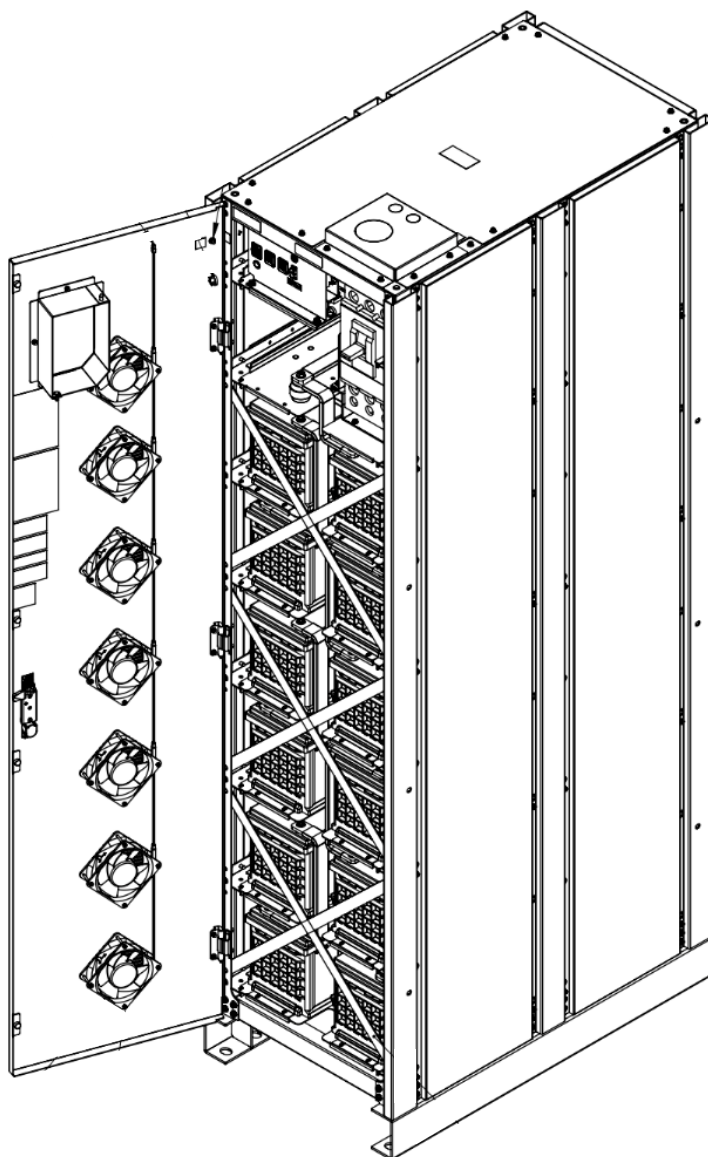




BC 2 Series UPS Battery Cabinets

BC 2, BC 2 - 300X, and BC 2 - 500



*BC 2, BC 2 - 300X, BC 2 - 500
UPS Battery Cabinet*

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Introduction

This manual contains information intended to help owners and operators understand how to safely and properly prepare, install, and operate ZincFive BC 2 Series UPS Battery Cabinets. The instructions in this manual must be followed in accordance with the Limited Warranty. Refer to ZincFive's *BC 2 Series UPS Battery Cabinet Service Manual* for information related to servicing and maintenance of the battery cabinet. Contact a ZincFive support representative, using the information listed below, if you have any questions.

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Support

For technical support, or questions about the safe installation, operation, or maintenance of ZincFive batteries, please contact a ZincFive support representative:

Phone: 888.517.7776

Email: productsupport@zincfive.com

Website: zincfive.com/support

Returns

For product returns, please contact a ZincFive support representative to obtain a return material authorization (RMA).

ZincFive, Inc.
20050 SW 112th Ave.
Tualatin, Oregon 97062

Email: productsupport@zincfive.com
Phone: 888.517.7776

Customer is responsible for properly packaging the product(s) for return. ZincFive does not warranty product damage from return shipping unless it is shipped in approved packaging and according to the approved packaging and shipping guidelines.

IMPORTANT SAFETY INSTRUCTIONS - SAVE THESE INSTRUCTIONS

THIS MANUAL CONTAINS IMPORTANT INSTRUCTIONS AND WARNINGS FOR ZINCfive's BC 2 SERIES UPS BATTERY CABINETS THAT SHOULD BE FOLLOWED DURING INSTALLATION, OPERATION, STORAGE AND MAINTENANCE OF THE BATTERY SYSTEM. FAILURE TO HEED THESE INSTRUCTIONS AND WARNINGS WILL VOID YOUR WARRANTY.

Safety

Safety Symbols

ZincFive BC Series UPS Battery Cabinets are carefully designed and manufactured to ensure that they are safe and reliable products when used properly. To ensure the safe and proper use of the ZincFive BC Series UPS Battery Cabinet, the following symbols are used throughout this manual or on the equipment. Operators, buyers, and technicians must observe each occurrence of these symbols as they appear throughout the document. Only qualified personnel should carry out the instructions accompanied by these symbols.



DANGER Symbol

DANGER:

An electrical danger exists in this area. Use extreme caution at all times.

DANGER:

Un danger électrique existe dans ce domaine. Faites preuve d'une extrême prudence en tout temps.



CAUTION Symbol

CAUTION:

Important information or operating instructions. Follow them exactly.

ATTENTION:

Informations importantes ou instructions d'exploitation. Suivez-les exactement.



Protective Earth/Ground Symbol

GROUND SYMBOL:

Used to designate a connection point to ground.

*Symbole de terre de protection/
symbole de terre*

SYMBOLE DE SOL:

Désigne un point de connexion à la terre.



Read the Instructions Symbol

READ THE INSTRUCTIONS:

Read and understand the manual and all safety instructions carefully before using this equipment.



WEEE Disposal Symbol

ELECTRONIC DEVICE: DO NOT THROW AWAY

Proper disposal of batteries is required. Refer to your local codes for disposal requirements.

Battery Safety

-  The battery must be installed by qualified personnel in accordance with the latest edition of the National Electrical Code ANSI/NFPA 70 and/or Canadian Electrical Code, Part I, CSA C22.1.
-  To prevent accidental shorts, shocks or electrocutions, never let water or any form of liquid touch, surround or enter the batteries.
-  Do not operate the batteries with damaged cables and wires. Defective cables and wires must be replaced before system installation. Prior to system installation, verify that all cables and wires are properly secured and connected. Faulty connections can interrupt operation and cause irreparable damage to this product.
-  Opening or attempting to dismantle the battery case will void the warranty and create a risk of electrical short circuit, burns, or other physical harm.
-  Do not dispose of batteries in a fire as the batteries may explode.
-  Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes and it may be toxic.
-  A battery can present a risk of electrical shock and high short-circuit current. Contact with any part of a grounded battery can result in electrical shock. The following precautions should be observed when working on batteries:
 1. Remove watches, rings, or other metal objects.
 2. Use tools with insulated handles.
 3. Wear rubber gloves and boots.
 4. Do not lay tools or metal parts on top of batteries.
 5. Disconnect the charging source and load prior to installing or maintaining the battery.
 6. Remove battery grounds during installation and maintenance to reduce the likelihood of shock.
 7. Remove the connection from ground if any part of the battery is determined to be grounded.

Notes:

1. The batteries used in the BC Series UPS Battery Cabinets, Z5 13-80 H S F and Z5 13-90 U S F, were tested by UL Solutions at the cell level, in accordance with UL 9540A on 11/21/2019 and 02/14/24, and did not exhibit thermal runaway. See UL File E518051 for further reference.
2. If an emergency situation exists, please contact 911 or the local fire department for assistance. ONLY if it is safe to do so, isolate the battery cabinet from the system by opening the battery breaker OR wait until emergency personnel have arrived and determined the area to be safe. Contact ZincFive for any other questions or concerns.

Battery Warnings and Cautions

-  SHIELD EYES WITH PROTECTIVE GEAR AT ALL TIMES.
NO SPARKS, FLAMES, OR SMOKING.
ALKALINE ELECTROLYTES.
FLUSH EYES IMMEDIATELY WITH WATER.
WET NON-SPILLABLE.
DO NOT INCINERATE, PUNCTURE, OR IMPACT.
DO NOT SHORT CIRCUIT.
KEEP OUT OF REACH OF CHILDREN. DO NOT TIP. KEEP LEVEL.
WARNING: RISK OF FIRE, EXPLOSION, OR BURNS. DO NOT DISASSEMBLE, HEAT ABOVE 75°C, OR INCINERATE.

Safety Precautions

The battery cabinet(s) must be installed by qualified personnel according to the local and national regulations and requirements, defined below. Install the battery cabinet according to the following standards (depending on your local area):

1. **National Electrical Code NFPA 70**
2. **Canadian Electrical Code CSA C22.1**

The battery cabinet must be installed indoors only, in a temperature-controlled area free of conductive contaminants. Install on a level, solid surface (e.g. concrete or floor stand) that can support the weight of the system.

Follow all safety precautions when working on this system and always wear proper safety equipment including eye protection.



**HAZARD OF ELECTRIC SHOCK, EXPLOSION,
OR ARC FLASH**

1. **HIGH VOLTAGE:** The battery cabinet voltage varies by model between 360 Vdc to 600 Vdc.
2. **MAXIMUM FAULT INTERRUPTING RATING (MAIN CIRCUIT BREAKER):** 20 kA, 35 kA, and 50 kA options (instantaneous trip ≤ 20 mS for any current ≥ 7800 A)
3. **ARC FLASH DETAILS:** Refer to the Arc Flash Details in ZincFive's *BC Series UPS Battery Cabinet Service Manual*.
4. **MAXIMUM AVAILABLE OUTPUT FAULT CURRENT:** BC 2: 5400 A or BC 2 - 300X and BC 2 - 500: 6200 A.

Tools

Use insulated tools for all installation and maintenance. The batteries and all bolts come pre-torqued and marked. The tools needed for final installation include:

- An insulated Flat Head Screwdriver and wrench (Installation of AC wires to terminal block, tightening cord grips)
- Insulated 8 mm or 5/16" Hex driver bit (DC Breaker termination)
- Long and short #2 Philips head screwdriver.
- Insulated Torque Wrench with crow's foot adapter and 10 mm Socket (Battery bolts, Faceplate)
- 8 mm socket (Cover, side panels, and GND screw)

Sécurité de la batterie

-  Cette batterie doit être installée par un personnel qualifié conformément à la dernière édition du National Electrical Code ANSI/NFPA 70 et/ou du Code canadien de l'électricité, Partie I, CSA C22.1.
-  Pour éviter des courts-circuits, des chocs ou des électrocutions accidentels, ne jamais laisser de l'eau ou toute forme de liquide toucher, entourer ou pénétrer dans les piles.
-  Ne pas faire fonctionner les batteries avec des câbles et des fils endommagés. Les câbles et fils défectueux doivent être remplacés avant l'installation du système. Avant l'installation du système, vérifier que tous les câbles et fils sont correctement fixés et connectés. Des raccords défectueux peuvent interrompre le fonctionnement et causer des dommages irréparables à ce produit.
-  L'ouverture ou la tentative de démontage du boîtier de la batterie annule la garantie et crée un risque de court-circuit électrique, de brûlures ou d'autres dommages physiques.
-  Ne pas jeter les batteries dans un feu. Elles peuvent exploser.
-  Ne pas ouvrir ou endommager les batteries. L'électrolyte libéré est nocif pour la peau et les yeux. Cela peut être toxique.
-  Une batterie peut présenter un risque de choc électrique et de courant de court-circuit élevé. Tout contact avec une partie quelconque d'une batterie mise à la terre peut entraîner un choc électrique. Les précautions suivantes doivent être observées lorsque vous travaillez sur des batteries :
 1. Retirer toutes montres, bagues ou autres objets métalliques.
 2. Utiliser des outils avec des poignées isolées.
 3. Porter des gants et des bottes en caoutchouc.
 4. Ne pas poser d'outils ou de pièces métalliques sur les batteries.
 5. Déconnecter la source de charge et la charge avant d'installer ou d'entretenir la batterie.
 6. Retirez les mises à la terre de la batterie pendant l'installation et l'entretien afin de réduire les risques de choc.
 7. Retirer le raccordement à la terre si une partie de la batterie est déterminée comme étant mise à la terre.

Notes:

1. Les batteries utilisées dans les armoires de batteries UPS série BC, Z5 13-80 H S F et Z5 13-90 U S F, ont été testées par UL Solutions au niveau des cellules, conformément à UL 9540A le 21/11/2019 et le 14/02/24. , et n'a pas présenté d'emballement thermique. Voir le fichier UL E518051 pour référence supplémentaire.
2. En cas d'urgence, veuillez contacter le 911 ou le service d'incendie local pour obtenir de l'aide. Si vous pouvez le faire en toute sécurité, isolez l'armoire de batteries du système en ouvrant le disjoncteur de batterie. Attendez l'arrivée du personnel d'urgence et jugez la zone sûre avant de prendre toute autre mesure. Contactez ZincFive pour toute question ou préoccupation.

