	GSP71173204F, 3.2V 320Ah
Series and parallel	1P2S
Nominal capacity (STC)	320 Ah
Nominal Energy	53.25 kWh
Nominal Voltage	166.4 Vdc
Maximum Working Voltage Range	130 to 189.8 Vdc
Maximum Charge Current	173 A @ 25°C / 77°F
Maximum Disharge Current	173 A @ 25°C / 77°F
Energy Density	≥174 Wh/kg
Standard Charge/Discharge	C/2 @ STC
Rated Charge/Discharge Current	160 A
Cooling Method	Active Liquid Cooling
STC: 25°C ± 5°C (77°F ± 9°F); 0.5C; DOD 100%; 2.5V to 3.65V/cell	

3.2 Mechanical Specifications

Table 3-3, AES 210HV Mechanical Specifications

Mechanical Specifications	AES 210HV
Chemistry	$LiFePO_4$
Width (A)	1300 mm (51.2 in)
Depth (B)	1300 mm (51.2 in)
Height (C) [a]	2373.5 mm (93.4 in)
Total Weight [b]	1550 kg (3400 lb)
Battery Pack Weight (each)	350 kg (771.62 lb)
Shipping Weight (estimated)	2500 kg (5500 lb)
IP Rating	IP55
Case Material	Galvanized Steel Sheet
Color	Light Gray - RAL 7035 Anthracite Gray - RAL 7016
[a] Without lifting hooks. [b] Calculated.	

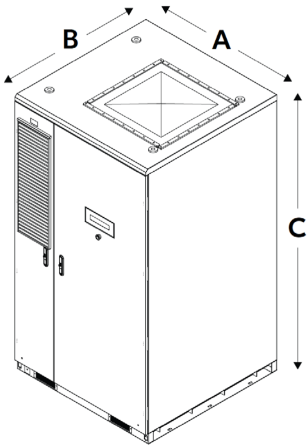


Figure 3. AES 210HV Battery Dimensions

3.3 Clearance Specifications

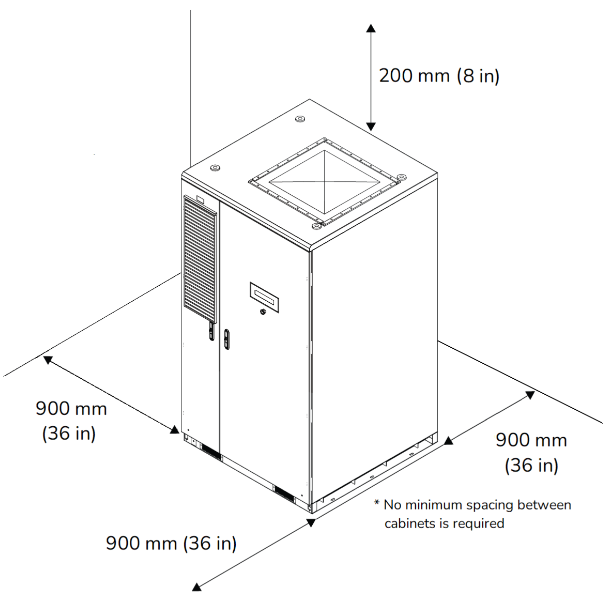


Figure 4. AES 210HV Battery Cabinet Clearance

NOTE
Clearance dimensions are published for airflow and service access only. Consult with the local Authority Having Jurisdiction for accepted spacing and separation or other requirements applicable for the area of installation.

Figure 5. No minimum spacing between battery cabinets

NOTE
The AES 210HV cabinets may be placed side by side as long as the front and back airflow and service access spacings are adhered to. Consult with the local Authority-Having-Jurisdiction for accepted spacing and separation or other requirements applicable for the area of installation.

3.4 Environmental Specifications

Table 3-4, AES 210HV Environmental Specifications

Environmental Specifications	AES 210HV
Environmental Category	Outdoor (IP55 / NEMA 3R)
Rated Altitude	An altitude of up to 2,000 m (6,561 ft). Higher elevations do not significantly affect operating characteristics.
Charge Temperature Range	-30°C to 55°C (-22°F to 131°F)
Discharge Operating Temperature Range	-30°C to 55°C (-22°F to 131°F)
Storage Temperature [a][b]	-20°C to 45°C (-4°F to 113°F)
Acoustic Noise at 1 m	≤ 75 dB
Relative Humidity	< 95% (Non-condensing humidity)

[a] Storage outside of specified temperatures will result in permanent capacity loss and void the warranty.
[a] "Storage" refers to periods without Auxiliary AC Power with an active Thermal Management System.

3.5 Protection Specifications

Table 3-5, AES 210HV Protection Specifications

Protection Specifications	AES 210HV
Cell Overvoltage	
Level 1 [a]	**≥ 3.55 V for 5 s:** Charging is derated. Discharging is allowed. Consequence: Charging is reduced to avoid overvoltage.
Level 2 [a]	**≥ 3.60 V for 5 s:** Charging is stopped, Discharging is allowed. Consequence: Charging is halted to protect against overvoltage. Discharging is still available.
Level 3 [b]	**≥ 3.65 V for 3 s:** System shuts down. Charging and discharging are halted. A manual restart is required.
Cell Undervoltage	
Level 1 [a]	**≤ 2.90 V for 5 s:** Discharging is derated. Charging is allowed. Consequence: Discharging is reduced to avoid undervoltage.
Level 2 [a]	**≤ 2.80 V for 5 s:** Discharging is stopped. Charging is allowed. Consequence: Discharging is halted to protect from battery undervoltage. Charging is allowed.
Level 3 [b]	**≤ 2.60 V for 3 s:** System shuts down. Charging and discharging are halted. A manual restart is required.
Cell Imbalance	
Level 1 [a]	**≥ 350 mV for 5 s:** Charging and discharging are derated. Consequence: Charging and discharging current are reduced to balance cell voltage differences.
Level 2 [a]	**≥ 400 mV for 5 s:** Charging and discharging are stopped. Consequence: Charging and discharging are halted to avoid imbalance between cells.
Level 3 [b]	**≥ 500 mV for 3 s:** System shuts down. Charging and discharging are halted. A manual restart is required.
Battery Pack Overvoltage	
Level 1 [a]	**≥ 184.6 V for 5 s:** Charging is derated. Discharging is allowed. Consequence: Charging is reduced to avoid overvoltage.
Level 2 [a]	**≥ 187.2 V for 5 s:** Charging is stopped. Discharging is allowed. Consequence: Charging is halted to protect against overvoltage.

[a] Level 1 and level 2 Warnings: These will cause temporary system performance limitations, but the system should self-recover automatically once conditions normalize.

[b] Level 3 Alarm: This will trigger a system shutdown and maintenance alarm. To restore operation, identify and address the root cause of the alarm, then perform a manual restart.

Protection Specifications	AES 210HV
Level 3 [b]	**≥ 189.8 V for 3 s:** System shuts down. A manual restart is required. Consequence: Total system shutdown to protect against damage from overvoltage-related failure.
Battery Pack Undervoltage	
Level 1 [a]	**≤ 150.8 V for 5 s:** Discharging is derated. Charging is allowed. Consequence: Discharging is reduced to avoid undervoltage.
Level 2 [a]	**≤ 145.6 V for 5 s:** Discharging is stopped. Charging is allowed. Consequence: Discharging is halted to protect against undervoltage.
Level 3 [b]	**≤ 135.2 V for 3 s:** System shuts down. A manual restart is required. Consequence: Total system shutdown to protect against damage from undervoltage-related failure.
Battery Cabinet Discharge Current	
Level 1 [a]	**≥ 150 A for 5 s:** Discharging current is reduced by the BMS. Consequence: Discharging is reduced to avoid overcurrent.
Level 2 [a]	**≥ 155 A for 5 s:** Discharging is stopped. Charging is allowed. Consequence: Discharging is halted to protect against overcurrent damage.
Level 3 [b]	**≥ 160 A for 3 s:** System shuts down. A manual restart is required. Consequence: Total system shutdown to protect against damage from discharge overcurrent-related failure.
Battery Cabinet Charge Current	
Level 1 [a]	**≥ 150 A for 5 s:** Charging current is derated by the BMS. Consequence: Charging is reduced to avoid overcurrent.
Level 2 [a]	**≥ 155 A for 5 s:** Charging is stopped. Discharging is allowed. Consequence: Charging is halted to protect against damage from overcurrent.
Level 3 [b]	**≥ 160 A for 3 s:** System shuts down. A manual restart is required. Consequence: Total system shutdown to protect against damage from charge overcurrent-related failure.

[a] Level 1 and level 2 Warnings: These will cause temporary system performance limitations, but the system should self-recover automatically once conditions normalize.
[b] Level 3 Alarm: This will trigger a system shutdown and maintenance alarm. To restore operation, identify and address the root cause of the alarm, then perform a manual restart.

Protection Specifications	AES 210HV
Low Insulation Resistance	
Level 1 [(a)]	**≤ 1000 kΩ for 2 s:** Charging and discharging are derated. Consequence: Charging and discharging are derated to avoid issues from reduced insulation resistance.
Level 2 [(a)]	**≤ 500 kΩ for 2 s:** Charging and discharging is stopped. Consequence: Charging and discharging are halted to protect against damage from poor insulation.
Level 3 [(b)]	**≤ 100 kΩ for 2 s:** System shuts down. A manual restart is required. Consequence: Total system shutdown to protect against damage from insulation-related failure.
High Temperature	
Level 1 [(a)]	**≥ 40°C (104°F) @ Charge for 5 s / ≥ 45°C (113°F) @ Discharge for 5 s:** Charging and discharging current are reduced. Consequence: Current is derated to avoid high temperatures.
Level 2 [(a)]	**≥ 45°C (113°F) @ Charge for 5 s / ≥ 50°C (122°F) @ Discharge for 5 s:** Charging and discharging are stopped. Consequence: Charging and discharging are halted to protect against high-temperature damage.
Level 3 [(b)]	**≥ 50°C (122°F) @ Charge for 3 s / ≥ 55°C (131°F) @ Discharge for 3 s:** System shuts down. A manual restart is required. Consequence: Total system shutdown to protect against damage from high-temperature-related failure.
Low Temperature	
Level 1 [(a)]	**≤ 10°C (50°F) @ Charge for 5 s / ≤ 5°C (41°F) @ Discharge for 5 s:** Charging and discharging current are reduced. Consequence: Charging and discharging are derated to avoid damage in low temperatures.
Level 2 [(a)]	**≤ 5°C (41°F) @ Charge for 5 s / ≤ 0°C (32°F) @ Discharge for 5 s:** Charging and discharging is stopped. Consequence: Charging and discharging are halted to protect against low-temperature damage.
Level 3 [(b)]	**≤ 0°C (32°F) @ Charge for 5 s / ≤ -10°C (14°F) @ Discharge for 5 s:** System shuts down. A manual restart is required. Consequence: Total system shutdown to protect against damage from low-temperature-related failure.

[(a)] Level 1 and level 2 Warnings: These will cause temporary system performance limitations, but the system should self-recover automatically once conditions normalize.

[(b)] Level 3 Alarm: This will trigger a system shutdown and maintenance alarm. To restore operation, identify and address the root cause of the alarm, then perform a manual restart.

Protection Specifications	AES 210HV
High Terminal Temperature	
Level 1	**≥ 70°C (158°F) for 5 s:** Warning only.
Level 2	**≥ 75°C (167°F) for 5 s:** Warning only.
Low State of Charge	
Level 1	**≤ 10% for 5 s:** Warning only.
Level 2	**≤ 0% for 5 s:** Warning only.

[a] Level 1 and level 2 Warnings: These will cause temporary system performance limitations, but the system should self-recover automatically once conditions normalize.

[b] Level 3 Alarm: This will trigger a system shutdown and maintenance alarm. To restore operation, identify and address the root cause of the alarm, then perform a manual restart.