Avertissements et mises en garde sur la batterie

-  PROTÉGER LES YEUX EN TOUT TEMPS AVEC UN ÉQUIPEMENT DE PROTECTION.
PAS D'ÉTINCELLES OU DE FLAMMES. INTERDICTION DE FUMER.
ÉLECTROLYTES ALCALINS.
RINCER LES YEUX IMMÉDIATEMENT AVEC DE L'EAU.
HUMIDE ÉTANCHE.
NE PAS INCINÉRER, PERFORER OU COGNER.
NE PAS COURT-CIRCUITER.
TENIR HORS DE PORTÉE DES ENFANTS. NE PAS RENVERSER. MAINTENIR À NIVEAU.
ATTENTION : RISQUE D'INCENDIE, D'EXPLOSION OU DE BRÛLURES. NE PAS DÉMONTER, CHAUFFER AU-DESSUS DE 75°C, OU INCINÉRER.

Précautions de sécurité

Ce produit doit être installé par un personnel qualifié conformément aux exigences définies ci-dessous. L'armoire de batterie doit être installée conformément aux règlements locaux et nationaux. Installez l'armoire de batterie selon les normes suivantes (en fonction de votre région):

1. **Code national de l'électricité NFPA 70**
2. **Code canadien de l'électricité CSA C22.1**

L'armoire de batterie doit être installée dans une zone à température contrôlée exempte de contaminants conducteurs. Installez sur une surface plane, solide (par exemple, support en béton ou au sol) capable de supporter le poids du système.

Suivez toutes les précautions de sécurité lorsque vous travaillez sur le système et portez toujours l'équipement de sécurité approprié, notamment une protection oculaire.



**RISQUE DE CHOC ÉLECTRIQUE, D'EXPLOSION
OU D'ÉCLAT D'ARC ÉLECTRIQUE**

1. **HAUTE TENSION** : La tension d'armoire de batteries varie selon le modèle entre 360 VDC to 600 VDC.
2. **VALEUR ASSIGNÉE DE RUPTURE MAXIMALE (DISJONCTEUR)** : 20 kA, 35 kA, and 50 kA (déclenchement instantané < 20 mS pour tout courant $\geq 7\,800$ A)
3. **DÉTAILS DE L'ÉCLAT D'ARC ÉLECTRIQUE** : Reportez-vous aux détails sur les arcs électriques dans le manuel d'entretien de l'armoire à batteries UPS de la série BC de ZincFive.
4. **COURANT DE DÉFAUT DE SORTIE MAXIMUM DISPONIBLE** : BC 2 - 5400 A or BC 2-300X and BC 2-500 - 6200 A.

Outils

Utilisez des outils isolés pour toute tâche d'installation et d'entretien. Les batteries et tous les boulons sont préserrés et marqués. Outils nécessaires pour l'installation finale :

- Un tournevis à tête plate isolé : Pour installer les fils c.a. au bornier.
- Embout de tournevis hexagonal isolé 8 mm ou 5/16 po pour le raccordement du disjoncteur c.c.
- Tournevis cruciforme no 2 long et court.
- Clé dynamométrique isolée avec douille de 10 mm : Pour les boulons de batterie.

ZincFive BC 2 Series UPS Battery Cabinet Introduction

Each ZincFive BC 2 Series UPS Battery Cabinet features ZincFive's patented Nickel-Zinc batteries and a built-in battery monitoring system (BMS). The battery cabinet is designed as a long-life, reliable solution for the Mission Critical Data Center space. See BC 2 Series Versions and Model Numbers in the Appendix for additional details on individual cabinet solutions. For an overview of battery cabinet design, see BC 2 Series UPS Battery Cabinet Features below. Additionally, refer to pg. 23 for details on the integrated battery monitoring solution, which provides highly-detailed information on the operation and performance of the battery system, accessible through the customer interface portal.

Versions and Model Numbers

There are three distinct UPS battery cabinet versions within the ZincFive BC 2 Series: BC 2, BC 2 - 300X, and BC 2 - 500. Each cabinet features a reliable, safe, and sustainable immediate power solution (IPS) with individual versions demonstrating increasing power density and decreasing footprints as the series progresses. All cabinets can house 36, 37, 38, or 39 batteries to support various UPS runtimes and voltage requirements. This manual includes instructions for each battery solution and cabinet version.

Each battery cabinet has a specific model number which differs from the series name, but reflects variables such as version, battery count, power supply, color, and other manufacturing details. A comprehensive breakdown of model nomenclature for the ZincFive BC Series is located in Appendix E on pg. 39.

Battery Cabinet Features

The BC Series UPS Battery Cabinet is an extremely feature rich design. Some of the major design features are highlighted below.

- A low weight and compact cabinet design that is easy to install.
- An accessible breaker door for safer operation.
- Draw-out trays, which simplify battery maintenance.
- An Integrated Battery Monitoring System that provides real time data and alarms.
- High current discharge capability of up to 1200A continuous.
- Reduced recharge times due to 160A maximum recharge current.
- Wide operating temperature range.
- IEC 62040-1, IEC 62040-2.
- UL1973, UL9540, UL1778
- CAN/CSA C22.2 No. 107.3
- CE, RoHs, and FCC Compliant
- Cabinet is seismic rated to IBC 2021.

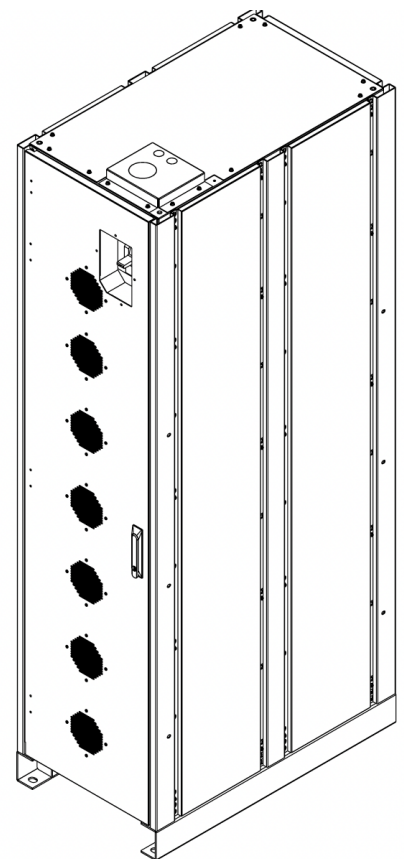


Figure 1- BC 2 UPS Battery Cabinet.

Shipping and Unpacking



USE CAUTION WHEN MOVING! DO NOT LIFT FROM THE TOP OF THE CABINET AS IT WILL NOT SUPPORT THE FRAME WEIGHT. THE CABINET HAS A CENTER OF GRAVITY BETWEEN 38.2" AND 39.7" DEPENDING ON BATTERY COUNT. REFER TO APPENDIX A FOR ADDITIONAL MOVING DETAILS.

The battery cabinet comes fully assembled and is shipped upright on a pallet, in an air ride equipped truck. Upon arrival follow these steps:

1. Inspect the outside of the cabinet for visible damage prior to signing for release.
 - a. It is the responsibility of the person receiving the shipment to inventory and fully inspect all materials against the bill of lading, or weigh the bill immediately while the carrier representative is still present. Ensure that all items are accounted for, including the number of skids and quantity of boxes. Also note any visible external damage that may have occurred during transit. Make all applicable notations on the delivery receipt before signing and file a damage report with the carrier.
 - b. Examine the **Tilt** and **Shock** sensors on the cabinet. Both are just notifications to show the unit may have been exposed to excessive forces and that inspection is required to ensure no damage was done. Units received should be accepted from the shipper, but the activation must be noted with the shipper at the time of acceptance.
2. Remove foam wrap, protectors, and clear plastic over the battery cabinet. There are no strap downs on the batteries - everything remains secure and in place.
3. Perform a visual inspection of the cabinet.
 - a. Open the door and examine all the batteries/drawers to make sure everything is still secure and attached.
 - b. Check the seismic brackets to ensure bolts are present and secure.
 - c. Check any torque seal markers on batteries.
 - d. Immediately unpack the system and check for any concealed damage. Check the materials received against the detailed packing list to verify the quantity and the condition as complete and satisfactory.
 - e. Note observations of any liquid or crystallized electrolyte on the sides of the batteries.
4. To return any damaged goods, please contact a ZincFive support representative to obtain a return material authorization (RMA). ZincFive does not warranty product damage from return shipping unless it is shipped in approved packaging - please ensure all packaging material is saved.
 - a. Remove all bolts holding the cabinet to the pallet.
 - b. Carefully move the cabinet to the install location using the necessary fork lift/pallet jack. Spread forks as wide as possible when lifting.
 - c. Keep the cabinet as low as possible to keep the center of gravity as low as possible.
 - d. The cabinet is designed to be movable while fully loaded with batteries.



Figure 2- Palletized Battery Cabinet Packaging.

BC 2 Series Storage Requirements

To limit drift in State of Charge (SOC) during extended storage, the batteries must not be stored for more than six months without recharging. If attached to a UPS that remains de-energized for a long period, energizing the UPS system every six months for a 12-hour period is recommended in order to recharge batteries. Refer to the table below for further detail on storage procedure.



CUSTOMERS MUST STRICTLY ADHERE TO BATTERY STORAGE REQUIREMENTS. FAILURE TO DO SO MAY IMPACT BATTERY PERFORMANCE AND VOID YOUR WARRANTY.

BC Series Storage Requirements			
Storage Temperature (°C)	Storage Time	Boost Frequency From Start of Storage Time	Conditioning Requirements
-20 < T	DO NOT store @ < -20°C		
-20 < T < 5	6 months	No Boost	Conditioning Phase 2
	12-18 months	Every 3 months	Full Conditioning: Phases 1 and 2
5 < T < 35	3 months	No Boost	Conditioning Phase 2
	6 months	No Boost	Full Conditioning: Phases 1 and 2
	6 months	Every 3 months	Conditioning Phase 2
	12 months*	1 boost at 6 months	Full Conditioning: Phases 1 and 2
	12 months*	Every 3 months	Conditioning Phase 2
	12-18 months*	Every 3 months	Full Conditioning: Phases 1 and 2
35 < T < 45	6 months	Every 3 months	Full Conditioning: Phases 1 and 2
	12-18 months*	Every 3 months	Full Conditioning: Phases 1 and 2
T > 45	DO NOT store @ > 45°C for more than 5% of storage time		
T > 50	DO NOT store @ > 50°C		
*Warranty Implications	Note: The warranty starts at 6 months, regardless of storage length or boost interval. If batteries are stored beyond 6 months without a boost charge, any failed batteries found during conditioning or commissioning will not be covered.		

Placement and Bolt Down

The battery cabinet has several bolt locations for securing to the floor. Refer to Appendix D for bolt hole locations and spacing requirements. Either the A or B bolt patterns will meet a seismic rating of 2.29 g.

See the below *IBC 2021 Seismic Product Data Sheet* for specifics.

IBC 2021 Seismic Product Data Sheet

ZincFive BC 2 Battery Cabinet

This data sheet provides a summary of the analysis and verification of the seismic performance for the ZincFive BC 2 battery cabinet. The seismic design capability of the cabinet was analyzed according to IBC 2021 / ASCE 7-16 and varies according to the following installation configurations:

Single battery cabinet without internal seismic brackets: **0.36 g** (Cs)

Single battery cabinet with internal seismic brackets: **0.86 g** (Cs)

Multiple battery cabinets ganged together without internal seismic brackets: **0.47 g** (Cs)

Multiple battery cabinets ganged together with internal seismic brackets: **0.95 g** (Cs)

A single battery cabinet with the internal seismic brackets (configuration 2 above) was used to validate the seismic design capability of the cabinet according to ICC AC156. The test value (Sds) of **2.29 g** was calculated based on the following values from ASCE 7-16: $z/h = 1$, $I_e = 1.5$, and $R = 4.0$. The cabinet passed the test without structural damage, validating the analyzed design configurations.

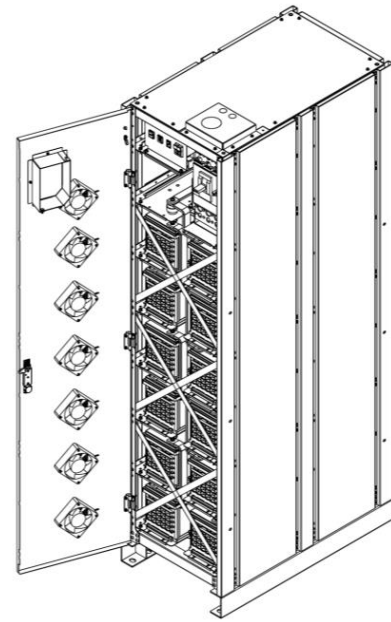


Figure 3- Open BC 2 UPS Battery Cabinet.

The Cs value can be used to determine the seismic capability of the battery cabinet at the installation site. For example, assuming the following values from ASCE 7-16: $F_a = 1.2$, $I_e = 1.5$, and $R = 4.0$, the capability of configurations 1 through 4 above cover 94.0%, 96.6%, 99.4 %, and 99.8% of the counties in the USA, respectively.

Code References:

- a) International Building Code (IBC), International Code Council, 2021
- b) Minimum Design Loads for Buildings and Other Structures, ASCE 7-16
- c) Steel Construction Manual, AISC A360-16
- d) Engineering detailed report and qualification test report issued by "Clark Dynamic Test Laboratory Inc" available by request.

Anchoring Instructions

1. Mark and drill the ground holes and set the bolts in the correct pattern prior to setting the cabinet in place.
 - a. One at a time, set each cabinet in place with anchor bolts installed to allow for side access as needed.
 - b. Access to the rear A or B bolt locations is possible through the front with a wrench extension.
 - c. Access to rear bolt locations is easiest if greater than 6.0 in. or 152 mm of clearance is available.
 - d. If a wrench extension is unavailable or rear clearance is less than 6.0 in. or 152 mm, then access to the A or B rear bolt locations may require pulling the bottom battery tray out by 30% and removing the side panels. For tray removal instructions reference ZincFive's *BC 2 Series UPS Battery Cabinet Service Manual*.



DO NOT ATTEMPT TO WELD THE CABINET TO THE GROUND. TO ENSURE PROPER SEISMIC RATING, ALL CABINETS MUST BE ANCHORED TO THE GROUND UTILIZING APPROPRIATELY SIZED BOLTS, BEST SUITED FOR THE INSTALLATION SITE.

2. Anchoring is the responsibility of the customer and is site and seismic rating dependent. Refer to local professionals for the specific anchoring procedure, and the *IBC 2021 Seismic Product Data Sheet* on pg 12 for seismic specifics.
3. Anchor the frame using customer-supplied nuts and bolts that are appropriately sized for the installation site.
 - a. Anchor bolt hole dimension: 0.75"
4. Required battery cabinet clearances:
 - a. Rear - Greater than 0.5 in. or 12.7 mm for heat rejection, greater than 6 in. or 152 mm for the easiest installation.
 - b. Front - 35 in. or 890 mm for full tray removal and battery access.
 - c. Side - N/A
 - d. Top - 24 in. or 610 mm. clearance is required to service the battery system via the top panel.
 - **Nothing can be mounted or supported from the top removable panel. Refer to Figure 9 on pg. 15 for a field example of appropriate clearance at the top of the battery cabinet.**

Additional Inspection

Once the cabinet is placed at its final install location, perform a final inspection. Follow all safety precautions when working on this system and always wear the proper safety equipment, including eye protection. The cabinet voltage will exceed 500 V between some of the batteries/components.

1. Inspect all of the installed batteries:
 - a. Conduct a visual and torque inspection of battery string and cables. Examine torque markings and torque check all battery connections to ensure there are no loose connections. Torque to: 9.1 +/- 0.9 N-m.
 - b. Thoroughly inspect the inside and outside of the cabinet for damage.
 - c. If batteries require a re-torque, the side panels may be removed to gain access or utilization of shelf tray support.
2. Confirm battery cabinet wiring:
 - a. Ensure there is no loose wiring and all connections are still secure.
 - b. Check the BMS wiring on the BMS and Power shelves to confirm that nothing loosened during placement. Access is possible through the top panel as well as the slide out trays.
3. Confirm battery voltage:
 - a. Check that all batteries are within +/-0.3 V of one another. Since all batteries ship at 50% State of Charge (SOC), the batteries will likely be around 13.5 +/- 0.3 V.

Field Connections

Prior to initiating the power ON sequence, a licensed electrician should complete the below required connections according to site specific electrical codes.

1. **Ground:** Connect the ground wire to the ground nut at the top of the cabinet, as shown in Figure 4 (top right).



INSTALLERS MUST USE THE GROUND NUT SPECIFIED. GROUNDING TO ANY OTHER AREA OF THE CABINET IS NOT ADVISED AND DOES NOT ALIGN WITH ZINC-FIVE DESIGN SPECIFICATIONS. ALL PROCEDURES SHOULD ALIGN WITH SITE SPECIFIC ELECTRICAL CODES.

2. **DC:** Connect the positive and negative conductors to the circuit breaker. Refer to Figures 4 and 5 a/b for information.
 - a. Ensure all power is off before attempting to connect.
 - b. Attach positive conductor(s) to Terminal 1 at the top of the breaker
 - c. Attach the negative conductor(s) to Terminal 3 at the top of the breaker.
 - d. Circuit breaker torque and wire details:
 - Torque to: 442 in-lb/50 N-m
 - Wire Details: Use 90°C rated or higher, between #2/0 AWG - 500 kcmil Copper or Aluminum.
 - Refer to Appendix C for the circuit breaker connection connection details.

3. **AC:** Connect the ground, neutral, and line to the terminal block for incoming AC. Refer to Figures 5 a/b through 8.
 - a. String AC connects to the terminal block and requires a 9 mm stripped length. Torque all screws to 0.7 N-m (6.19 in-lbs).
 - Wire details: Use 75/90°C rated or higher between #14 to #10 AWG (2.5 to 5.0 mm²) solid/stranded copper.
 - b. AC GND connects to the terminal block and requires a 9 mm stripped length. Torque all screws to 0.7 N-m (6.19 in-lbs). Remove the faceplate (10 mm) to access.
 - Wire Details: Use 75/90°C rated or higher between #18 to #10 AWG (0.82 to 5.0 mm²) solid/stranded copper.
 - The AC power must be supplied by a 100 Watt UPS backed circuit to ensure the BMS remains powered on, allowing the system to function when in backup during a power outage.



NO UNAUTHORIZED MODIFICATIONS SHALL BE MADE TO THE TOP OF THE CABINET, INCLUDING MOUNTING, DRILLING HOLES, ITEM PLACEMENT. FAILURE TO MAINTAIN PROPER TOP CLEARANCE COULD IMPACT SAFETY.

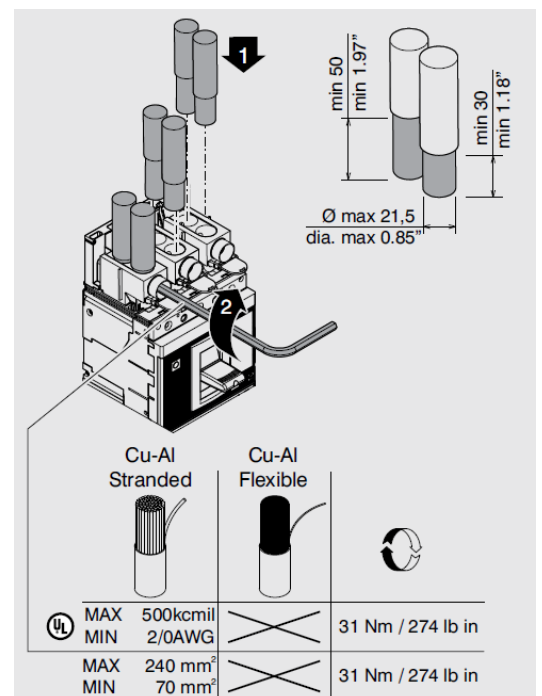
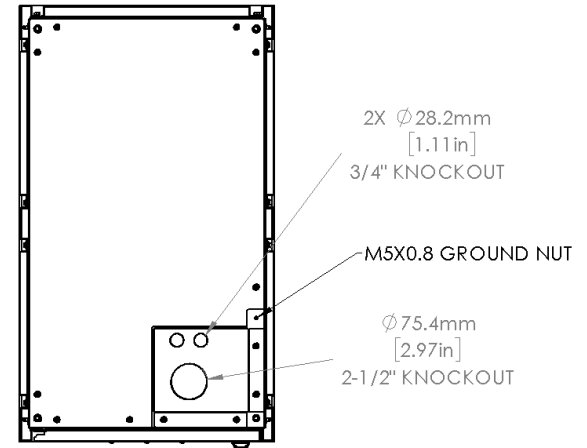


Figure 4 (Top) - Knockout and ground details for the top panel of the cabinet.

Figure 5 a/b- SQD (Middle) and ABB (Bottom) Breaker connection specifications.

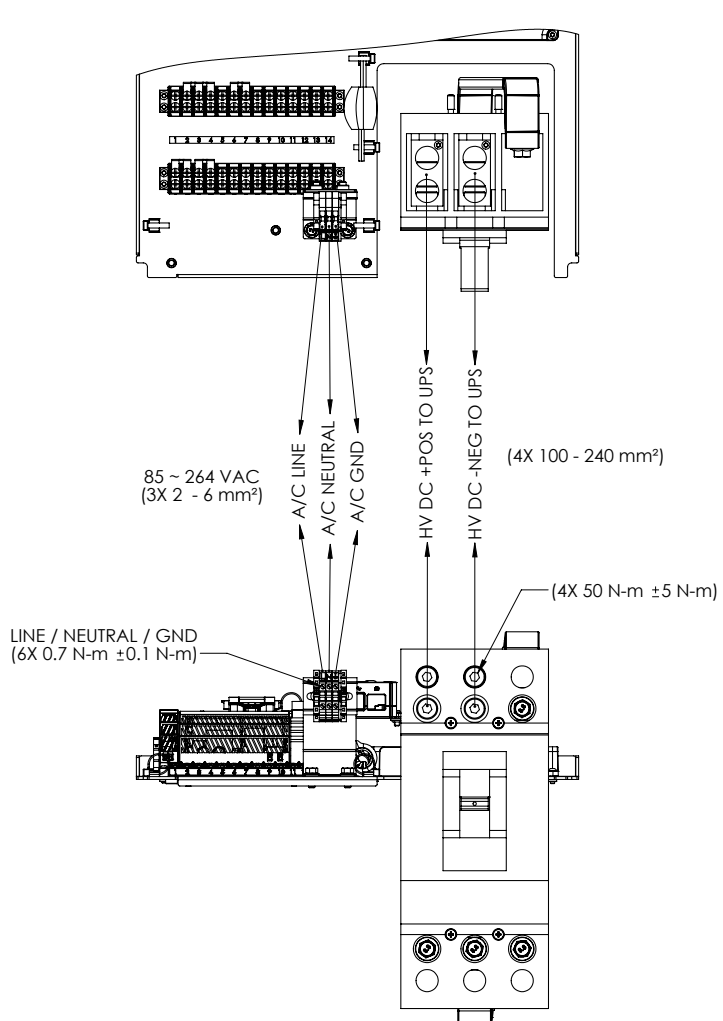


Figure 6a - A/C DC Interface for SQD Breaker.

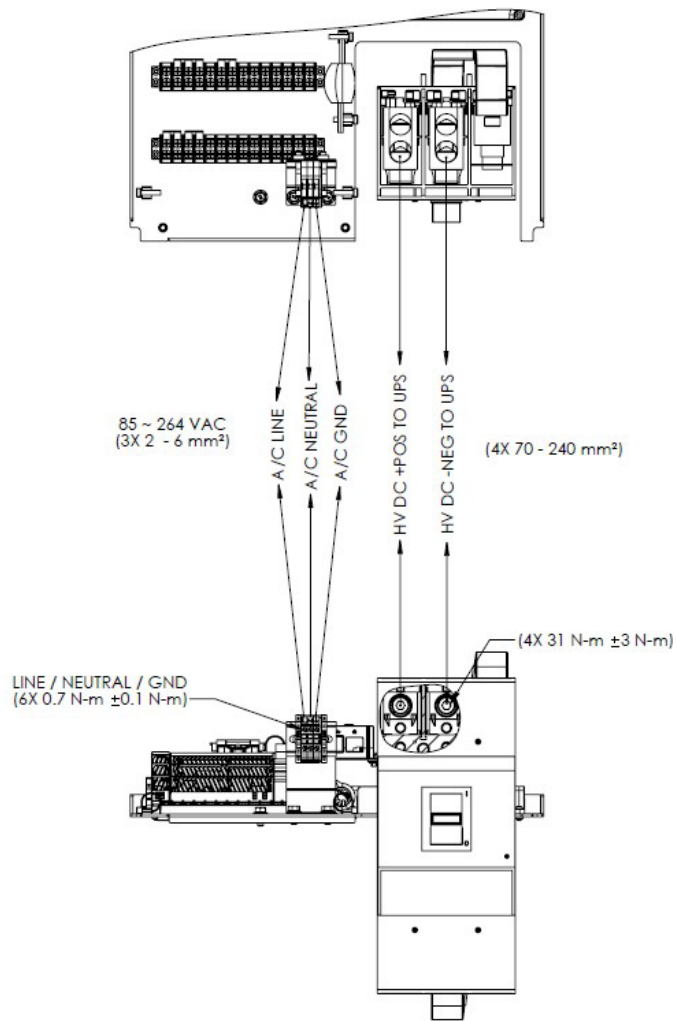


Figure 6b - A/C DC Interface for ABB Breaker.