3.6 Thermal Management System Specifications

Table 3-6, AES 210HV TMS Specifications

Specifications	AES 210HV
Product Name	8 kW Energy Storage Chiller Unit
Product Model	BTMS-80-ES
Operating Ambient Temperature	-35 to +55°C (-31 to 131°F) (varies based on coolant and control logic)
Storage Temperature	-40 to +80°C (-40 to 176°F)
Coolant Type	50% water / 50% ethylene glycol
Refrigerant Type	R513A
Power Supply	200 to 275 Vac, 60 Hz (208/240 Vac Single Phase)
Refrigerating Capacity	≥ 8.0 kW @ 18°C (64.4°F) outlet water & 45°C (113°F) ambient temperature
Heating Capacity (PTC Water Heater)	≥ 2.5 kW @ 40°C (104°F) outlet water setting temperature
PTC Water Heater	PTC Ceramic Thermistor Semiconductor Resistor
Refrigeration COP	≥ 2.2 @ 45°C (113°F)
Power Factor	≥ 90%
Electric Power for Refrigeration [a]	≤ 4.5 kW
Electric Power for Heating [b]	≤ 3.5 kW
Pump Power Consumption	≤ 0.3 kW
Standby Power	≤ 20 W

[a] The average cooling power consumption between 25°C (77°F) and 55°C (131°F) is approximately 3,600 W.

[b] The average heating power consumption between -30°C (-22°F) and 5°C (41°F) is approximately 3,400 W.

Specifications	AES 210HV
Coolant Flow Rate	≥ 50 L/min @ 90 kPa @ 18°C water (≥ 13.2 Gallons/min @ 13.05 psi @ 64.4°F water)
Noise Level	≤ 75 dB
Total Weight	95 ± 3 kg (±)
Work Altitude	< 4000 m (13,123 ft)
Corrosion Protection	Coating C4
[a] The average cooling power consumption between 25°C (77°F) and 55°C (131°F) is approximately 3,600 W. [b] The average heating power consumption between -30°C (-22°F) and 5°C (41°F) is approximately 3,400 W.	

3.7 Regulatory

Table 3-7, AES 210HV Regulatory

Regulatory	AES 210HV
Transportation	UN38.3 Transportation
Safety	UL1973 UL9540A UL9540 3rd Edition DC ESS (pending)
EMC	IEC 61000-6-2 IEC 61000-6-4
Other Standards	IEC 62619 IEC 62477-1 NEMA 3R / IP55

4. TRANSPORTATION

- **Palletized Shipping**
  - Each AES-210HV unit is mounted on individual pallets for shipping.
  - A flatbed truck or van truck provides secure, efficient, and optimal transportation.
- **Inspection on Receipt**
  - Upon receiving the shipment, inspect the battery cabinet for any damage during transit. Take photos to document a claim.
  - Report damage claims immediately to the carrier and to Discover Energy Systems. Include the product serial number and carrier details.
- **Transport Conditions**
  - Ensure the battery cabinet remains in an upright position during transport.
  - Use packaging that ensures stability for the entirety of the transportation process.

5. HANDLING

- **Pre-Handling Check**
  - Inspect the outer packaging for damage, moisture, or deformation.
  - Do not handle the battery cabinet if the packaging is compromised.
- **Safety Measures**
  - Use spotters to guide the cabinet during movement.
  - Do not push or apply pressure to the front or back panels when moving the cabinet.
  - Maintain a safe distance from the cabinet during all handling operations.

5.1 Forklift

NOTE
CABINET BASE DAMAGE
When being moved by a forklift, the AES 210HV must remain on its shipping pallet. The cable raceways at the base of the cabinet are not designed to support forklift handling.
Failure to follow these instructions may result in equipment damage.

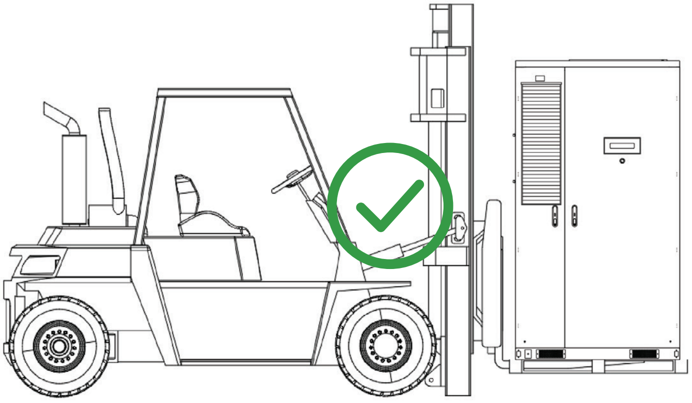


Figure 6. AES 210HV Valid Forklift Handling

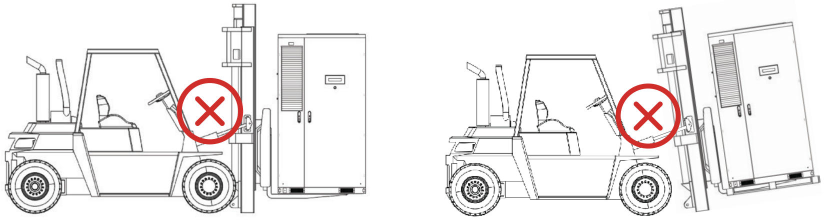


Figure 7. Improper Forklift Handling (Left: No pallet, Right: Tilted greater than 10°)

Forklift Handling

- The cabinet must remain on its shipping pallet for forklift transport.
- The battery weighs 2,500 kg (5,511 lb). Use a heavy-duty forklift with a minimum lifting capacity of 3,000 kg (6,600 lb) and forks at least 1,300 mm (52 in) in length.
- Keep the tilt angle below 10° and lift/lower smoothly to prevent shocks or sudden impacts.

⚠ CAUTION

DROP HAZARD

- Plan ahead to minimize travel distances and length of time the forklift solely supports the cabinet.
- When moving the battery cabinet by forklift, always transport the cabinet while it remains on its shipping pallet.
- Use a forklift rated for a load capacity exceeding three metric tons (3000 kg [6600 lb]) with a fork length of 1300 mm (52 in) or more.
- The tilt angle of the cabinet should not exceed 10° during movement.
- Perform a test lift to ensure stability and correct fork positioning.
- Move on flat surfaces only and keep the lift height as low as possible to avoid tipping.
- Use spotters to guide the cabinet safely, keeping all personnel at a safe distance.
- Lower the cabinet gently to prevent damage.

Failure to follow these instructions may result in injury.

5.2 Overhead Hoisting

⚠ CAUTION

TIPPING HAZARD

- When lifting, ensure the load is evenly distributed across all lifting points to maintain a balanced vertical lift.
- Move the unit slowly and carefully into the designated location, following standard safety protocols.
- Do not use slings or straps without spreaders for overhead lifting.
- Tilting of the unit is strictly prohibited.

Failure to follow these instructions may result in injury.

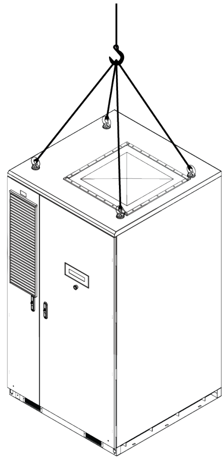


Figure 8. AES 210HV Overhead Hoisting

Overhead Hoisting

Lifting Preparation

- Securely fasten all four lifting lugs into the designated holes at the top of the cabinet.
- The diameter of the lifting lug hole is 51 mm (2 in).
- The crane hook or lifting bar must be at least 900 mm (36 in) above the cabinet.

Hoisting Guidelines

- Use all four lifting lugs for balanced lifting.
- Ensure sling connections are secure and sling lengths are equal.
- Keep the hoisting angle below 10° to maintain stability.
- Conduct a low-height test lift to verify load stability.
- Use lifting straps or chains rated for at least 3,000 kg (6,600 lb).
- Spreader bars may be required to prevent straps from contacting the cabinet.
- Keep the crane hook at least 1 meter above the cabinet for safe lifting.
- Lock the cabinet door to prevent accidental opening.
- Lift and lower slowly to avoid shocks or sudden impacts.

Safety Precautions

- Keep all personnel at a safe distance during lifting and lowering.
- Use spotters to guide the cabinet into position and ensure a clear working area.

6. SYSTEM OVERVIEW

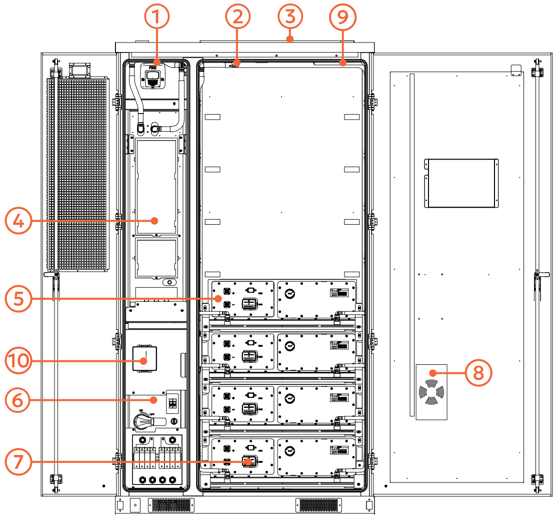


Figure 9. AES 210HV System, Front Doors Open

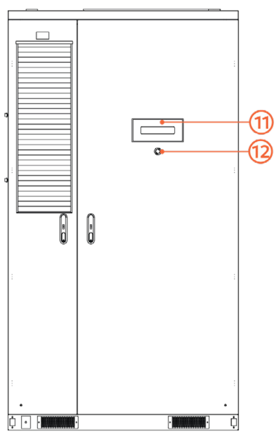


Figure 10. AES 210HV, Doors Closed

No.	Name	Description
1	Audible and Visual Fire Alarms	In the event of a fire hazard, the battery cabinet activates the thermal suppression device and sounds an alarm. For more information, see 6.4 Thermal Suppression System.
2	Heat and Smoke Detector	Smoke detection triggers an alarm, while heat detection activates an alarm and the thermal suppression system.

No.	Name	Description
3	Passive Deflagration Vent	Explosion control vents relieve pressure during thermal events by venting gases, which helps minimize the risk of explosion.
4	Thermal Management System (TMS)	The TMS manages heating and cooling for the battery cabinet. For information, see Section 6.4.
5	Battery Packs x 4	Energy storage units with integrated cell monitoring via the Battery Management Unit (BMU). Each pack features an aerosol fire suppression system and aerogel-based cell separation, for advanced thermal runaway mitigation.
6	High Voltage Box (HV Box)	The HV Box manages power flow, protects the system, provides redundant control via UPS, and monitors the system through the Battery Control Unit (BCU). For information on the High-Voltage Battery box, see Section 6.2.
7	Manual Service Disconnect (MSD) x4	Each battery pack is equipped with a Manual Service Disconnect (MSD).
8	Dehumidifier	The humidifier maintains humidity inside the sealed battery cabinet at an acceptable level.
9	Aerosol Thermal Suppression Device	If a high heat event is detected, the aerosol fire suppression system is automatically activated to quickly release an aerosol fire suppression agent.
10	LYNK II Gateway	The LYNK II Gateway facilitates communication between the battery cabinet BCU and external devices, such as inverters or cloud-based systems.
11	LED Indicators	The LEDs indicate the system operation status: • Green (solid): Battery On, DC Contacts Closed (in operation) • Green (flashing): Battery On, DC Contacts Open (standby) • Amber: Warning Alarm or Critical Fault • Red: E-Stop is Engaged
12	E-Stop	Emergency stop switch for manual shutdown of the battery cabinet.

6.1 Cabinet Indicator Lights

Indicator Light	Status	Description
Green Light (Blinking)	Standby (UPS Active / Receiving AC Power)	This indicates that the UPS is active or that the cabinet is receiving AC input power. The battery cabinet is in standby mode. There is no output power (contactors are open). The battery cabinet is awaiting the power-on command.
Green Light (Solid)	Power-on command received	The control system has sent a power-on command (allowing the contactors to close if all systems are good). Contactors may not close or may open due to a fault (solid amber) or E-Stop condition (solid red). The green light remains solid until the power-off command is received.
Green Light (Off)	Error	The Battery Control Unit (BCU) has no power, or an error occurred on powering up. If the amber indictor light is solid or flashing, the battery cabinet does not accept a power-on command. Diagnosis and corrective action is required.
Amber Light (Blinking)	Warning (Level 1 / Level 2)	Warning condition present that either requires monitoring or preventive action. If system was previously activated, the green indicator light remains solid, and the contactor remains closed. If system was not previously activated, or if system was deactivated, the battery cabinet may not accept a power-on command until the warning is cleared.
Amber Light (Solid)	Alarm (Level 3)	Critical fault or condition that requires immediate action or resolution. The contactors are opened; the green indicator light may remain solid. The battery cabinet does not accept a power-on trigger from the control system while in this state.
Red Light (Solid)	Emergency Stop (Manual Shutdown)	E-Stop was manually triggered. The battery cabinet is turned off, due to a manual shutdown. The red light is solid to signify an emergency stop condition.