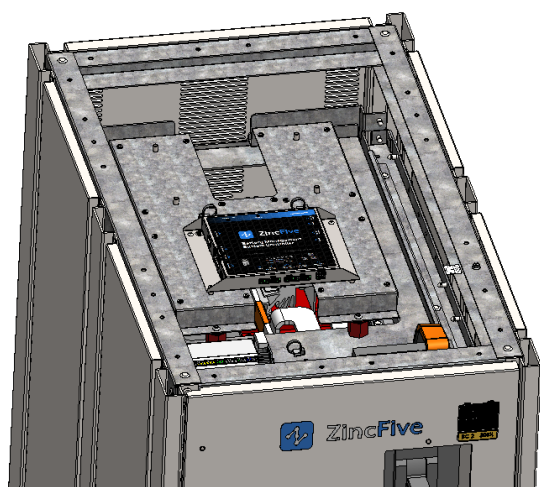


Figure 7 - AC Input wiring (right side at the front of the cabinet) and ON/OFF Switch.



Figure 8 - Field example of standard wire installation

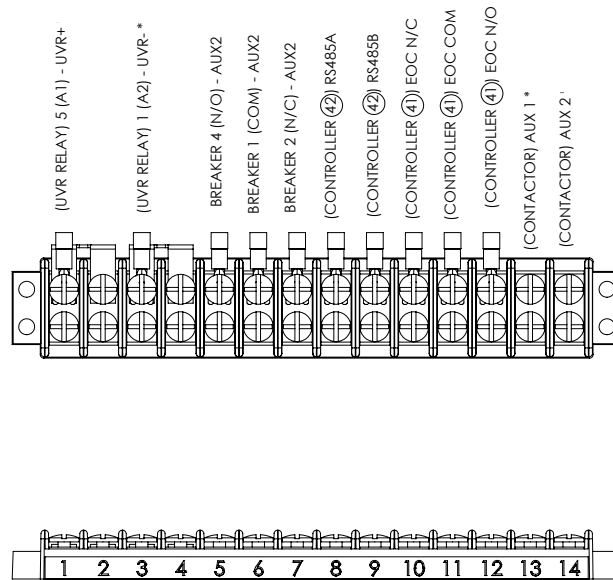


Figure 9 - Customer Terminal Block.

4. UVR/SHUNT and AUX Access: For UPS Systems that require an interface to the circuit breaker, a customer accessible Terminal Block is provided. Utilize 14-16 AWG UL approved wire and #6 spade connectors.
 - a. UVR/Shunt Relay – A relay coil is available to facilitate external UPS connection to the battery circuit breaker - see Figure 9 for details.
 - b. Once the battery cabinet is configured with UVR access, wait until the UPS outputs its rated UVR voltage, prior to turning on the circuit breaker.
 - UVR/Shunt Pin 1 = POSITIVE (+) Polarity
 - UVR/Shunt Pin 3 = NEGATIVE (-) Polarity
 - c. Once the battery cabinet is configured with shunt access, the circuit breaker will trip when the UPS outputs its rated shunt trip voltage.
 - d. AUX circuit breaker access is available via NO, NC, and COM on the terminal block provided. See Figure 9 for details.
5. Modbus RTU and Aux Contactor access:
 - a. Modbus RTU – Pins 8 and 9 are available for Modbus RTU access.
 - b. Dry Contact – Pins 10, 11, and 12 are available for use as a customer specified Dry Contact Operation.
Note: If a customer wishes to utilize this feature, NRE and FW customization are required. Please contact ZincFive Service and Support for further detail: productsupport@zincfive.com
 - c. Aux Contactor – Pins 13, 14 are available to track the status of the Contactor (Shorted = Closed).
Note: This feature may not be available for all cabinet configurations.
6. Confirm all the harnesses are secured to the BMS (Top box) by an authorized service personnel.
7. Connect the ethernet cable to the faceplate (top left panel inside the door) if any remote monitoring of the battery cabinet is desired.
8. Confirm all batteries are within +/- 0.3 V of one another. Since all batteries ship between 30-50% SOC, it is likely the batteries will be around 13.5 +/- 0.3 V.

9. Enable the DC Power (UPS/Charger)

- Ensure the UPS or battery charger is set to the recommended settings for battery system operation
- Close the Breaker- the system is now able to move out of the **Standby State** and is now ready to function.
- If the SOC is below 90% and battery temperatures are all $>15^{\circ}\text{C}$ and $<40^{\circ}\text{C}$, the system immediately transitions into a **Charge State**.
 - Regardless of the SOC, the system may try to transition into a Charge State if it was recently power cycled.

10. Perform a discharge to confirm the system is working properly and without errors. For commissioning and conditioning procedures, please reference ZincFive's *BC 2 Series UPS Battery Cabinet Service Manual*.

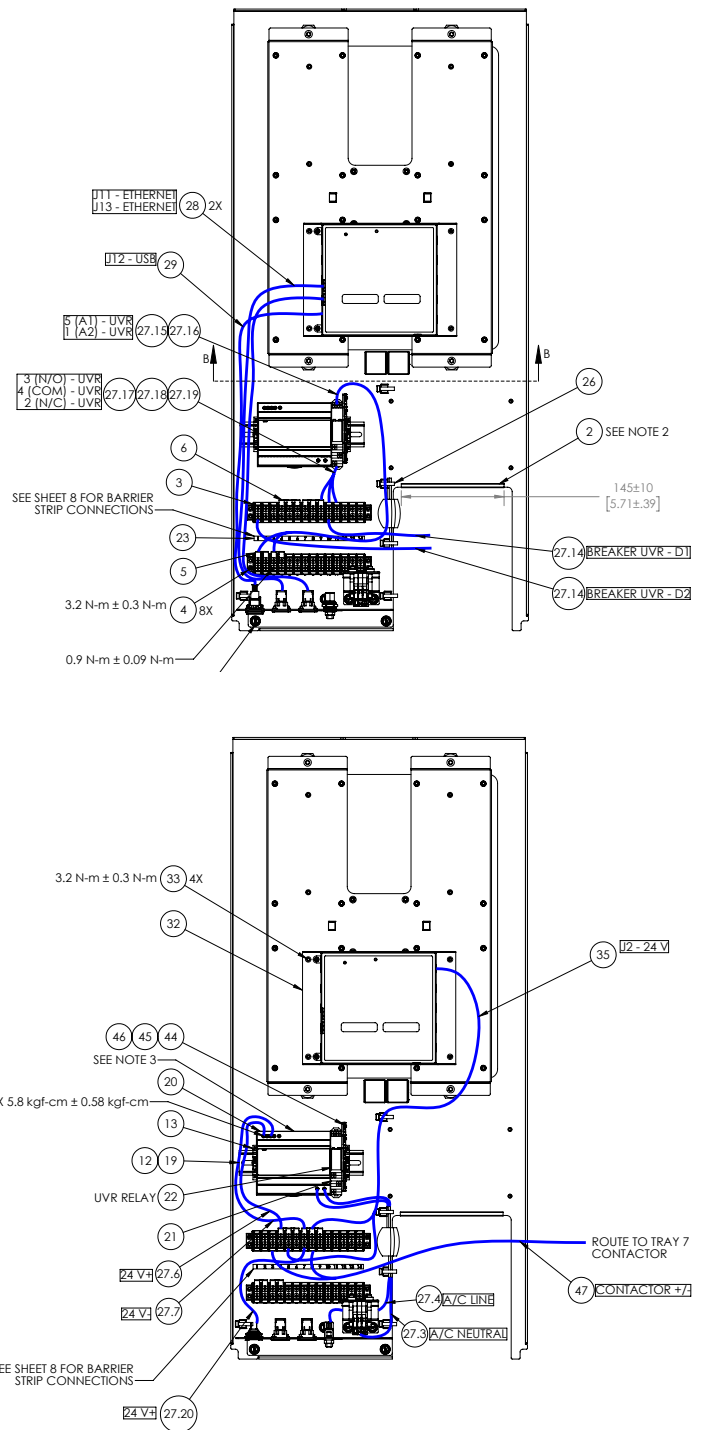


Figure 10 - Various BMS and Power Tray Component Layouts.

Setup

1. DC Power and AC Power: Attach all cables to the cabinet. Additionally attach UVR/Shunt and aux contacts to the UPS if needed.
 - a. The 120 - 240 Vac 50/60 Hz feed to the cabinet must remain continuous - a 100 W UPS backup is recommended). Loss of the 120-240 Vac 50/60 Hz feed opens the breaker, shuts down the system, and turns off the Battery Management System (BMS).
2. The battery cabinet should only be installed in an ambient environment between 20 °C -35 °C.
3. For optimum performance, refer to the below recommended charge voltage values. See Appendix F for the acceptable charge voltage range, with minimum and maximum values.
 - a. 36 Battery Cabinet (36 BC): 542 Vdc for BC 2 - 300X and BC 2 - 500 or 544 Vdc for BC 2.
 - If Temperature compensated voltage (TCV) is available, then voltage range is 551 Vdc @20 °C to 541 Vdc @ 35 °C.
 - b. 37 Battery Cabinet (37 BC): 557 Vdc for BC 2 - 300X and BC 2 - 500 or 559 Vdc for BC 2.
 - If TCV is available, then voltage range is 566 Vdc @ 20 °C to 556 Vdc @ 35 °C.
 - c. 38 Battery Cabinet (38 BC): 572 Vdc for BC 2 - 300X and BC 2 - 500 or 574 Vdc for BC 2.
 - If TCV is available, then voltage range is 580 Vdc @ 20 °C to 571 Vdc @ 35 °C.
 - d. 39 Battery Cabinet (39 BC): 587 Vdc for BC 2 - 300X and BC 2 - 500 or 589 Vdc for BC 2.
 - If TCV is available, then voltage range is 596 Vdc @ 20 °C to 586 Vdc @ 35 °C.

Operation

Prior to initiating system operation, review the below instructions regarding proper charging and discharging processes for the batteries, as well as fan function and control parameters.

Charging

1. First, close the circuit breaker and confirm that the the **System Activity** indicator shows a **Standby State**.
2. While in Standby State, the battery cabinet only begins charging when SOC < 90% and all batteries are between 15 °C - 40 °C.
3. Set the UPS to charge the battery cabinet with any current between 20 -160 A. See the conditioning documents for multiple cabinet charge current recommendations. For any current above 160 A, refer to the *Troubleshooting* section on pg. 32.
 - a. The System Activity should change to **Charge State**.
4. Charging is complete if any of the following occur:
 - a. The current <4 A and string voltage >537 Vdc for 36 batteries, >552 Vdc for 37 batteries, >567 Vdc for 38 batteries, and >582 Vdc for 39 batteries.
 - b. Any monobloc voltage >15.5 V.
 - c. The string voltage is >555 Vdc for 36 batteries, >570 Vdc for 37 batteries, >585 Vdc for 38 batteries, and >600 Vdc for 39 batteries.
5. After charging, System Activity will return to Standby State.

Discharging

1. The discharge can only start in a Standby State or Charge State.
2. If the current draw is < -15 Amp, the system enters a **Discharge State**.
3. In **Validation Mode**, discharge ends with the breaker opening via BMS upon any of these customizable conditions:
 - a. Number of Low Voltage Batteries - Range: 1-3, Default: 1
 - b. Number of High Temperature Batteries - Range: 1-3, Default: 1
 - c. Monobloc Low Voltage Cutoff - Range: 7.7-10 V, Default: 10
 - d. Monobloc High Temperature Cutoff - Range: 75-85 °C, Default: 75 °C
 - e. Single Monobloc Low Voltage Cutoff - Range: 7.6-10 V, Default: 10 V
 - f. Single Monobloc High Temperature Cutoff - Range: 75-100 °C, Default: 75 °C
 - g. String Low Voltage Cutoff - Range: 350-450 V, Default: 450 V
4. In **Normal Mode** discharge ends once the UPS reaches its Low Voltage Cutoff (typically 383 V - 400 V). Refer to *BC 2 300X/500 Battery Conditioning* in ZincFive's *BC 2 Series UPS Battery Cabinet Service Manual* for the recommended UPS LVCO and expected power levels in the customer application.

5. After a discharge, all batteries must fall below 40 °C before recharge begins.
6. The standard maximum recommended continuous current is 800 A, or up to 1200 A with a high-current power path option and Z5 13-90 U S F battery.
7. The ABB breaker is set to trip at 3000 A and SE breaker is set to trip at 1500 A for Z5 13-80 H S F batteries. The SE breaker is set to trip at 3000 A for a BC 2 - 500 cabinet with Z5 13-90 U S F batteries with a dead short circuit.
NOTE: A negative value signifies the battery is discharging.

Fan Function

1. Battery Temperatures
 - a. Turn the fan on during discharge, five seconds after the contactor closes.
 - b. Turn the fan off if all battery temperatures <35 °C or all batteries <40 °C and fans have been on for 5 hours.
 - c. Any battery ≥ 40 °C.
2. Depending on diode and contactor temperatures, the fans will:
 - a. Turn on if the contactor temperature >60 °C, and turn off if it is <55 °C.
 - b. Turn off if the diode temperature >80°C, and turn off if it is <75°C.

Controls Parameters

A comprehensive alarm summary is available in Appendix G on page 60. There are tolerances associated with the hardware, regarding the resolution of each parameter. In the event of a BMS warning, error, or fault parameter, please refer to the following notes:

1. The system operating temperature should be 20 - 35 °C. The system remains in Standby State and does not start charging until the temperature window is 15 °C - 40 °C.
2. An Error signals the need for battery replacement when a battery temperature rises above 75 °C multiple times or 85 °C at any point, or falls to 7.5 V.
3. Actual Discharge Ah (ADAh) is the present cycle Discharge Ah tabulated from the last full charge.
4. If the UPS voltage is too low on charge, the system will undercharge the batteries and not indicate a normal "End Of Charge". If there is enough charge to indicate ADAh is <0, current is <4 A, and the EOC Voltage threshold is not met, then the system should exit charge, indicating EOC, and issuing a warning.
5. When current limits are exceeded, currents < -1200 A and < 1300 A for BC 2 – 500, and < -800 A and < -1000 A for BC 2 and BC 2 - 300X, will have a persistence of 2 seconds prior to triggering an Error alarm. Currents <-1300 A or <-1000 A respectively issues a Fault alarm instantaneously. The breaker has short circuit protection that may open with currents < -1500 A.
6. The charge current is normally ≤ 160 A. The system records a Warning alarm if the current is >160 A for 15 s and < 1000 A instantaneous (no timeout or delay), and triggers the opening of the contactor. The contactor then closes after another 135 s. to attempt continuing the charge. A current > 1000 A instantaneously triggers an Error and opens the contactor, requiring BMS reset/power cycle.

Network Connections + WEB UI Setup

To ensure comprehensive and successful network connection and establishment of the Web UI, refer to the following instructions in sequence, and confirm that the minimum hardware and port requirements are met. To avoid connection issues, prior to commencing setup, ensure that ports are not blocked by a firewall.

Minimum Hardware Requirements

Component	Minimum	Recommended
OS	Ubuntu LTS 20.04+ Debian 11+ RHEL 9 / Alma 9 Windows 10/11 Pro (WSL 2)	Latest Ubuntu LTS or RHEL
CPU	x86-64, 2 cores	4 cores
RAM	4 GiB	8 GiB
Disk	10 GB free	20 GB SSD
Docker Engine	20.10+	Current LTS
Docker Compose	v2 plugin (<code>docker compose</code>)	Same

To create a single network input, daisy-chain power system components together or utilize an unmanaged network switch to connect to each cabinet. The output of the daisy-chained system or unmanaged network switch attaches the Server or building management system by analyzing the cabinet data with the Web UI (on the same subnet). Any brand of unmanaged switch can be utilized (Netgear, D-Link, TP-Link, etc.) but it needs to support 10/100 Mbps.

Port Requirements

Service	Container	Port (host:container)	Purpose
Web-UI HTTPS	web-ui	443:443	Secure operator UI
Web-UI HTTP (optional)	web-ui	80:80	Initial setup / redirect
MQTT TLS	bms-mqtt	8883:8883	Telemetry from tray modules
NTP (UDP)	ntp	123:123/udp	Time sync

Optional Modbus RTU + TCP Setup

If using Modbus RTU (Remote Terminal Unit), set the Baud Rate to 19,200, no parity, 8 data bits, and 1 stop bit. The default Modbus Server ID setting for all cabinets is 1. Modbus TCP Setup is additionally supported.

Refer to Appendix C for the Modbus Dictionary for further detail.

Installing The Web UI

1. Unzip the folder provided by ZincFive.
2. For windows users, double click install-windows.cmd. The installation will include docker desktop - walk through the install wizard until you reach the docker desktop splash screen (Fig.10).
 - a. The installer will continue to run in the background. If a restart is required to complete docker desktop installation, proceed and then rerun the install script after restarting
 - b. Open a terminal and type "ipconfig" to figure out your IP Address

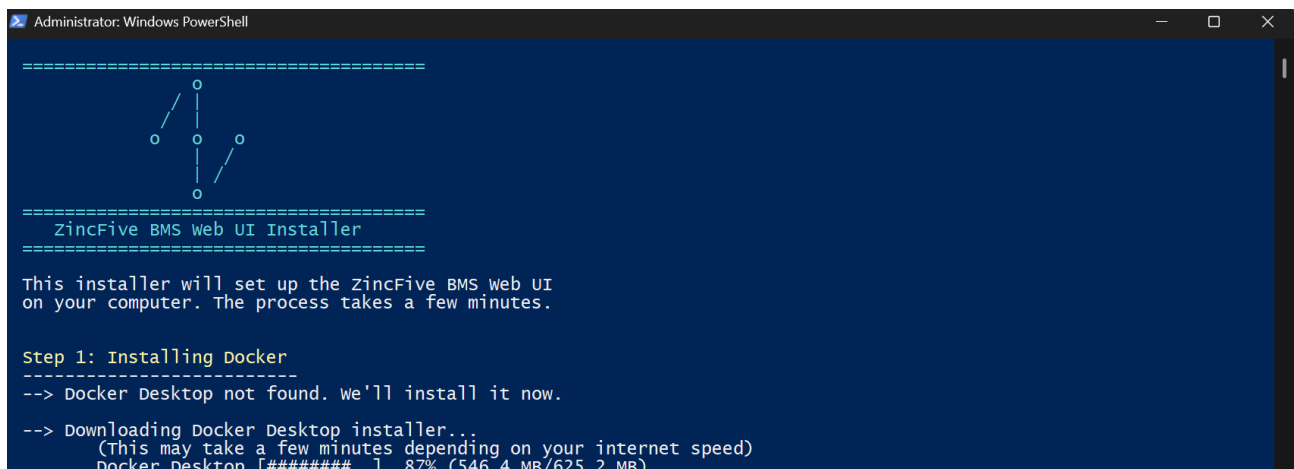


Figure 10- Beginning of installation in the Windows terminal

```

Administrator: Windows PowerShell
2026-02-13 17:36:55.894 [gen2-bms] [2/3] Importing tar: mosquito.tar
2026-02-13 17:36:55.894 [gen2-bms] Loading mosquito.tar
--> Loading component 2 of 3...
loaded image: eclipse-mosquitto:2.0.18
2026-02-13 17:37:00.233 [gen2-bms] [2/3] Imported tar: mosquito.tar
2026-02-13 17:37:00.233 [gen2-bms] [3/3] Importing tar: ntp.tar
2026-02-13 17:37:00.234 [gen2-bms] Loading ntp.tar
--> Loading component 3 of 3...
loaded image: cturra/ntp:latest
2026-02-13 17:37:47.272 [gen2-bms] [3/3] Imported tar: ntp.tar
[OK] All components loaded successfully!
--> Starting services...
2026-02-13 17:37:47.766 [gen2-bms] Bringing up stack...
2026-02-13 17:37:47.766 [gen2-bms] Running: docker compose --ansi never --progress plain --env-file c:\Users\caomheo\sullivanroc\oneDrive - ZincFive, Inc\Documents\ZF BMS\gen2-bm
-airgap-test\installer\deploy\compose\env -f c:\Users\caomheo\sullivanroc\oneDrive - ZincFive, Inc\Documents\ZF BMS\gen2-bms-airgap-test\installer\deploy\compose\compose.yml up -
--remove-orphans --force-recreate --pull never --no-build
Network zincfive-bms-ui_default Created
Volume zincfive-bms-ui_bms-data Creating
Container zincfive-bms-ui-bms-mqtt-1 Creating
Container zincfive-bms-ui-ntp-1 Creating
Container zincfive-bms-ui-bms-mqtt-1 Created
Container zincfive-bms-ui-bms-server-1 Creating
Container zincfive-bms-ui-bms-server-1 Created
Container zincfive-bms-ui-bms-mqtt-1 Starting
Container zincfive-bms-ui-ntp-1 Starting
Container zincfive-bms-ui-bms-mqtt-1 Started
Container zincfive-bms-ui-bms-server-1 Starting
2026-02-13 17:37:50.182 [gen2-bms] Stack status:
Container zincfive-bms-ui-bms-server-1 Started
AME IMAGE COMMAND SERVICE CREATED STATUS PORTS
zincfive-bms-ui-bms-mqtt-1 eclipse-mosquitto:2.0.18 "/docker-entrypoint..." bms-mqtt 1 second ago Up Less than a second 0.0.0.0:8883->8883/tcp, [::]:8883->8883/tcp
zincfive-bms-ui-bms-server-1 gen2-bms-app:test "/bin/sh -c 'npx pri..." bms-server 1 second ago Up Less than a second 0.0.0.0:80->80/tcp, [::]:80->80/tcp, 0.0.0.0:443->443/tcp, [::]:443->443/tcp
zincfive-bms-ui-ntp-1 cturra/ntp:latest "/bin/sh /opt/startu..." ntp 2 seconds ago Up Less than a second (health: starting) 0.0.0.0:123->123/udp, [::]:123->123/udp
[OK] All services started successfully!
2026-02-13 17:37:50.727 [gen2-bms] Deploy complete.

=====
Installation Complete!
=====

The ZincFive BMS web UI is now running on this computer.
You can access it from a web browser at these addresses:
http://172.24.240.1
http://192.168.2.7
=====

Press Enter to close this window...

```

Figure 11- Completion of docker installer and containers, showing available IP addresses.

3. For Linux/macOS users, run install-linux-macos.sh in your shell, then wait for the install to complete
4. The installer can take up to 30 minutes to finish depending on hardware. Once completed, the installer will show you the available ip addresses- this is where the Web UI is hosted (Figure 11).
3. Once the install is finished, the containers will show as running in docker desktop (Figure 12).
 - a. For Linux/macOS users, please use the following command: docker ps --filter "name=zincfive-bms-ui"
 - b. Navigate to one of your ip addresses. This will display the first login page where the initial site admin account is created (Figure 13).
4. Log in to the Web UI.

Containers [Give feedback](#)

Container CPU usage ⓘ

12.98% / 2400% (24 CPUs available)

Container memory usage ⓘ

62.1MB / 30.33GB

Show charts

☒ ☐ Only show running containers

☒	Name	Container ID	Image	Port(s)	CPU (%)	Memory usag...	Memory (%)	Disk read/write	Network I/O	Actions
☒	zincfive-bms-ui	-	-	-	12.98%	62.1MB / 93.18G	0.19%	147.1KB / 17.5M	374.77KB / 28.2	☒ ☐ ☐ ☐
☒	bms-mqtt-1	bdc70581ef90	eclipse-mo	8883:8883	0.05%	876KB / 31.06GB	0%	0B / 0B	7.26KB / 5.77KB	☒ ☐ ☐ ☐
☒	ntp-1	f3a252057b5d	cturra/ntp:	123:123 (UDP)	0%	972KB / 31.06GB	0%	4.1KB / 0B	1.51KB / 126B	☒ ☐ ☐ ☐
☒	bms-server-1	bc03873ba6c7	gen2-bms-	443:443	12.93%	60.3MB / 31.06G	0.19%	143KB / 17.5MB	366KB / 22.4KB	☒ ☐ ☐ ☐