6.2 High Voltage Box (HVB)

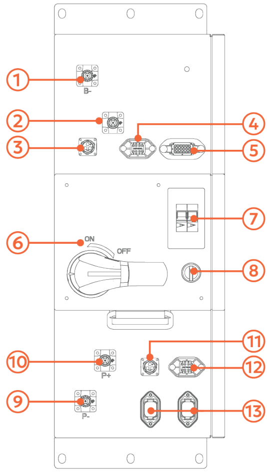


Figure 11. AES 210HV - High Voltage Box

No.	Name	Description
1	B-	Battery Pack Negative (-) Input
2	B+	Battery Pack Positive (+) Input
3	J7	AC Auxiliary Supply to Thermal Management Unit
4	J1	Thermal Management Communication Port
5	J2	Inter-battery Communication Port for the First Battery Pack
6	DC Disconnect	Dual Pole DC Disconnect for the Battery Output (P+/P-)
7	AC Auxiliary Power Breakers	Breakers/Disconnects for Cabinet Power Circuits (Main, BMS, Thermal Management)
8	UPS Switch	Switch for the Uninterruptible Power Supply (UPS), which provides backup power for a black start scenario.
9	P-	Inverter Negative (-) Output
10	P+	Inverter Positive (+) Output
11	J6	AC Input (240 Vac 60Hz)
12	J5	Proprietary Communication Port
13	J3/J4	LYNK II Communication Ports

6.2.1 Uninterruptible Power Supply (UPS)

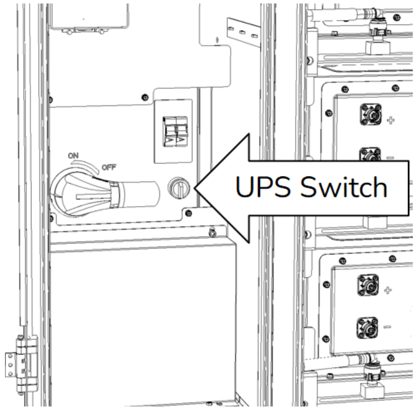


Figure 12. AES 210HV UPS Switch

NOTE
With the UPS ON, the system functions independently of AC input (for a limited time). The internal UPS battery provides a 24 V supply to the sensors and control system.

The AES 210HV system's Uninterruptible Power Supply (UPS) is designed for Black Start scenarios and redundant control without AC input. The UPS provides power to critical components when no AC auxiliary input is available. The UPS ensures the system can be powered on without external AC power, enabling the Battery Management System (BMS) and essential circuits to function during startup.

- **Black Start Power.** The UPS provides backup power when there is no AC auxiliary supply for starting the system in critical situations.
- **Limited Duration.** The UPS is intended for temporary use during black start conditions and is not designed for long-term operation without an AC input. While active, the UPS can power the BMS and auxiliary sensors for several hours. For optimal redundancy, connect the AC input to a dedicated circuit for continuous power availability.

6.2.2 HV Box Fusing

High-Voltage Fast-Acting Fuses (FS15H315-8M). The AES 210HV system includes two fast-acting fuses rated at 315 A, 1500 Vdc. These fuses provide essential overcurrent protection for system components, and with fast reaction times, the fuses minimize risks associated with short circuits and power surges.

6.3 Battery Pack

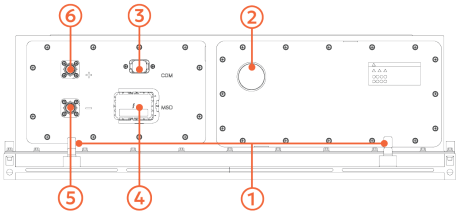


Figure 13. AES 210HV Battery Pack

No.	Name	Description
1	Battery Pack Coolant Inlet/Outlet	Connects the battery pack to the Thermal Management System, facilitating the flow of coolant for temperature regulation.
2	Battery Pack Pressure Relief Valve	If a thermal event occurs inside the battery pack, the valve indicator will pop forward and release the internal aerogel to suppress a thermal runaway event.
3	Battery Pack Communication Harness	This connects the battery pack to the High Voltage Control Box for communication and monitoring.
4	Manual Service Disconnect (MSD)	The MSD includes a 500 A fuse. Use the MSD to manually disconnect high-voltage circuits in the battery pack during transportation, installation, maintenance, or emergencies.
5	B-	Battery Pack Negative (-) Terminal, used for the negative connection of the battery pack.
6	B+	Battery Pack Positive (+) Terminal, used for the positive connection of the battery pack.
Not shown	Internal fire suppression	The integrated pack-level fire suppression system is located behind the right access panel.

6.4 Thermal Management System

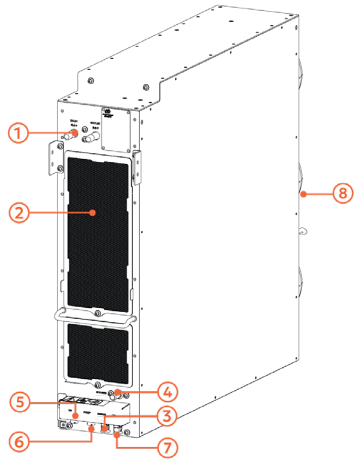


Figure 14. AES 210HV Thermal Management System

No.	Name	Description
1	Inlet / Outlet	Connects to the cooling system for circulation of liquid coolant through the TMS system.
2	Air Intake	Facilitates air intake for the cooling mechanism of the TMS.
3	Debug/Service Port	Used for diagnostics, testing, and software updates.
4	Charge Pipe	Allows for refilling coolant into the system.
5	AC Input	Provides AC power input to the TMS.
6	Pump DC Power Input	Supplies power to the liquid coolant pump during maintenance or service operations.
7	Proprietary Communication Port	Connects the TMS to other internal systems.
8	Air Exit	Supports ventilation and heat dissipation by facilitating air exhaust using three fans.

The AES 210HV features a liquid-based Thermal Management System (TMS) designed to maintain optimal operating conditions for the battery packs. The TMS provides both heating and cooling, allowing the batteries to function efficiently across a wide ambient temperature range.

- The system circulates a 50/50 glycol mixture in a closed-loop circuit to regulate battery temperature.
- The TMS operates under slight positive pressure to ensure proper coolant flow.
- If the system loses pressure due to a leak, a low-pressure alarm will trigger, automatically shutting down the TMS until the issue is resolved and servicing is completed.

6.4.1 Cooling Mode

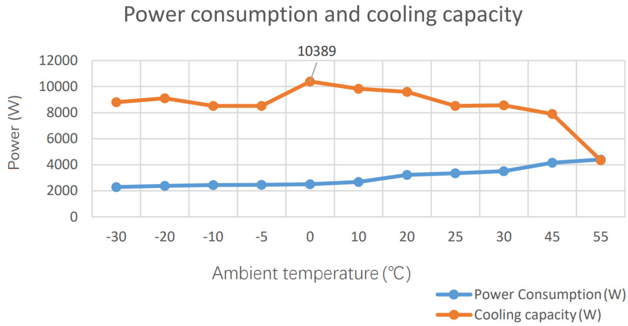


Figure 15. Cooling Power Consumption

When battery temperatures exceed the preset threshold, the Thermal Management System (TMS) initiates the cooling cycle. Liquid coolant flows through the battery pack's cooling plates, absorbing excess heat before being directed to an evaporator. There, heat is transferred to a refrigerant, rapidly cooling the fluid before it recirculates through the system. Three high-efficiency fans at the rear of the TMS expel the extracted heat from the cabinet, ensuring effective thermal regulation and preventing overheating.

Cooling activates when the system-wide temperature reaches ≥ 30°C (86°F) or any battery pack exceeds 32°C (89.6°F) and stops when both the system average drops to ≤ 28°C (82.4°F) and all individual packs fall below 30°C (86°F). Upon activation, the TMS starts the coolant pump within 20 seconds and engages the compressor after 30 seconds, adjusting power dynamically to maintain a target coolant temperature of 20°C ±1°C (68°F ±1.8°F). Cooling takes priority over other functions unless heating is simultaneously required, in which case the system enters self-circulation mode.

6.4.2 Heating Mode

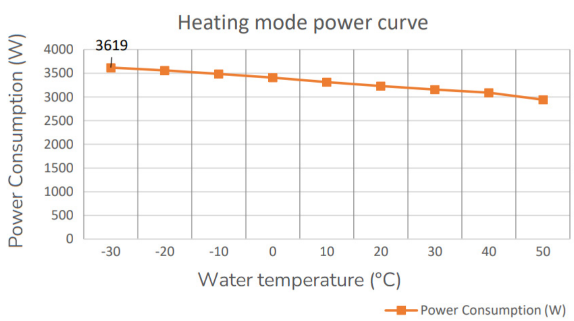


Figure 16. Heating Power Consumption

When the battery temperature drops below a predefined threshold, especially in cold environments, the Thermal Management System (TMS) activates a heating cycle. The system circulates coolant through a PTC heater, warming it before directing it to the battery packs. This process continues until the battery temperature reaches the optimal operating range, ensuring stable performance and longevity while preventing cold-related efficiency losses.

Heating activates during discharge if the system-wide temperature is ≤ -5°C (23°F) or any battery pack is ≤ -10°C (14°F), and during charging if the system-wide temperature is ≤ 10°C (14°F) or any pack is ≤ 5°C (41°F). Heating turns off when the system-wide temperature is ≥ 25°C (77°F) and all individual packs are at least 20°C (68°F), ensuring uniform thermal conditions. The TMS controls PTC heaters, maintaining a target coolant temperature of 30°C (86°F), and limits charging/discharging until safe operating temperatures are restored.

6.5 ESS Protection - Mitigation, Detection, Suppression, Control

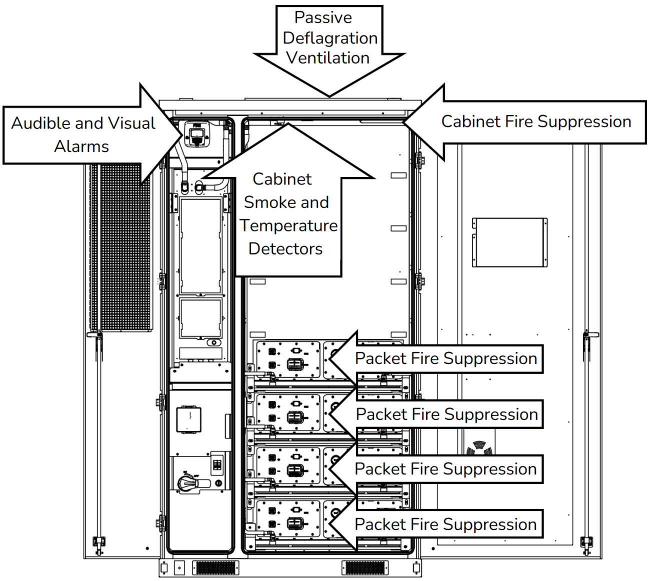


Figure 17. Fire Protection System Components

The AES 210HV battery cabinet is equipped with a comprehensive thermal runaway mitigation and fire protection system. This includes aerogel cell separation to limit thermal propagation, a dual-redundant aerosol-based fire suppression system for rapid fire suppression, and passive deflagration ventilation to manage overpressure events. Designed to detect and respond to thermal hazards at both the battery pack and cabinet levels, this system ensures maximum safety and risk containment.

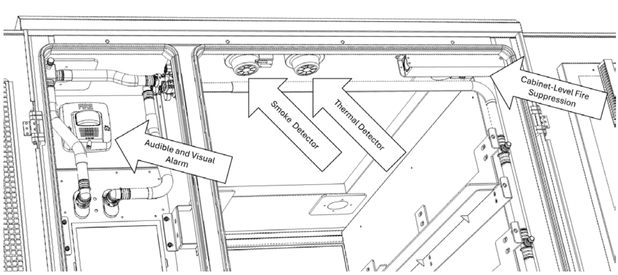


Figure 18. Fire Protection System Components

6.5.1 ESS Protection Components

- **Thermal Runaway Mitigation.** Implemented through multiple safety mechanisms. The BMU (Battery Management Unit) and BCU (Battery Control Unit) continuously monitor system parameters, ensuring controlled charging and discharging for safe operation. The TMS (Thermal Management System) actively regulates cell temperatures within safe operating ranges. In the event of thermal runaway, aerogel cell separators with phase change materials provide thermal insulation and help prevent propagation.
- **Smoke Detector.** Continuously monitors for smoke and combustible gases. If levels exceed a predefined threshold, the system triggers a fire alarm and initiates an automatic battery system shutdown.
- **Thermal Detector.** Detects excessive temperature conditions and activates the fire suppression system, releasing aerosol-based extinguishing agents while simultaneously triggering the fire alarm and system shutdown.
- **Audible and Visual Alarm.** Alerts personnel to fire or thermal hazards through both sound and flashing indicators when a smoke or temperature event is detected.
- **Aerosol Fire Suppression System.** Deploys an aerosol-based extinguishing agent upon activation to suppress thermal events within the battery pack and cabinet.
  - **Fire Suppression Control**
    - **Cabinet-Level Fire Suppression** is managed by a cabinet thermal detection system.
    - **Pack-Level Fire Suppression** is managed by an independent, self-contained thermal detection system.
- **Passive Deflagration Vent.** Provides explosion control by safely venting heat and gases from the top of the cabinet to relieve pressure buildup during thermal events.

6.5.2 Cabinet-Level Protection - Cabinet-Level Fire Suppression

In the top-right corner of the cabinet is a 300 gram (0.66 lb) aerosol canister that is electronically triggered by the temperature detector. The aerosol agent fills the cabinet during a thermal event.

6.5.3 Pack-Level Protection - Pack-Level Fire Suppression

Each battery pack contains a 12 gram (0.4 oz) aerosol canister, designed to automatically deploy in the event of internal thermal runaway or external thermal event, triggered at 170°C ±10°C (338°F ±18°F).

6.6 LYNK II Gateway - Connecting to Inverters and the Cloud

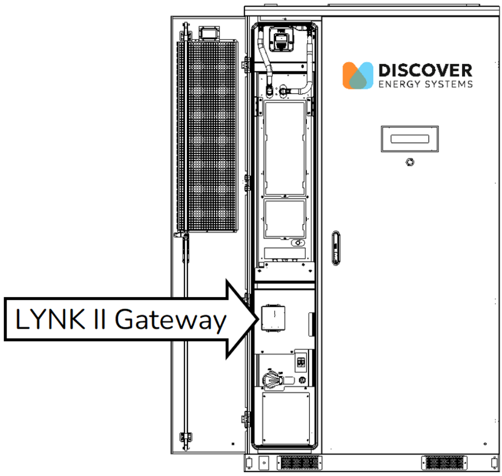


Figure 19. Location of LYNK II Gateway

The LYNK II Gateway enables communication between the battery system and external inverters using standard HV Battery CAN protocols through an RJ45 cable. Please refer to the corresponding inverter integration guide for configuration details with a specific inverter or power conversion system (PCS).

When connected to the internet, the LYNK II Gateway also provides access to mylynkcloud.com, allowing for remote monitoring and control.

6.7 Fused DC Distribution

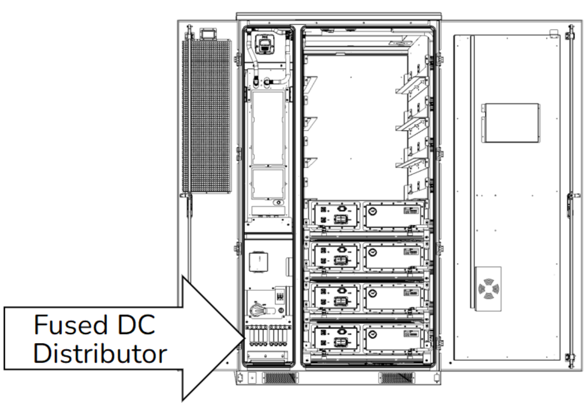


Figure 20. Location of fused DC distribution

The Fused DC Distributor is a critical component inside the AES 210HV cabinet. It provides a centralized connection point for high-current DC wiring and safely distributes power between the battery and connected devices, such as inverters.

Key features:

- **Fused Connections.** Eight fuse terminals (four positive, four negative) with 70 A fuses (alternative fuses available from 35 to 150 A) each for fault protection during operation.
- **High Voltage Capability.** Designed to handle the AES 210HV's high voltage with robust interrupt capacity to support high-power applications.
- **Convenient Access.** Equipped with a removable protective shield for safety, installation and maintenance.
- **Cable Compatibility.** Studs allow wires to inverters and other devices to be connected with ring terminals.

The DC Distribution simplifies wiring, enhances safety, and supports scalable configurations in high-voltage energy systems.

7. INSTALLATION

⚠ WARNING

ELECTRIC SHOCK AND FIRE HAZARD

- This system must be installed in strict accordance with the manufacturer's instructions.
- Before starting any installation work, ensure all power sources are properly disconnected, including AC and DC sources, and all MSD are completely removed.
- Use insulated tools to avoid short circuits, and confirm that all power supply disconnect devices are securely locked out.
- Follow lockout/tagout procedures, essential to ensure safe handling of the system during installation.

Failure to follow these instructions may result in death or serious injury.

⚠ WARNING

ELECTRIC SHOCK HAZARD

- This system contains high-voltage components that can cause serious injury or death.
- Always assume terminals and connections are live unless confirmed otherwise.
- Use appropriate personal protective equipment (PPE), such as insulated gloves, goggles, and flame-retardant arc-flash-rated clothing.

Failure to follow these instructions may result in death or serious injury.

⚠ CAUTION

DISASSEMBLY HAZARD

- Do not disassemble or attempt to modify the battery packs or other components.
- Only qualified personnel with the appropriate training should handle or service the battery cabinet.
- Disassembling the battery cabinet without authorization may void warranties and pose safety risks.

Failure to follow these instructions may result in injury.

The AES 210HV must be installed in compliance with all applicable local and national electrical and building codes, including the National Electric Code (NEC) in the USA and the Canadian Electric Code (CEC) in Canada. Additional requirements may be imposed by the Authority Having Jurisdiction (AHJ) based on site-specific conditions. Key considerations include, but are not limited to:

- **Upstream Protection.** Properly rated input disconnects and overcurrent protection as required by code.
- **Clearance & Accessibility.** Compliance with minimum access and service clearances.
- **Conductor Sizing.** Use of appropriately rated feeder and load conductors.
- **Grounding.** Mandatory chassis safety grounding of the enclosure.
- **Impact Protection.** Required in locations where the system may be exposed to vehicle or equipment impact.

Always consult the AHJ and relevant regulatory bodies to ensure full compliance before installation.

7.1 Tools

⚠ WARNING

ELECTRIC SHOCK HAZARD

- Be careful when working with batteries, as they pose a risk of electric shock and high short-circuit currents.
- Use only insulated tools around the modules and batteries, and carefully avoid shorting the battery terminals or connections.
- Always ensure the system is de-energized following lockout/tagout (LOTO) procedures and MSDs are removed for full isolation. Even if the system is de-energized, a residual charge may remain.

Failure to follow these instructions may result in death or serious injury.

Tools and Equipment

- **Insulated Tools.** Sized to match nuts, bolts, and cables, typically rated for at least 1000V. Using insulated tools will provide an extra layer of safety.
- **RMS Type Voltmeter.** Rated for a minimum of 1000 Vdc, used correctly, tis tool will confirm that the system is de-energized.
- **Personal Protective Equipment (PPE).** Appropriately rated to meet or exceed the system's arc flash incident energy levels, including gloves, face shields, and flame-resistant clothing.
- **Cable Management Tools.** Use insulated cable ties or holders to secure cables and reduce the likelihood of accidental contact.

7.2 Location and Site Preparation

General Installation Requirements

- **Foundation Stability.** The system must be installed on a level, solid foundation capable of supporting its full weight when fully loaded with battery packs. Ensure the surface can handle vibration without compromising stability.

- **Accessibility.** Clear space around the system for ventilation, cooling, and maintenance. Follow relevant local installation standards to ensure safety and compliance.

Outdoor Installation Requirements

- **Foundation Drainage.** Construct the foundation with proper drainage, sloping away from the system to prevent water pooling near the cabinet base.
- **Flood Protection.** The install location should be away from flood zones, drainage areas, or regions prone to standing water.
- **Environmental Safety.** Fencing and lighting are recommended for enhanced security, particularly for public or commercial installations. Fencing and lighting may be required to comply with applicable local regulations.

7.3 Foundation and Installation Guidelines

A well-designed and constructed foundation is critical for the stability and long-term performance of the battery cabinet. The foundation must be able to support the full load of the cabinet while addressing environmental conditions such as vibration, temperature fluctuations, and potential water exposure.

NOTICE
DAMAGE DUE TO SEISMIC EVENT • For installations in seismic-prone areas, consult local building codes or a civil engineer to comply with seismic requirements. • Alternative anchoring solutions may be required to secure the battery system in seismic zones. **Failure to follow these instructions may result in equipment damage.**

AES 210HV Conduit Routing and Bolt-Down Hole Placement

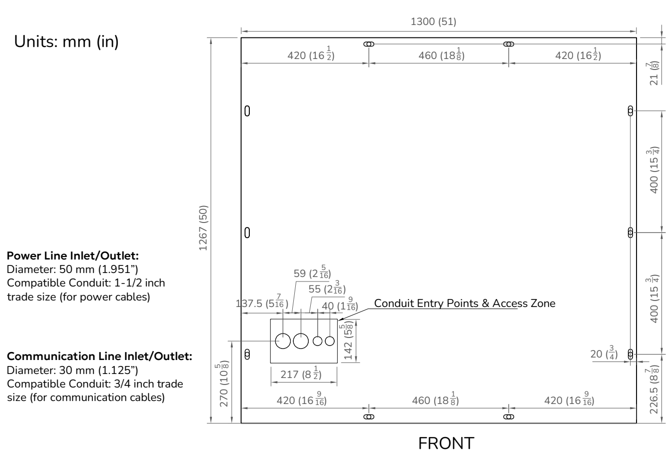


Figure 21. AES 210HV Dimensions

For stability and performance, the AES 210HV battery system must be installed on a properly constructed concrete foundation. Follow these steps to construct the pad and secure the cabinet.

7.3.1 Concrete Pad Construction

- **Level Surface.** The concrete pad must be level to prevent cabinet tilting or shifting, which can cause mechanical stress and affect system performance.
- **Load Capacity.** The pad must support the fully loaded cabinet weight, including all battery packs and components. Verify load-bearing capacity per system specifications.
- **Material and Construction.** Use reinforced concrete designed to withstand the system's weight, vibrations, and environmental factors, including weather and seismic conditions.
- **Thickness and Size.** The pad must be at least 150 mm (6 inches) thick and extend 200 mm (8 inches) beyond the cabinet footprint on all sides. In seismic zones, an engineer must design the foundation to meet local seismic codes.
- **Water Runoff.** Taper the outer 200 mm (8 inches) to slope away from the cabinet, preventing water accumulation at the base.

7.3.2 Cabinet Conduit Connection

Proper wire trench design, inlet positioning, and sealing are critical to ensuring a secure and reliable battery cabinet installation.

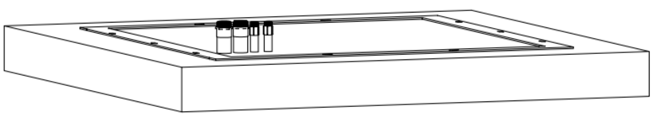


Figure 22. AES 210HV Foundation Inlets

Power and Communication Line Inlets

- **DC Power Inlet/Outlet.** The cabinet includes two inlet openings, each with a 50 mm (1.95") diameter, designed to accommodate 1 ½ inch (trade size) conduit couplings for DC power cables.
- **Communication Line Inlet/Outlet.** The cabinet features a 30 mm (1.125") diameter opening for ¾ inch (trade size) conduit couplings used for communication cables. It is recommended to install two shielded CAT6 cables (one for closed-loop communication with the inverter and one for an internet connection to the LYNK II Gateway).
- **AC Line Inlet/Outlet.** The cabinet includes a 30 mm (1.125") diameter opening designed for ¾ inch (trade size) conduit couplings to accommodate AC power cables for the Auxiliary AC input.