Figure 12- Containers running in docker desktop

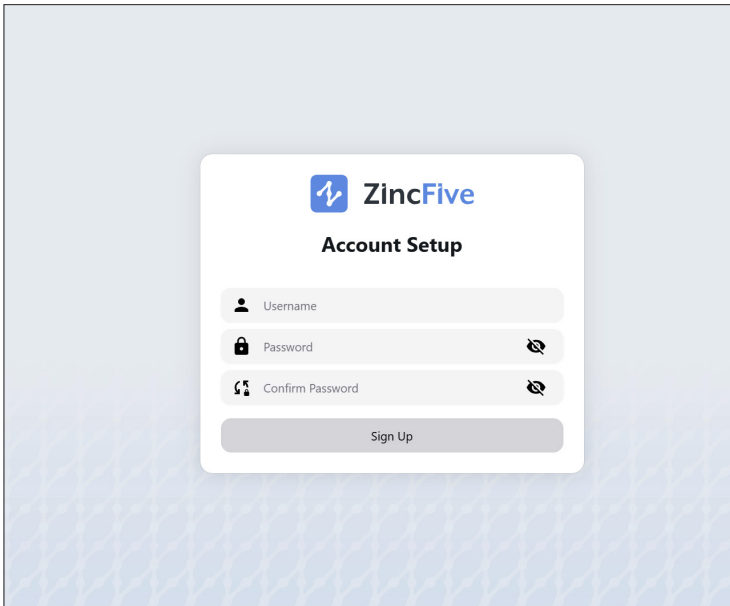


Figure 13- Web UI setup page

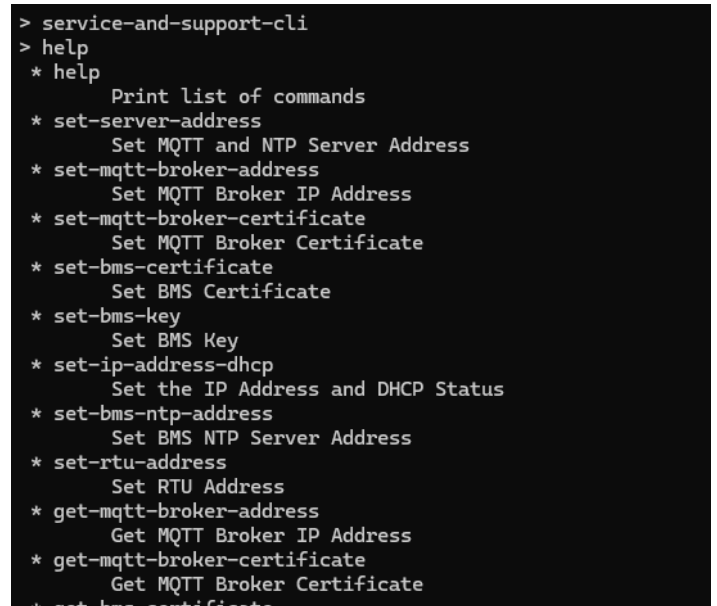


Figure 14- Command Line Interface

Connecting The Cabinet to The Web UI

1. Connect a micro-USB cable from the laptop to the BMS.
2. Use Terra Term, a terminal emulator, to connect to the BMS.
3. To access the command line interface or CLI (Fig. 14), enter the following command: `service-and-support-cli`.
4. In the CLI, type "`set-server-address`" and add the ip address where the web ui is hosted. After, enter "`set-ip-address-dhcp`". Here you can set a static ip address and enable/disable dhcp.
 - a. Example: `set-ip-address-dhcp 192.168.1.11 ON`
5. Enter "`get-mac-address`" and record the 12-digit number.
6. Return to the Web UI and select **Add Cabinet**. Enter the preferred Cabinet Name and the Mac Address in the Cabinet ID line, then press add.
7. On the home page select the newly added cabinet, which will take you to the cabinet details page. A green status indicator will confirm the cabinet is online. The cabinet is now added and communicating.
8. Once all network settings are input via the CLI and the cabinet is added/online, the user should click the cabinet ID to view the Cabinet Details page. and then click **Provision**. To close the breaker, press 'Provision'.
 - a. Once provisioned, the CLI is no longer available and the cabinet breaker can now be closed.
 - b. To deprovision, hold down the reset button on the front of the cabinet. Continue to hold the button for 30 s while power cycling the cabinet using the rocker switch.

Troubleshooting + Support

Refer to the table below for a list of common issues and solutions.

Symptom	Command	Likely cause / fix
Web-UI fails TLS handshake	<code>docker compose logs web-ui</code>	Certificate paths incorrect or missing CA chain
MQTT connect error	<code>docker compose logs bms-mqtt</code>	<code>client.crt/key</code> mismatch; regenerate bundle
Port 443 already in use	<code>sudo lsof -i :443</code>	Disable other service or change mapping in compose
Database connection refused	Web-UI log	<code>bms-database</code> container not running – restart stack

If any issues persist after troubleshooting, email productsupport@zincfive.com or call 888.517.7776 and provide the following:

1. Output of `docker compose ps`
2. Last 50 lines of Web-UI logs (`docker compose logs --tail 50 web-ui`)
3. Host OS (`cat/etc/os-release`)

ZincFive BMS Reboot + Configuration Reset

The BMS is designed for user reboot, using Hardware Reset, and user restore, using Configuration Reset. Rebooting initiates a standard restart, and should not be initiated unless in conjunction with restoration, which clears the system settings in order to change the system's virtual address. Use a pin or other thin instrument to access Hardware or Configuration Reset functions (Figure 16)

1. To initiate BMS reboot, tap the **Hardware Reset** button (Fig. 15-B). Allow 15 seconds for system reset.
2. To initiate BMS restore either:
 - a. Press and hold the momentary switch on the front panel. Then, turn the power off, wait 5 seconds and turn the power back on.
 - b. Hold the **Configuration Reset** button (Fig. 15-A) and press the Hardware Reset button. After the boot loader, if:
 - The user holds the Configuration Reset button for 5 seconds, the IP address, DHCP server status, and NTP server will return to default settings.
 - The user holds the Configuration Reset button for 10 seconds, the IP address, DHCP server status, NTP server, Server CA, and BMS Certificate will return to default settings. This deprovisions the device and makes the command line interface (CLI) accessible. Refer to *Connecting the Cabinet to the Web UI* on page 15 for further detail on using the CLI.



Figure 15- ZincFive BMS Controller buttons
A- Configuration Reset button, B- Configuration Reset button

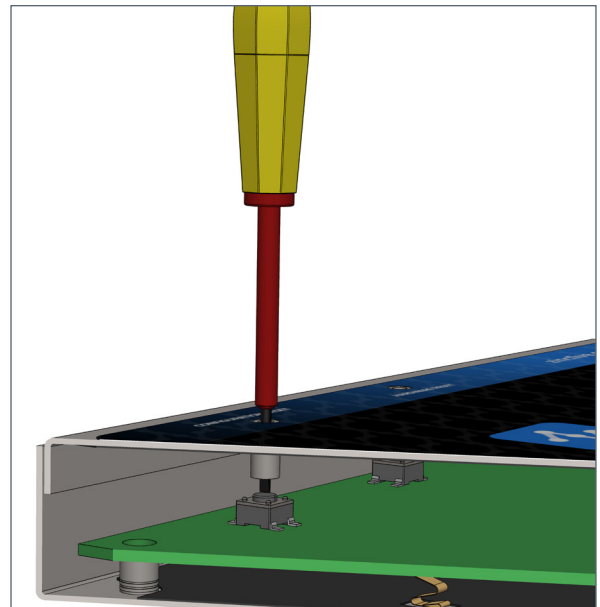


Figure 16- BMS Controller reset button access

Account Management

The ZincFive BMS UI utilizes a Role Based Access Control (RBAC) system for account management. The Site Administrator has total access to the BMS and can assign various permissions to various role types or selected users, including:

1. Setting Password Complexity according to the following features:
 - a. Any combination of uppercase/lowercase letters, numbers, and symbols
 - b. Number of characters required in a password
 - c. Password update frequency: anywhere from 1-12 months
 - d. Number of successive failed authentication attempts allowable before logout (11 or more).
2. Creating, editing, and deleting additional role types
 - a. Cabinet or user permissions can be added or removed for each role.
3. Generating recovery keys used to login if the Site Administrator forgets their password.
 - a. There are five keys total that can only be used one time each.
 - b. The keys can be regenerated at any time.

User Permissions

The Site Administrator can assign the following user management permissions to any user:

1. View users table
2. Add/delete users
3. Edit usernames or passwords
4. Assigning or removing a role to/from a user
5. Unlocking user accounts after successive failed authentication attempts

Cabinet Permissions

There are many general, configuration, calibration, and validation related cabinet permissions that Site Administrators can assign to users.

1. General assignable permissions include:
 - a. Adding and deleting cabinets, editing cabinet names and IDs
 - b. Changing a cabinet commissioning status or validation mode from ON or OFF
 - c. Exporting a CSV containing all cabinet data

- d. Exporting cabinet black box records
 - e. Initiating a cabinet firmware update
2. Assignable configuration permissions include:
- a. Editing the name of the attached UPS System
 - b. Changing battery quantity (any value from 36-39) or battery type between HSF and USF.
 - c. Changing the IP Address
 - d. Changing DHCP settings between on and off
 - e. Replacing batteries and clearing the battery's faults.
3. Assignable calibration permissions include:
- a. Calibrate Hall Current - 3 point calibration
 - b. Calibrate Shunt Current - 4 point calibration
 - c. Calibrate UPS Voltage - single point calibration
 - d. Calibrate String Voltage - single point calibration
 - e. Calibrate H2 Sensor - single point calibration
 - f. Set SOC from 0 to 100 or reset SOH to default value
 - g. Reset ADAH or CDAH to the default value
4. Assignable validation permissions include setting:
- a. The number for Low Voltage Batteries Cutoff between 1 and 3 batteries
 - b. The number for High Temperature Batteries Cutoff between 1 and 3 batteries
 - c. The Battery Low Voltage Threshold between 7.5 and 10 V
 - d. The Battery High Temperature Threshold, between 75 C and 85 C
 - e. The String Low Voltage Threshold between 370 and 450 V
 - f. The Single Battery Voltage Threshold between 0 and 10 V
 - g. The Single Battery Temperature Threshold between 75 and 100 C

System Permissions

The Site Administrator can assign the following system management permissions to any user.

- 1. Create System
- 2. Delete System
- 3. Edit System

Site Administrator

The Site Administrator is the account that is first created when the Web UI is initially deployed with no other existing users. Navigate to the **First Login** page (Fig. 17) at <server_address>/first-login and enter a unique username and password (there are no default credentials). This is now the Site Administrator account and there may only be one Site Administrator per deployment of the Web UI. After initial account creation, attempts to create an account through the First Login page to will result in an account creation failure.

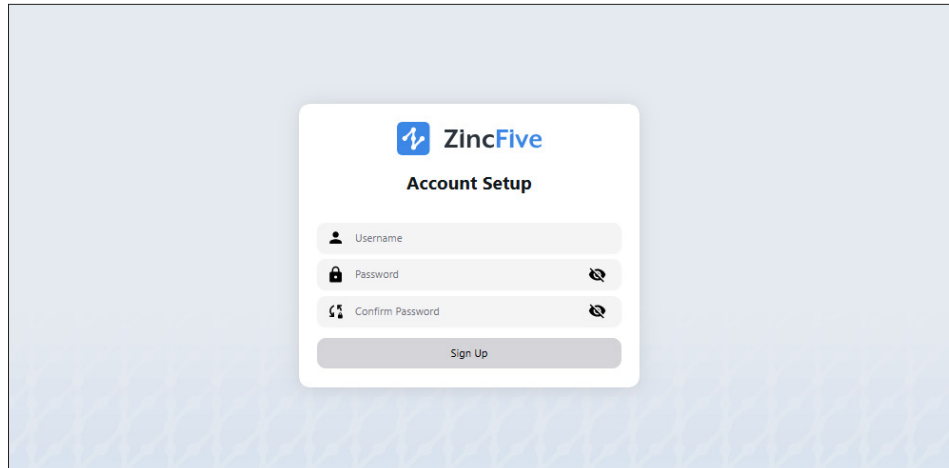
The image shows a web form titled "ZincFive Account Setup". It has a blue header with the ZincFive logo. Below the header, there are three input fields: "Username", "Password", and "Confirm Password". Each field has a small icon to its left (a person for Username, a lock for Password, and a person with a checkmark for Confirm Password). To the right of the Password and Confirm Password fields are small "show/hide" icons (an eye). At the bottom of the form is a "Sign Up" button.

Figure 17- Web UI Site Admin First Login Page

Creating Roles

To create a role within the Web UI, select **Site Admin Configurations** under the menu icon located in the upper right hand corner of the page.

1. Navigate to the 'Roles & Permissions' subsection, which contains additional subsections to view all current roles and create new roles.
2. Using the **Create Role** feature, create and name a **Role Type** and select the preferred privileges (Fig. 18).