Size the trenches appropriately to accommodate all power and communication lines while maintaining separation to prevent interference.

Remove the DC Distribution Panel - Access the Connections Compartment

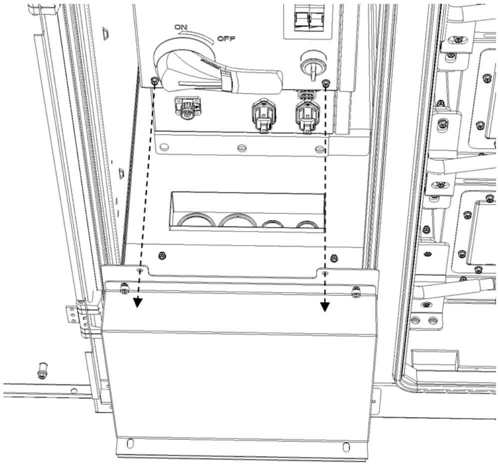


Figure 23. Remove DC Distribution Panel

- Ensure the workspace is safe and clear.
- Open the left battery cabinet door to access the internal connections area.
- Ensure the battery is off, the DC disconnect is off, and all MSD are removed before removing any connections or panels.
- To gain access to the wiring area, remove the DC Distribution Panel. The DC Distribution Panel is located near the bottom of the High Voltage Box (HVB).
- Remove the screws securing the DC Distribution Panel and extract it from the space to expose the conduit connection area.

NOTE
The conduit connection plate, which secures the conduit, can be removed during installation to provide easier access for attaching and securing the conduit during installation.

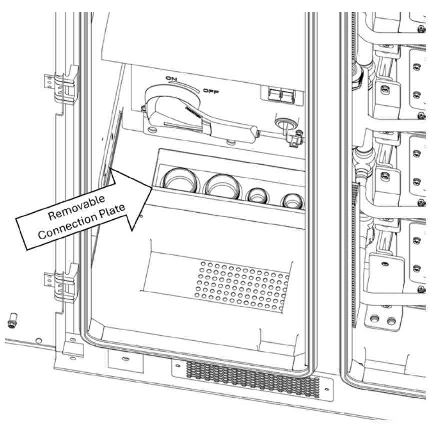


Figure 24. Conduit Connection Plate

- **Conduit Routing**

  Design conduit pathways to extend vertically from the trench through the concrete pad and into the bottom of the battery cabinet. Ensure a direct, strain-free alignment with entry points, avoiding sharp bends or unnecessary cable stress. Secure conduits properly to maintain stability and ease of installation.

7.3.3 Cabinet Grounding

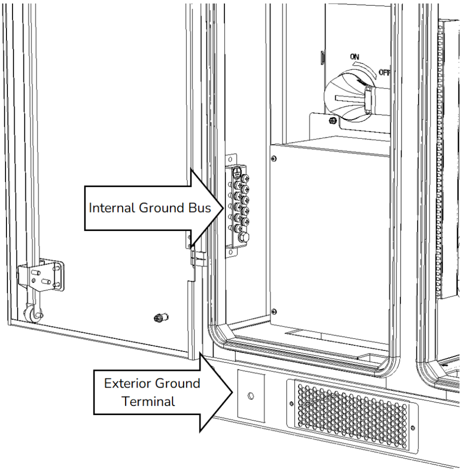


Figure 25. AES 210HV Grounding Options

Grounding Points

The AES 210HV battery system includes two designated grounding points to ensure proper electrical bonding and system safety.

- **Exterior Ground Terminal.** Located on the front-bottom-left of the enclosure, this terminal is used for external system grounding, providing a secure, low-resistance connection to the cabinet's exterior.
- **Internal Ground Bus.** Positioned on the bottom-left wall inside the enclosure, this bus offers a dedicated grounding point for conductors within the cabinet, ensuring reliable internal grounding.

NOTICE
WATER INGRESS AND ENCLOSURE DAMAGE Avoid creating additional holes in the enclosure. Use the external ground terminal for exterior grounding or the internal ground bus for connections inside the battery cabinet. **Failure to follow these instructions may result in equipment damage.**

7.3.4 Positioning and Securing Cabinet

NOTE
Anchors can be embedded in the concrete prior to cabinet placement or installed afterward.

1. **Positioning the Battery Cabinet**

- **Align the Battery.** Overhead lift and position the battery cabinet onto the pad. Align the cabinet precisely over the conduit.

2. **Installing Anchors**

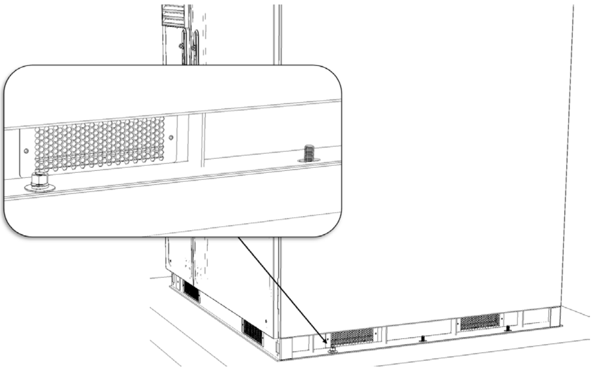


Figure 26. AES 210HV Anchor Points

- **Drill Anchor Holes**

  With the battery cabinet positioned, use a hammer drill to create anchor holes at the designated mounting points on the cabinet's base.

- **Vacuum Out the Holes**

  Thoroughly clean out dust and debris using a vacuum or compressed air. Removing all debris is critical for effective epoxy adhesion.

- **Install Epoxy Anchors**

  For anchoring, use ½" ASTM F1554 Grade 36 threaded rod (or M14 equivalent) with Hilti HIT-HY 200 V3 epoxy or an equivalent product approved for high-strength applications.

  Epoxy Application Process

  - Insert the epoxy dispenser's nozzle deep into each hole and fill it from the bottom up, ensuring even distribution.
  - After filling, immediately insert the threaded rod into the hole with a twisting motion to ensure the epoxy fully coats the rod and hole walls.
  - Follow the manufacturer's specified curing time to ensure the epoxy hardens completely before securing nuts.

3. Securing the Cabinet

- **Torque the Anchors**

  Once the epoxy has fully cured (consult the Epoxy Manufactures' Instructions for cure time guidelines based on temperature conditions), attach flat washers, lock washers, and hex nuts to each threaded rod. Torque the nuts to the epoxy manufacturer's specification to fasten the battery cabinet to the concrete pad.

7.4 Electrical Wiring

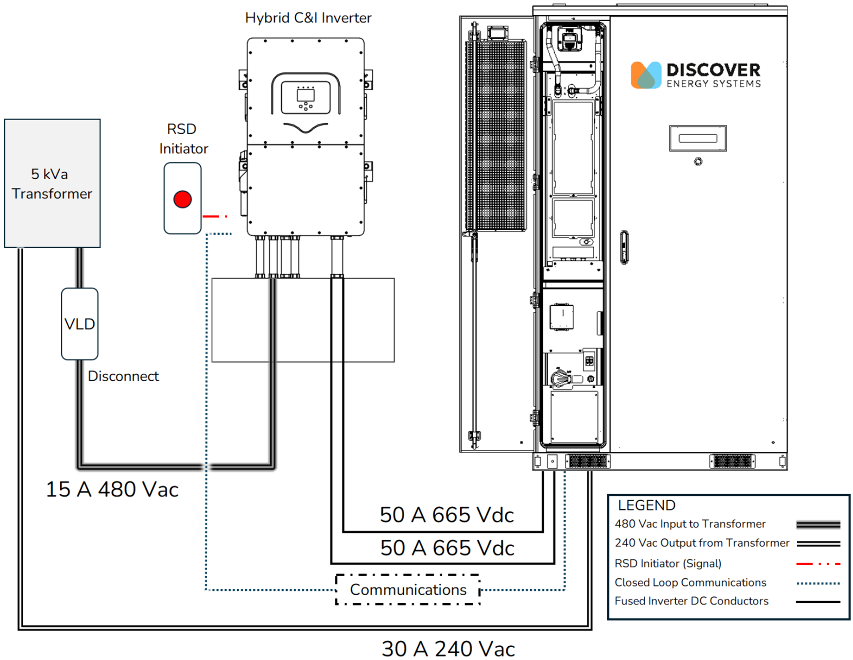


Figure 27. AES 210HV Electrical Wiring

⚠ WARNING

ELECTRIC SHOCK HAZARD

- Always ensure the system is de-energized following lockout/tagout (LOTO) procedures and MSDs are removed for full isolation.
- Do not assume disconnection—always verify by checking the lines and ground with a suitably rated voltmeter.
- Lock out the source disconnection devices.
- Set the manual disconnect switch in each battery cabinet to the OFF position.
- Remove all Manual Service Disconnects (MSDs) from each battery pack.
- Follow lockout/tagout procedures when servicing the equipment.

Failure to follow these instructions may result in death or serious injury.

The battery system requires dedicated connections for DC power, auxiliary AC power, LYNK communication, internet, and grounding. To ensure safety and prevent interference, DC, AC, and communication cables must be routed in separate conduits.

- **DC Conductors.** Terminate DC connections at the Fused DC Distribution. Conductors must be properly sized based on the inverter specifications and fuse rating (standard fuse is 70 A).
- **AC Input.** Connect AC input cables to the AUX AC wiring assembly, using two conductors plus a ground wire, rated for 30 A at 240 Vac (single-phase).
- **Communication.** Use two Unshielded Twisted Pair (UTP) cables, one for CANbus communication with the inverter and one for the internet connection to the LYNK II Gateway.
- **Grounding.** Connect the system to a dedicated ground rod or Ufer ground for proper grounding and safety compliance.

NOTICE

COMMUNICATION CABLE DAMAGE

- Do not route communication cables in the same conduit as power cables.
- Communication cables are delicate and should be protected from excessive force to prevent tearing.
- Ensure cables meet the required voltage insulation standards and are shielded from scratches or other damage to maintain insulation integrity.
- Confirm cables are not under excessive stress or in contact with sharp edges or nearby terminals.
- Position and secure cables with straps to maintain positioning and safety.

Failure to follow these instructions may result in equipment damage.

NOTICE

DO NOT PARALLEL AES 210HV BATTERY CABINETS ON THE DC BUS

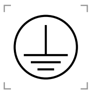
Do not parallel AES 210HV battery cabinets on the DC bus. Attempting to connect multiple cabinets in parallel on the DC bus may result in unbalanced currents, system instability, or potential damage to the equipment.

Failure to follow these instructions may result in equipment damage.

Connecting the DC outputs of battery cabinets in parallel is not supported. The AES 210HV battery cabinets are designed to operate as independent units, each with its own DC connections to the inverter DC inputs/outputs. Attempting to connect multiple cabinets in parallel on the DC bus may result in unbalanced currents, system instability, or potential damage to the equipment.

7.4.1 Recommended Cable Specifications

These specifications are a general guide, actual wire sizes and ratings should be verified based on use, load calculations, and local electrical codes.

Description	Terminal ID	Cable Type	Notes
Ground		Bare or Insulated Copper	Connected to a ground rod or Ufer ground-in pad for low-resistance grounding.
Communication Cables	LYNK II RJ45 for Ethernet and CAN-based connections	Standard CAT6 or higher Ethernet Cable	Run two separate cables, one dedicated for CAN bus communication with the inverter and another for the intranet connection to the LYNK II Gateway.
AC Auxiliary Connection	J6 (Pre-Wired Connector)	Use cable rated for wet and dry	Continuous current less than 20 A, circuit breaker 32 A, use #10 AWG copper minimum, as per NEC guidelines for ampacity. Adjust for longer runs or higher temperatures.
DC Connections	DC Distribution Fuse Terminals (4 Positive, 4 Negative). 70 A Standard. Fuses from 35 A to 150 A available.	A high-strand, flexible single-conductor cable insulated with XLPE, RHW-2, USE-2, PV Wire, or equivalent, is used for high-voltage DC applications (750 Vdc).	Check the PCS or inverter manual for recommended or maximum wire size.