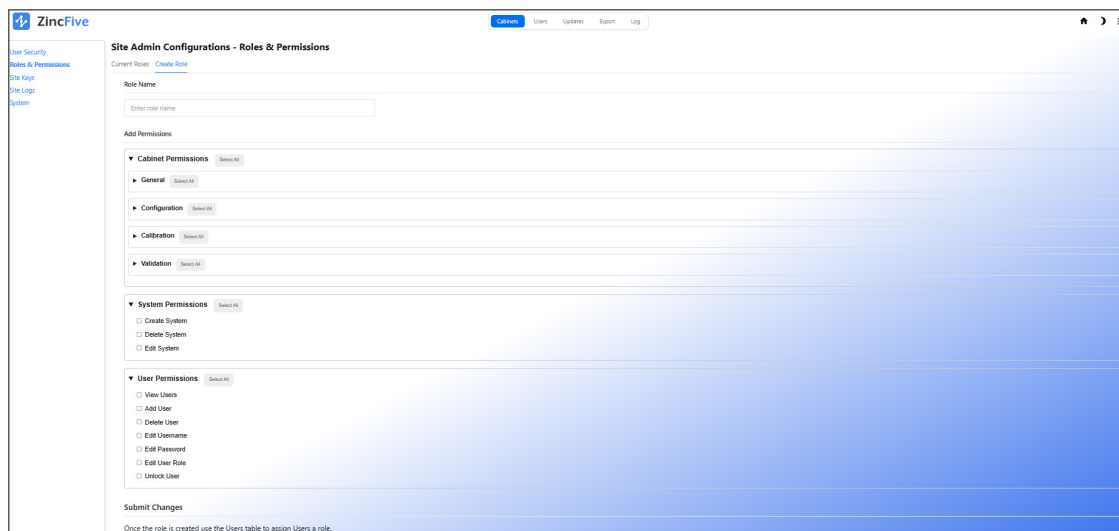
The image shows a web interface for "ZincFive Site Admin Configurations - Roles & Permissions". The top navigation bar includes "ZincFive", "Current Roles", "Create Role", "Update Role", "Export", and "Log". The left sidebar has a menu with "User Security", "Roles & Permissions", "Site Keys", "Site Logs", and "System". The main content area is titled "Site Admin Configurations - Roles & Permissions" and has a sub-header "Current Roles: Create Role". It contains a "Role Name" field with a placeholder "Enter role name". Below this is a section "Add Permissions" with four expandable sections: "Cabinet Permissions", "System Permissions", "User Permissions", and "Validation". Each section has a "Select All" button. The "Cabinet Permissions" section is expanded, showing "General", "Configuration", "Calibration", and "Validation" sub-sections, each with a "Select All" button. The "System Permissions" section is expanded, showing "Create System", "Delete System", and "Edit System" sub-sections, each with a "Select All" button. The "User Permissions" section is expanded, showing "View Users", "Add User", "Delete User", "Edit Username", "Edit Password", "Edit User Role", and "Unlock User" sub-sections, each with a "Select All" button. At the bottom, there is a "Submit Changes" button and a note: "Once the role is created use the Users table to assign Users a role."

Figure 18- Creating Roles through Site Admin Configurations

Editing & Deleting Roles

Within the **Current Roles** subsection of the UI menu, the Site Administrator can edit and delete assigned permissions (Figure 19a) or rename any role (Figure 19b).

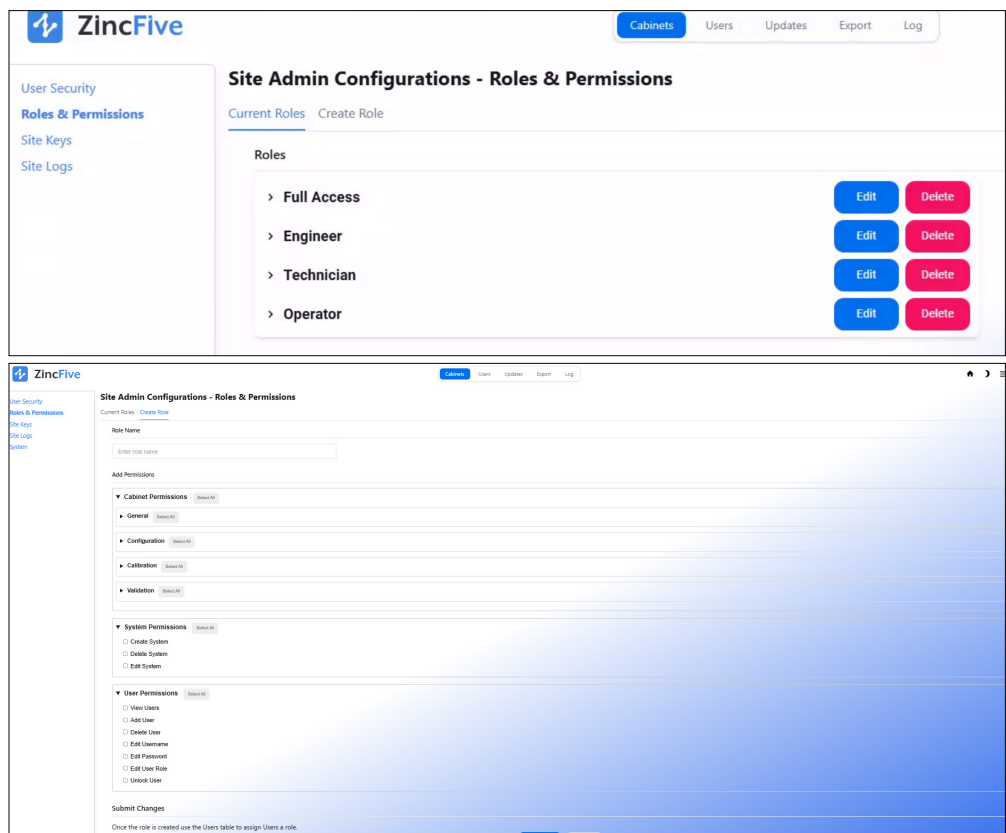


Figure 19 a + b - Editing, deleting, and renaming roles in the web UI

Viewing Roles or Users

As the Site Administrator, or any user with the permission to assign or remove roles to/from a user, navigate to the **Users** page and select the **View Roles** button. A pop-up window will appear listing all roles and their associated privileges (Figure 20). On the Users page, users are grouped into separate tables according to their respective roles (Figure 21).

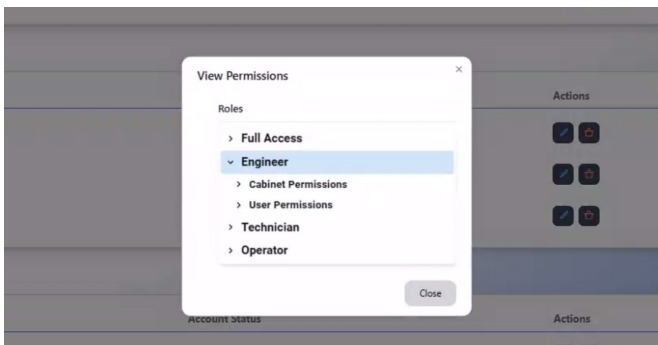


Figure 20- Viewing role permissions in the web UI

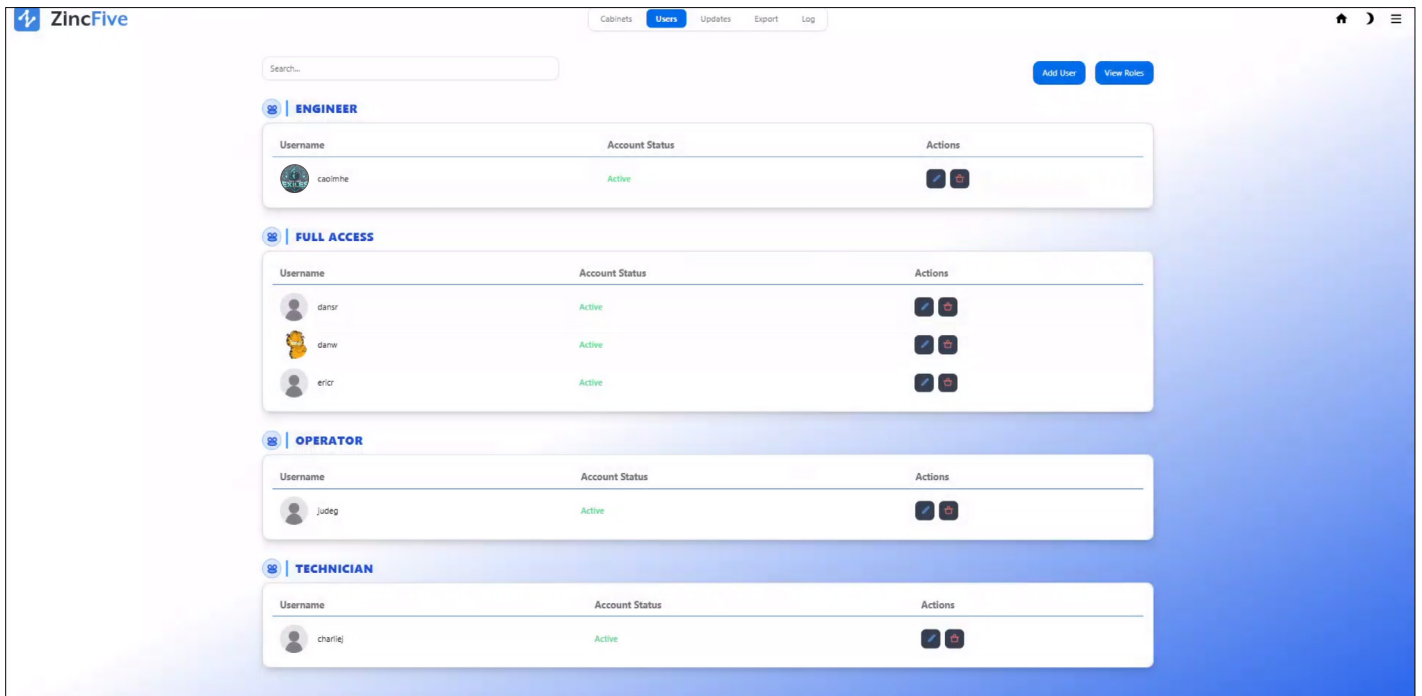


Figure 21- Users page displaying the various roles and personnel

Assigning and Removing Roles

As the Site Administrator, or any user with the permission to assign/remove roles to/from users, navigate to the Users page and select Edit next to the respective user- a pop-up window will appear (Figure 22). To assign a new role to a user, click the drop-down menu and select the respective role. To remove a role, select the x next to the role type assigned to the user. After adding or removing a role, press save so the changes take effect.

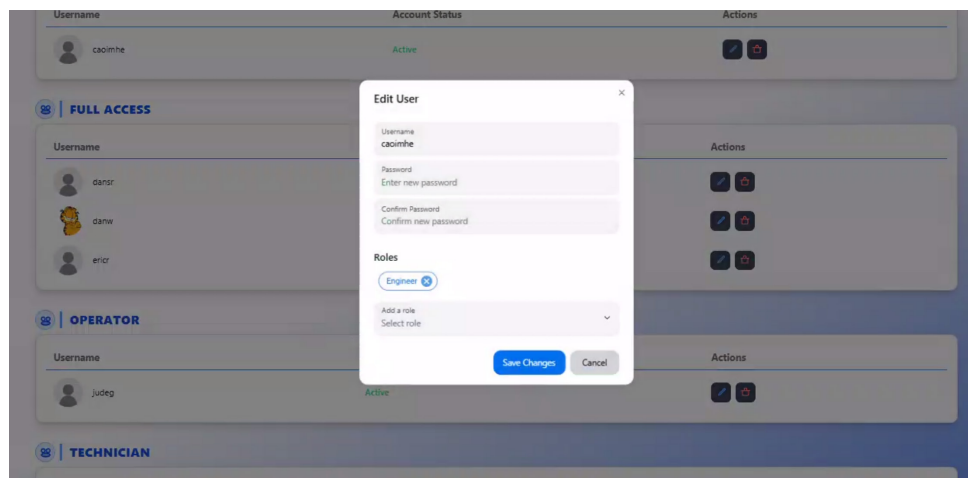


Figure 22- Editing user login information and assigned roles

The Site Administrator can also delete roles by selecting the **Delete** button next to the name of the role (Fig. 19a). Doing so will revoke the role from all users it is assigned to and delete the role type from the Web UI. Once deleted the role type will no longer exist and therefore will no longer be modifiable or assignable.

Account Lockout

Only the Site Administrator can set the allowable number of consecutive failed login attempts. All attempted logins during the lockout cooldown time will be denied and will appear to the user ambiguously as failed sign-ins. To adjust lockout settings:

1. Click the Menu icon, then **Site Admin Configurations** and select **User Security** on the left side of the page.
2. Select **Authentication Attempts** and rewrite the value under Number of Attempts. The minimum number is 11.
3. Click **Save Changes** at the bottom right side of the window.
4. Only users with the **Unlock User** permission assigned can unlock a user account.

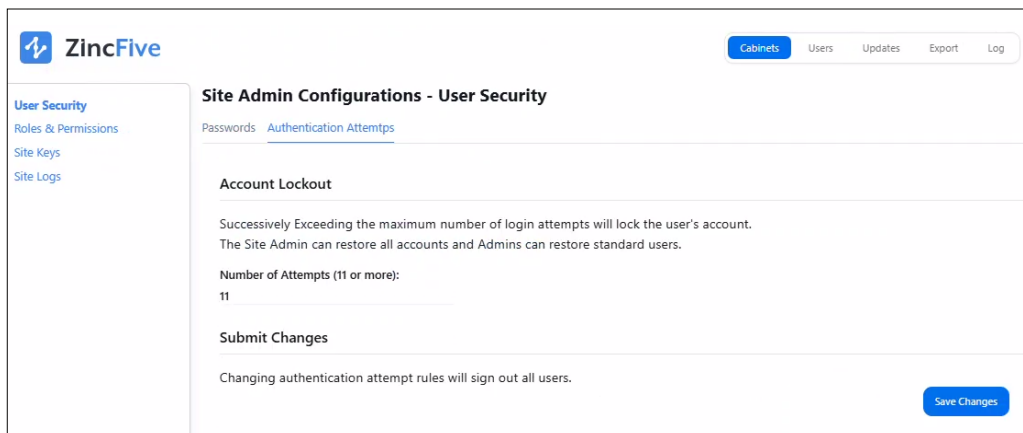


Figure 23- Establishing the maximum account authentication attempts as Site Admin

Account Timeout

To prevent tampering of data from unattended devices, users are automatically signed out after periods of inactivity. The default inactive time is 8 hours before account timeout, but can be adjusted by each individual user:

1. Click the Menu icon, then My Settings and select Security on the left side of the page.
2. Select **Inactivity Settings** and choose an option from the drop-down menu. The max inactivity time is 24 hours.
3. Click **Save Changes** at the bottom right of the screen.
4. Only users with the **Unlock User** permission assigned can unlock a user account.