7.4.2 Step-Down Transformer (480 Vac to 240 V)

The AES 210HV may require a 208-240 V AC single-phase supply for its auxiliary AC input, which powers the control system (maintaining UPS functionality) and the Thermal Management System (TMS). If a 208-240V single-phase supply is unavailable, a 5 kVA (or larger) single-phase step-down transformer with a 480 V primary and 240 V secondary can be used. This transformer converts 480 Vac from the inverter to 240 Vac, ensuring proper operation of the battery auxiliary input and TMS. Purchase an AC single-phase step-down transformer with a 480 V primary and 240 V secondary if required.

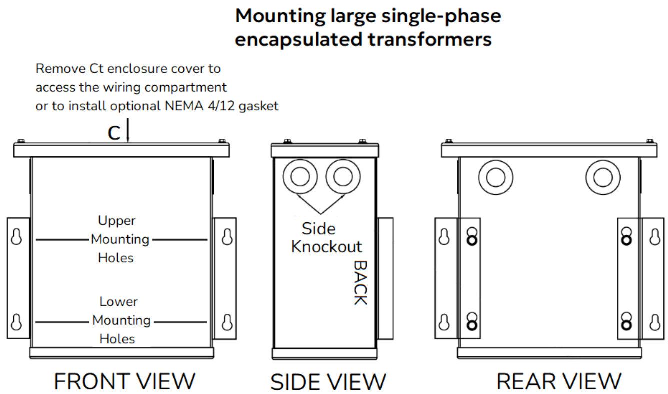


Figure 28. Example Step-Down Transformer (480 Vac to 240 Vac)

NOTE
Installation Instructions (for reference). The transformer's installation manual is the primary resource for installation guidance.

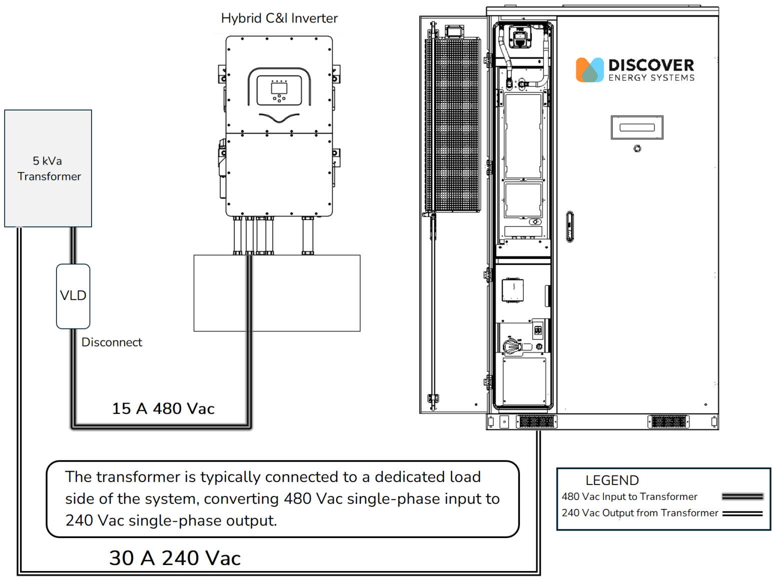


Figure 29. Example Transformer Wiring

NOTE
Operational Consideration For continuous off-gird operation wire the AC input to provide continuous power to auxiliary components, such as the TMS, even when grid or generator power is unavailable.

NOTE

AC System Compatibility

For installations using a 120/208 V three-phase or a single-phase 120/240 V setup, a transformer may not be required. The TMS and UPS can operate within an AC input range of 200 to 276 Vac. Therefore, it can use a single-phase input of either 208 V or 240 V.

NOTE

Operational Consideration

A single larger transformer can support multiple battery cabinets at the same site. To meet the system's power requirements, ensure the transformer has a load capacity of at least 5 kVA per cabinet.

7.4.3 Cabinet Wiring Connections

NOTICE

DAMAGE DUE TO WATER AND DUST INGRESS

- To maintain the IP55 rating of the battery cabinet, install all cables with proper sealing methods and appropriately-rated conduits.
- Follow the manual's guidelines for wire diameter, shielding, and grounding.
- Secure all connections using the specified torque values to prevent dust and moisture ingress.

Failure to follow these instructions may result in equipment damage.

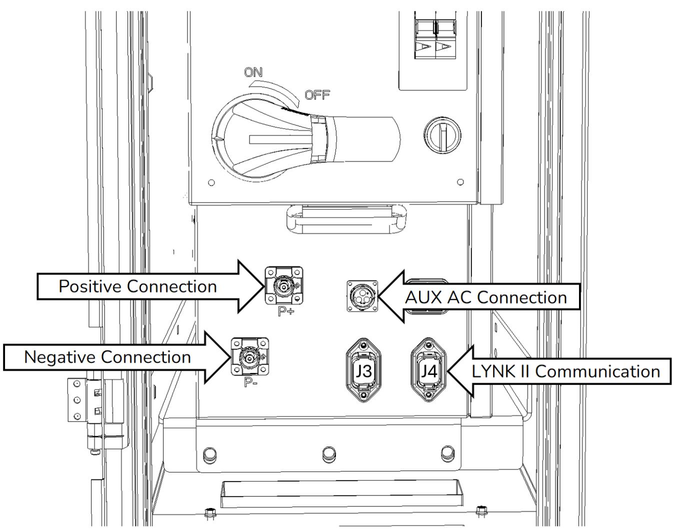


Figure 30. HV Box Connection Points

Connecting Communications to LYNK II Gateway

Plug the LYNK II communication cable into either the J3 or J4 port on the HVB. Route and connect the communication cable (RJ45) to the LYNK Port on the LYNK II Communication Gateway.

NOTICE

COMMUNICATION NETWORK DAMAGE

- Confirm that the cable is connected to the LYNK port. Connecting to any other port may damage equipment.
- Mixing the LYNK Network with other networks may result in equipment malfunction and damage.
- Do not plug a battery cabinet CAN communication cable or terminator into the LYNK II Communication Gateway's 10/100 Ethernet port.
- Do not connect a CAT5e or higher cable from the battery cabinet communications, LYNK, or Ethernet ports of the LYNK II to a network router's WAN or MODEM port.

Failure to follow these instructions may result in equipment damage.

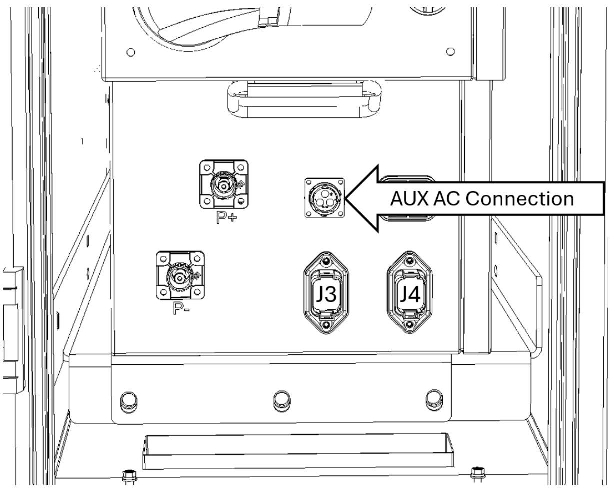


Figure 31. AUX AC Input Connection

AC Wiring to AUX AC Port

Terminate the AC input wiring from a 200 to 275 Vac source (such as transformer or other AC power supply) to the AUX AC Wiring Assembly. Plug the AUX AC Wiring Assembly into the AUX AC connection port on the HVB.

⚠ CAUTION

ELECTRIC SHOCK HAZARD

Ground the AC input connection in compliance with regulations and standards set and enforced by the electrical code and the authority having jurisdiction.

Failure to follow these instructions may result in injury.

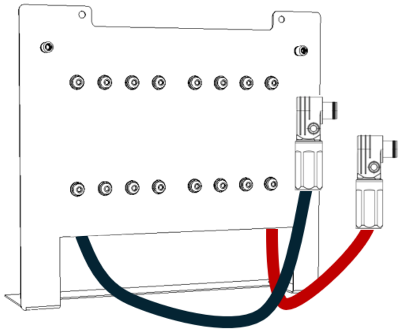


Figure 32. DC Distribution Connection to HV Box

High-Current Conductors to DC Distribution Panel

Plug the corresponding ends of the high-current positive and negative conductors into their respective ports on the High-Voltage Box (P+ & P-). Red/Orange to P+ and black to P-.

DC Wiring to HV Box

Mount the DC Distribution Panel and secure the high-current positive and negative conductors to the corresponding busbar on the DC Distribution panel.

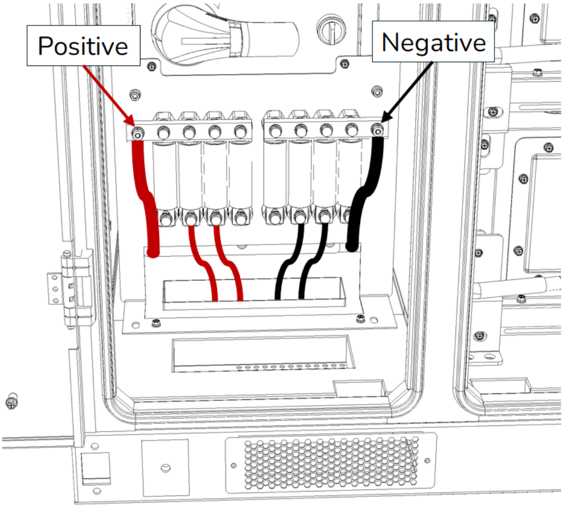


Figure 33. DC Distribution Connections

Terminate Inverter DC Conductors

Route DC Conductors. Run the inverter's DC conductors to the fuse terminals.

Crimp & Secure. Attach an appropriate ring terminal to each conductor and securely fasten them to the fuse. Leaving sufficient slack to prevent strain.

Polarity Check. Verify that all connections from the HVB (High-Voltage Battery) to the DC Distribution Panel and from the DC Distribution Panel to the Inverter are properly terminated with the correct polarity.

Install the DC Distribution Panel cover securely before powering on the system.

NOTICE
REVERSE POLARITY DAMAGE
Incorrect polarity can cause high-current faults or damage to system components.
Failure to follow these instructions may result in equipment damage.

7.4.4 AC Surge Protection

⚠ WARNING
ELECTRIC SHOCK HAZARD
Inadequate protection against AC transient surges from the inverter may result in dangerously high voltage on communication, DC, or AC conductors, damaging the system and posing safety hazards.
Failure to follow these instructions may result in death or serious injury.

AC Surge Protection Recommendation

To protect against transient surges, install a third-party Surge Protective Device (SPD) (UL TYPE 4CA) for 277V / 480V AC, 3P Wye with a 40 kA (Imax 40 kA - In 20 kA) Surge Current Rating at the source of the inverter's AC input conductors if the cabinet auxiliary AC supply is sourced from an unprotected system. Refer to the inverter's installation manual to verify surge protection requirements. If the inverter does not provide adequate built-in surge protection, an external SPD rated for 277V / 480V AC, 3P Wye must be installed to ensure system reliability and protection.

(Example part: DS44S-400/G, Citel America Inc. Surge Protective Devices (SPDs))

7.5 Manual Service Disconnect (MSD) Installation

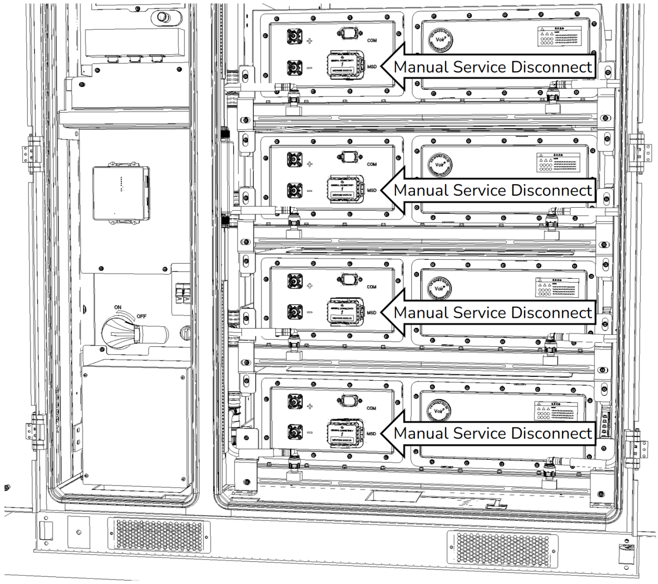


Figure 34. MSD Locations

⚠ WARNING

ELECTRIC SHOCK HAZARD

- DO NOT insert or remove the MSD (Manual Service Disconnect) while the system is under load or powered on.
- Before handling the MSD, the system must be completely shut down.
- Once the MSDs are installed, DC conductors may become energized—always assume all connections are live and proceed with extreme caution.

Failure to follow these instructions may result in death or serious injury.

NOTE

As a safety precaution, the battery packs are shipped with the MSD uninstalled.

The Manual Service Disconnect (MSD) is a critical safety component designed to isolate the high-voltage battery packs from the system during installation, maintenance, or emergency procedures. Follow these steps to properly install the MSD.

1. **Ensure the Battery Cabinet is Powered Down.** Before beginning the MSD installation, power down the battery cabinet and connected systems to avoid the risk of electrical shock or damage. Verify the system is not under load and confirm proper shutdown of the battery and inverter systems.
2. **Open the Battery Cabinet Door.** Access the battery pack compartment by opening the right-hand side battery cabinet door.

3. **Locate the MSD Slots:** The MSD slot is located on the of front each battery pack.

   Repeat for each MSD

   a. **Insert the MSD.** Insert the MSD into the battery pack's MSD receptacle slot with the handle in the unlocked upright position, as shown in the figure below.

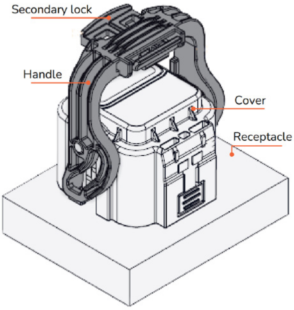


Figure 35. MSD Components

   b. Firmly press the MSD cover into the slot and rotate the handle down into the locking position to engage the cam mechanism.

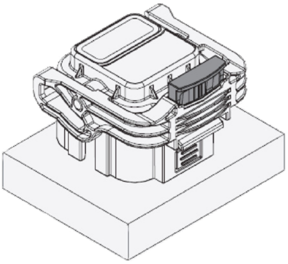


Figure 36. Rotate Handle

   c. Push in the secondary safety lock to complete the installation. Gently pull on the MSD to confirm it is locked in place.

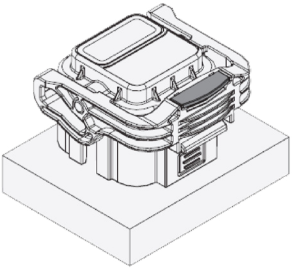


Figure 37. Secondary Safety Lock pushed in

Removal. To remove the MSD, reverse the process.

- Disengage the safety lock, press the handle release, lift the handle, and pull the MSD out using the handle.

7.6 Inverter Closed-Loop Communications

A closed-loop configuration is mandatory for stable and safe system operation. If communication is lost, the AES 210HV will initiate a shutdown, fulfilling Rapid Shutdown compliance requirements

Closed-loop communication is essential for the safe operation of the AES 210HV Battery Cabinet.

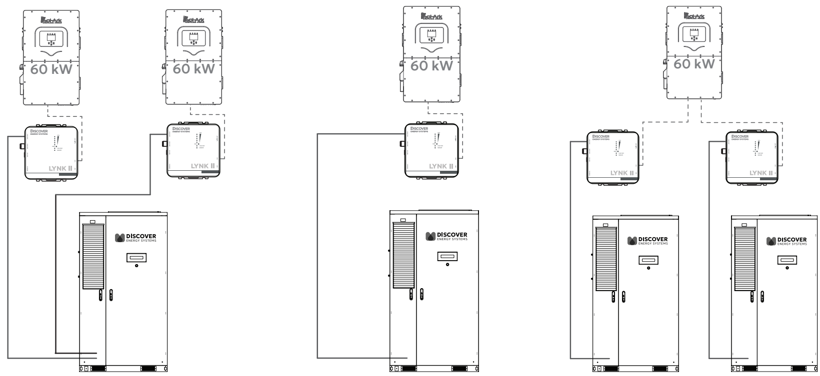


Figure 38. LYNK II Communication Examples

LYNK II Communication Gateway with Inverter

When properly connected to a closed-loop network and configured, the LYNK II Communication Gateway enables seamless communication between the AES 210HV battery and the PCS/Inverter. Once set up, the LYNK II:

- Transmits real-time battery parameters, including voltage, current, temperature, and state of charge (SOC), to the inverter.
- Relay charge/discharge voltage and current limits from the AES 210HV to the inverter for optimized battery management.

7.7 Rapid Shutdown Integration

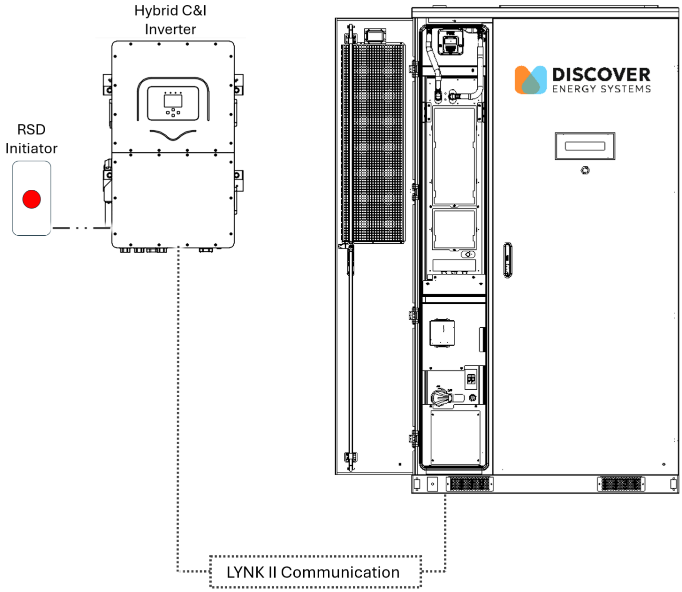


Figure 39. Rapid Shutdown Control

NOTE
Installation of Rapid Shutdown may not be required unless local regulations or project design specify. This feature supplements the preinstalled emergency shutdown button located on the front of the cabinet. This heartbeat feature is configurable and can be disabled where undesired.

- Integrate the inverter's Rapid Shutdown function with the designated Rapid Shutdown initiation device.
- Depending on the inverter's functionality, when a Rapid Shutdown event is triggered, it will either:
  - send a STOP command to the battery system, or
  - cease communication entirely.

When a Rapid Shutdown event occurs, the battery will begin shutting down within 30 seconds.

Communication Loss (Fail-Safe Mechanism)

If communication between the LYNK II and inverter is lost for more than 25 seconds:

- The inverter and battery will safely cease operation.
- The battery system will disconnect as part of the Rapid Shutdown process.
- This fail-safe approach ensures system safety, maintains Rapid Shutdown compliance, and prevents equipment damage in the event of communication failure.

Automatic Recovery

- The system will automatically resume operation when communication is restored, or the Rapid Shutdown is deactivated.
- If the Rapid Shutdown (heartbeat) feature is not required for the application, it can be deactivated in the LYNK Access system settings.
  - This may be applicable during commissioning, troubleshooting, off-grid setups, or highly redundant installations.

8. SYSTEM START-UP AND COMMISSIONING

NOTE
Follow these steps as a general guideline for system start-up and commissioning. For detailed, model-specific procedures, including configuration, safety checks, and integration requirements, refer to the inverter or Power Conversion System (PCS) integration guide.

8.1 Pre-Start-Up Checks

Procedure	Check
Inspect for Condensation. If moisture if present in the cabinet, ventilate and dry it with a cloth.	
Grounding System Check. Verify proper grounding connections.	
Verify Protection Devices. Check that all fuses, breakers, and safety devices are installed.	
Inspection of Physical Connections. Confirm the wiring, terminations, and fuses are securely fastened and torqued to specifications.	
Confirm Power Wiring. Verify battery power cables are properly connected and secured at both the DC Distribution Box and inverter and torqued to specifications.	
Verify DC Polarity. Confirm DC connections are set to the correct polarity.	
Verify AC Wiring. Check that incoming AC wiring is terminated correctly.	
Verify Communication Wiring. Check that all communication cables are properly terminated in the correct ports.	
Check for Liquid Leaks. Inspect piping and seals for any leaks.	
Inspect Terminals. Verify all wiring terminals are intact and undamaged.	
Wire Shield Installation. Verify the wire shields are properly installed on the HVB.	
Ensure MSDs are Correctly Installed. Confirm that all Manual Service Disconnects (MSDs) are properly engaged and locked in place.	
Foreign Object Removal. Remove any foreign objects from the cabinet.	
Lock and Secure Battery Pack Section. Ensure the door on the right-hand side of the battery cabinet is closed and locked. This door must remain closed during system operation; it cannot be opened while the system is active.	

8.2 Normal Start-Up Procedure

Procedure	Check
Confirm the Emergency Stop. Verify the Emergency Stop is **not** activated.	
Turn ON the AC Auxiliary Breaker. Switch on the AC auxiliary breaker to activate external AC power into the HVB. Make sure power is turned on at the source and at the breaker on the HVB. Verify the AC voltage is within the specified range.	
Turn on UPS. Switch the Uninterruptible Power Supply (UPS) to the ON position for system operation.	
Activate the DC Disconnect. Rotate the DC Disconnect handle clockwise to the ON position until it clicks and locks into place.	
Verify System Status. Check for any active alarms and ensure the system is active with a solid green indicator light. As the system goes through system checks and precharge initiation, it may take a few seconds for the system to fully activate.	

8.3 System Commissioning

Procedure	Check
Confirm Closed-Loop Communications. Use LYNK ACCESS software and the LYNK II Communication Gateway to confirm battery data (SOC, voltage, current) is shared with the inverter and its components.	
DC Battery Power Input. Verify the inverter is receiving DC battery power.	
Verify AC Voltage. Confirm incoming AC voltage is within the specified range.	
Verify Thermal Management System (TMS). Confirm the TMS is active and functioning properly.	
Inverter Battery Parameters. Confirm the inverter settings align with the required parameters, including low SOC shutdown and recharge values.	
Operational Stability. Run the system at the rated power and monitor for over-temperature, over-current, and under-voltage.	
Full Charge and Discharge Cycle. Perform a complete charge and discharge cycle of the battery under monitored conditions.	
Documentation. Document the commissioning process, including test results, performance, faults, system configurations, and any system behavior anomalies for future reference.	
Product Registration. Register the product after installation to activate the warranty and for ongoing support.	

8.4 Normal Shutdown Procedure

Procedure	Check
Set the System to Standby Mode. Verify the system is not actively charging or discharging before proceeding with shutdown.	
Press the Emergency Stop Button. Engage the Emergency Stop to disengage the integrated contacts in the HVB. This cuts the power to DC Power circuits.	
Turn off UPS. Power down the Uninterruptible Power Supply (UPS) using the UPS Switch on the HVB.	
Turn OFF the AC Auxiliary Breaker. Flip the AC Auxiliary Breaker on the HVB to the OFF position to disconnect external AC power from the system. Additionally, turn off AC power at the source for complete isolation from external power inputs.	
Rotate the DC Disconnect to OFF. Rotate the DC Disconnect handle to the OFF position to manually disconnect the DC circuits. **Note:** The DC Disconnect has a built-in locking tab. Secure it in the OFF position with the locking mechanism so the system remains de-energized during maintenance.	
Remove MSDs. Remove the Manual Service Disconnect (MSD) to isolate the high-voltage battery packs from the system during maintenance.	
Place Warning Sign. Post a clearly visible warning sign at the disconnect switch to prevent accidental re-energization. This sign must indicate that the system is under maintenance or shutdown and should not be operated.	
Engage Lockout/Tagout (LOTO). Follow proper Lockout/Tagout (LOTO) procedures. Place signs at the battery cabinet, disconnect, AC supply disconnect, and so on, ensuring the signs remain in place until all work is complete and the system is verified safe for re-energization.	

8.5 Emergency Shutdown Procedure

In the event of an emergency, follow these steps to safely shut down the system.

- **Press the Emergency Stop button.** This immediately de-energizes the cabinet by disengaging the integrated contacts in the HVB, cutting power to the DC circuits, and preventing further power flow through the system.
- **Turn off AC power at the source.** After activating the Emergency Stop, shut off the external AC source circuit to fully isolate the system. This provides an additional layer of safety, ensuring the system is completely disconnected from all external power inputs.

8.6 State of Charge (SOC) Algorithm

The AES 210HV battery system uses a multi-method SOC algorithm to ensure high accuracy and reliability in determining the State of Charge (SOC).

SOC Calculation Methods

1. **Coulomb Counting (Method #1)**
   - Active when the battery is charging or discharging (current ≠ 0).
   - Tracks the charge in and out of the battery in real-time to calculate SOC.
2. **Voltage-Based Lookup Table (Method #2)**
   - Activated when the battery has been idle (0 A current) for more than 2 hours.
   - Estimates SOC based on resting voltage using a predefined lookup table.
   - SOC adjustments using this method are limited to decreases only to prevent inaccuracies.

SOC Maintenance & Calibration

- The battery must complete a full charge or full discharge cycle every two weeks to maintain SOC accuracy.
- This process prevents SOC drift and ensures proper calibration of the algorithm.

Voltage-Based SOC Reference Points

- 100% SOC = 3.55V per cell (average)
- 0% SOC = 2.8V per cell (average)

This multi-method approach ensures precise SOC monitoring under various operating conditions, improving system performance and reliability.

9. MAINTENANCE

NOTICE
DAMAGE DUE TO IMPROPER MAINTENANCE Proper maintenance is essential for ensuring system reliability and longevity. The 805-0094 AES 210HV Maintenance Guide provides instructions on maintenance procedures and best practices. **Failure to follow these instructions may result in equipment damage.**

9.1 System Alarms (Cause and Troubleshooting)

Maintenance Alarm	Cause	Troubleshooting/Resolution
BMU Hardware Fault	BMU hardware failure or internal fault. (System Shutdown)	Inspect the affected battery pack, check all BMU and pack connections (internal/external), and replace the BMU if necessary.
BMU Voltage Detection Fault	BMU voltage detection failure or disconnected voltage input. (System Shutdown)	Inspect the affected battery pack, verify internal BMU connections, test BMU operation, and replace the battery pack if needed.

Maintenance Alarm	Cause	Troubleshooting/Resolution
BMU Communication Fault	BMU communication is inconsistent or unresponsive. (System Shutdown)	Check BMU and pack connections (internal/external), inspect for bent or corroded pins, and replace BMU or connectors if needed.
BMU Temperature Sensor Fault	BMU temperature detection failure. (System Shutdown)	Inspect internal BMU connections, verify BMU operation, and replace the affected battery pack if necessary.
Negative Contactor Fault	HV Box negative contactor not closing or not detected as closed. (Prevents System Start)	Check the 24 V control system, verify I/O input and contactor wiring, and replace the contactor if faulty.
Positive Contactor Fault	HV Box positive contactor not closing or not detected as closed. (Prevents System Start)	Inspect the 24 V control system, verify I/O input and contactor wiring, and replace the contactor if needed.
Precharge Fault	Precharge process failed due to an open disconnect or excessive precharge load. (Prevents System Start)	Verify system wiring, check if PCS disconnect is open, and inspect precharge resistance. Retry the precharge sequence; replace precharge system components if necessary.
Blown Fuse	HV Box fuse is open or blown due to overcurrent. (Prevents System Start)	Inspect fuse connections, check for continuity, and replace the fuse if needed.
E-Stop Initiated	Emergency stop button manually triggered. (System Shutdown)	Verify the status of the E-Stop button and reset it if necessary.
Current Shunt Fault	Faulty or loose current shunt connections affecting monitoring. (System Shutdown)	Inspect shunt connections, check for discoloration, and replace the shunt if necessary.
BCU Voltage Detection Fault	Inaccurate or disconnected voltage detection in HV Box. (Prevents System Start)	Inspect the MSD fuse, check BCU configuration, and verify all voltage detection connections. Replace the BCU if necessary.
BCU Abnormal Voltage Rise	Cell voltage increasing too quickly due to imbalance or connection issues. (System Shutdown)	Restart the system, verify all pack connections, identify the affected battery pack, and track voltage. Replace the battery pack if necessary.
Abnormal Cell Voltage High	Cell voltage exceeds safe limits due to imbalance.	Adjust the charging system's CV setpoint, track cell voltage, and initiate slow balancing. Replace the battery pack if needed.
Abnormal Cell Voltage Low	Cell voltage too low due to imbalance or poor connections.	Adjust the charging system's CV setpoint, track cell voltage, and discharge slowly. Replace the battery pack if necessary.

Maintenance Alarm	Cause	Troubleshooting/Resolution
Abnormally High Temperature	Temperature exceeds safe limits (>60°C). Possible TMS or battery pack issue.	Inspect TMS operation, check airflow and vents, ensure proper coolant circulation. Disconnect charger or load, and monitor system behavior. Replace TMS or battery pack if necessary.
BCU Contactor Override	The contactor was manually overridden.	Return the system to auto-control mode and restart if necessary.
Pack High Delta Voltage	Excessive voltage difference between battery packs due to imbalance or poor connections.	Verify all pack connections, check MSD installation, and balance-charge packs individually.
LYNK Communication Abnormal	Communication issue between BCU and LYNK.	Restart LYNK, check connections, and restart the system.
EMS Communication Abnormal	Communication issue between BCU and EMS.	Restart LYNK, check connections, and restart the system.
EMS Contactor Override	The contactor was manually overridden by the user.	Return the system to auto-control mode and restart if necessary.
EMS Communication Fault	Communication failure between BCU and EMS.	Restart LYNK, check connections, and restart the system.
Battery Pack Disabled	BCU detects a misconfigured BMU or BMU issue.	Check BCU and BMU configurations, verify pack communication cables, and reconfigure the system.
Battery Pack Offline	BMU missing or BMU-related issue detected.	Inspect MSD, verify BCU and BMU configurations, check pack communication cables, and reconfigure the system.
Pack Quantity Misconfigured	Incorrect number of BMUs detected.	Verify MSD installation, check BCU and BMU configurations, ensure proper pack communication, and reconfigure settings.

10. STORAGE GUIDELINES

NOTICE

DAMAGE DUE TO IMPROPER STORAGE

- Do not store the battery cabinet at a low or full State of Charge (SOC) for extended periods.
- If the SOC reaches a low level, immediately recharge the battery to prevent damage.
- Avoid long-term storage at full charge, as this can accelerate battery degradation.
- The recommended storage SOC is approximately 50%.
- Recharge the battery to 50% SOC every six months to maintain health and longevity.

Failure to follow these instructions may result in equipment damage.

Storage Environment

- Store the battery cabinet in a dry, clean, and well-ventilated location.
- Protect the cabinet from moisture, dust, and harmful gases.
- Do not store the cabinet near flammable, explosive, or corrosive substances.
- Cover the ventilation openings to prevent moisture or dust buildup inside the cabinet.

Storage Temperature Range

- The extreme storage range is -20°C to 45°C (-4°F to 113°F) with TMS operation required outside this range.
- If the system must be stored in temperatures outside the recommended range, the cabinet must be supplied with AC power to allow the Thermal Management System (TMS) to operate and maintain safe battery conditions.

Regular Inspections & Maintenance

Every 3 Months – Visual Inspection

- Inspect the battery cabinet for physical damage, corrosion, or moisture buildup.
- Ensure the storage environment remains within the recommended temperature range and is free of contaminants.

Cell Voltage Check (During Each Inspection)

- Verify that the average cell voltage is above 3.2V per cell.

Every 6 Months – Battery Health Check

- Check the average cell voltage.
- If the voltage drops below 3.2V per cell, recharge the battery to 50% SOC to prevent degradation and maintain long-term battery health.

Failure to follow these guidelines may lead to battery performance issues and potential equipment damage.

11. GLOSSARY OF TERMS, ABBREVIATIONS, AND ACRONYMS

AFB Arc Flash Protection Boundary	**AHJ** Authority Having Jurisdiction
BCU Battery Control Unit	**BMS** Battery Management System
BMU Battery Monitoring Unit	**C&I** Commercial and Industrial
COP Coefficient of Performance	**EMS** Energy Management System
HVB High Voltage Box	**LOTO** Lock Out Tag Out
MSD Manual Service Disconnect	**OCPD** Overcurrent Protection Device
PCS Power Conversion System	**PPE** Personal Protective Equipment
RSD Rapid Shutdown	**SOC** State of Charge
SPD Surge Protection Device	**THHN** Thermoplastic High Heat-Resistant Nylon-Coated
THWN Thermoplastic High Heat, Water-Resistant Nylon-Coated	**TMS** Thermal Management System
UPS Uninterruptible Power Supply	**UTP** Unshielded Twisted Pair
VLD Visible Lockable Disconnect	**VPC** Volts Per Cell

APPENDIX

A.1 AES 210HV COMMISSIONING CHECKLIST

This checklist is specific to the AES 210HV cabinet and should be used to confirm the correct installation and function of the cabinet during the commissioning of a complete energy storage system. Additional system-level test must be completed after the full battery energy storage system is integrated.

Cabinet Installation

Procedure	Check	Result
Ensure the cabinet is securely mounted to the foundation	Confirm that all anchors have been torqued to the manufacturer's specifications.	
Verify grounding installation	Confirm that the system is properly grounded via a ground rod or Ufer ground and meets local code requirements.	
Confirm correct DC polarity and wiring size	Verify correct polarity and wire sizing for expected system load requirements.	
Verify connection of battery home-run cables	Confirm home-run cables are securely connected to the DC Distribution Box and inverter.	
Ensure that MSDs are correctly installed	Verify each MSD is properly latched and engaged in the battery packs.	
Inspect AC auxiliary connections	Ensure AC input wiring is correctly sized (#10 AWG for 32 A circuit) and terminated properly.	
Verify communication wiring	Ensure communication wiring (CAN bus and intranet connection) is properly terminated.	
Check DC Distribution Box and terminal connections	Confirm DC Distribution Box and terminal connections are securely fastened and correctly polarized.	
Reinstall all terminal shields and covers	Ensure that all terminal covers and shields are securely fastened after wiring is complete.	

Battery Operation Verification

Procedure	Check	Result
Confirm all DC disconnect and overcurrent protection	Verify correct installation and rating of overcurrent protection and DC disconnect devices.	
Ensure the battery cabinet is powered on	Confirm that the battery cabinets are on, and the status LED indicates normal operation (solid green).	
Verify each battery cabinet status	Check for any fault indicators on the battery cabinets (amber or red LEDs) and address any issues accordingly.	
Test the thermal management system (TMS)	Ensure that the thermal management system is operational and functioning correctly.	
Run system under rated power load	Test the system under expected load and monitor for over-voltage, over-current, or thermal issues.	

Final Steps

Procedure	Check	Result
Close and lock all the cabinet doors	Secure the battery cabinet door, ensuring the system is safe and protected from unauthorized access.	
Document all testing results and configurations	Record all test results, system configurations, and any issues found during commissioning.	
Complete product registration	Register the product upon installation to activate the warranty and ensure future support.	

A.2 AES 210HV DECOMMISIONING CHECKLIST

This checklist is used to ensure the proper decommissioning and disassembly of the AES 210HV battery energy storage system. Additional system-level decommissioning procedures may be required for interconnected equipment.

Disconnection and Safety Procedures

Procedure	Check	Result
Open all disconnects	Ensure there is no electrical connection to any externally connected Hybrid Inverter System.	
De-energize internal busbars	Confirm the system is completely powered down and no voltage is present. Use a multimeter for verification.	
Disconnect external power sources	Ensure all AC and DC power sources have been safely disconnected and verified with a multimeter.	
Isolate Battery Packs	Pull the MSD from each battery pack one by one and confirm no voltage is present on battery cables.	

Disassembly of the AES 210HV

Procedure	Check	Result
Remove battery cabinet covers	Carefully remove the covers and shields for access to the internal components.	
Disconnect connections	Disconnect all external connections from the battery and inverter.	
Release cabinet anchors	Unscrew and remove all anchor bolts securing the AES 210HV to the concrete pad.	
Remove the battery cabinet	Safely remove the cabinet from its installed location using appropriate equipment.	

Disposal and Recycling

Procedure	Check	Result
Recycle components	Recycle all recyclable components in accordance with local and national recycling regulations.	
Dispose of non-recyclable components	Properly dispose of all non-recyclable components according to local waste disposal guidelines.	