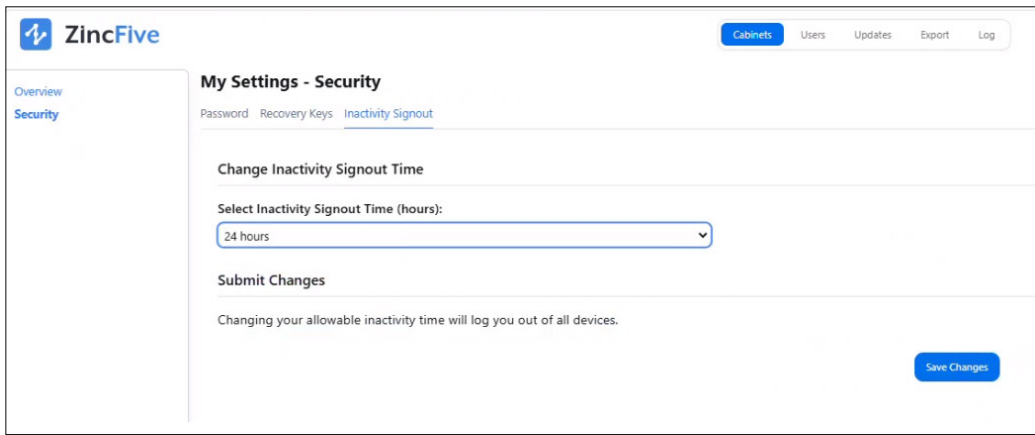


Figure 24- Establishing the inactivity signout time

Site Logs

There is a full security log of sign-in records and user actions available in the database, only viewable by the Site Administrator. This log contains information on any users accessing functions that require permission and is accessed via Site Admin Configurations.

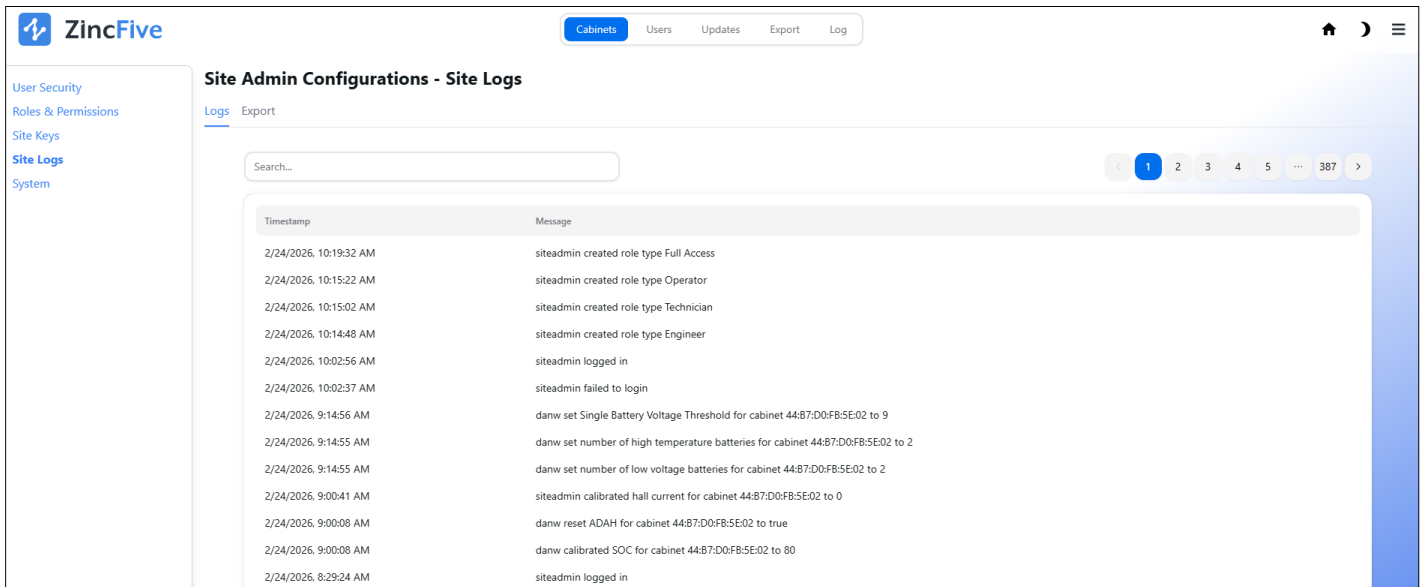


Figure 25- Viewing site security logs

Navigating The Cabinet Overview Page

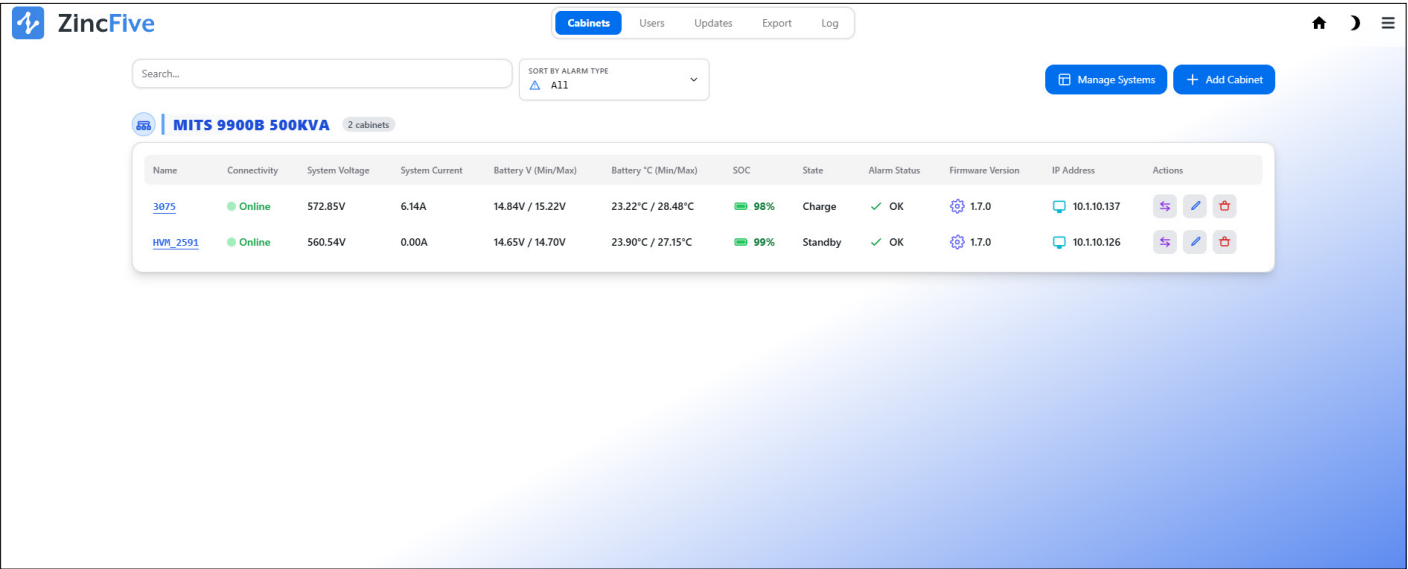


Figure 26- Viewing the Cabinet Overview Page

The Cabinet Overview page is the homepage of the Web UI. The cabinets are grouped according to their assigned system, as grouped cabinets sync and charge together. Here, a user can:

1. Add a cabinet to a system using a selected name and the corresponding MAC Address (Fig. 27)
2. Search cabinets by name/ID or filter by alarm type
3. Edit any cabinet name or ID, or delete any cabinet
4. Select the a cabinet ID to view the Cabinet Details page.
5. The top row of the page (Fig. 29), which includes the ZincFive icon, remains the same throughout the Web UI:
 - a. The home icon as well as the ZincFive logo returns the user to the Cabinet Overview page.
 - b. Clicking the sun icon enables light mode, and changes the icon to a crescent moon, which enables dark mode. The user's preferred mode is cached.
 - c. The hamburger menu (Fig. 28), provides a drop down list with individual user settings, Help & Feedback, information about the UI, and UI log out.
 - d. In addition to the Cabinet Overview Page, the page tabs (Fig. 29), available to the Site Administrator or users with assigned permission, provide access to the Users, Firmware Updates, Data Exports, and Cabinet Event Logs. Further detail about these tabs is available on page 26.

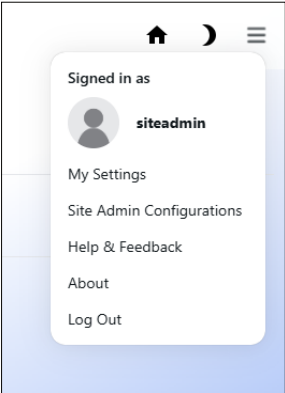
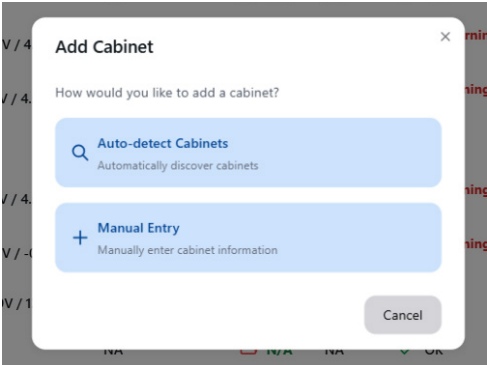
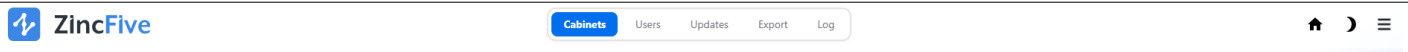


Figure 27 (TOP)- Adding cabinets
Figure 28 (MIDDLE)- Hamburger menu items
Figure 29 (BOTTOM)- Cabinet overview page tabs



Users Tab

Also accessible via Site Admin Configurations, the Users Page allows any user with permission to add, edit, and delete users or assign and remove roles to/from a user. Navigate to the Users page and select the View Roles button. A pop-up window will appear listing all roles and associated privileges. On the Users page, users are grouped into separate tables according to their respective roles (Fig. 30).

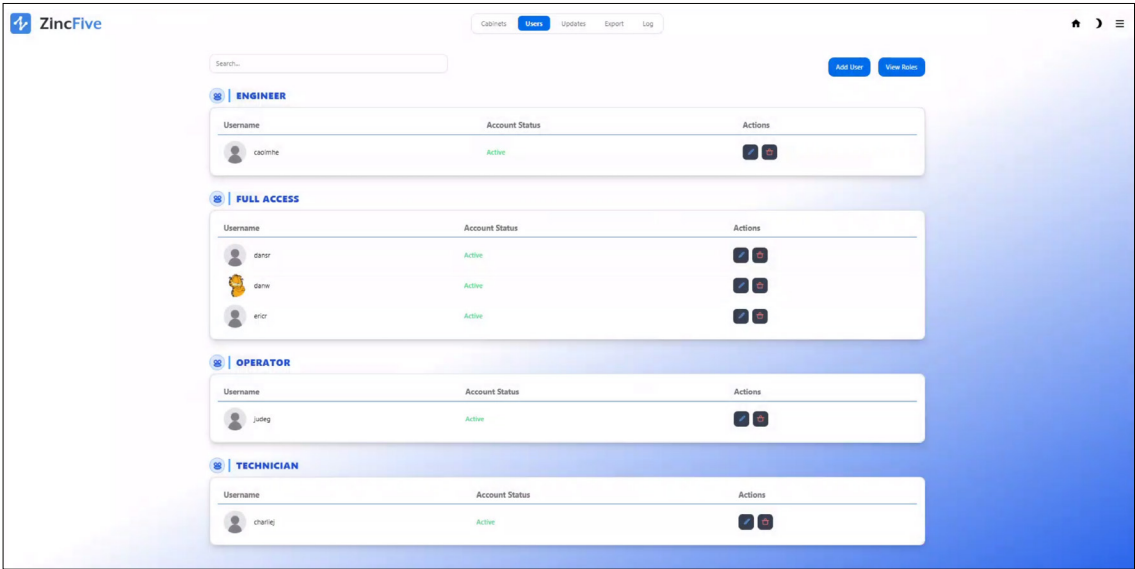


Figure 30- Viewing + editing users and assigned roles from the Users tab

Updates Tab

Viewing or actioning Firmware Updates for the full system is accessible via the Updates Page.

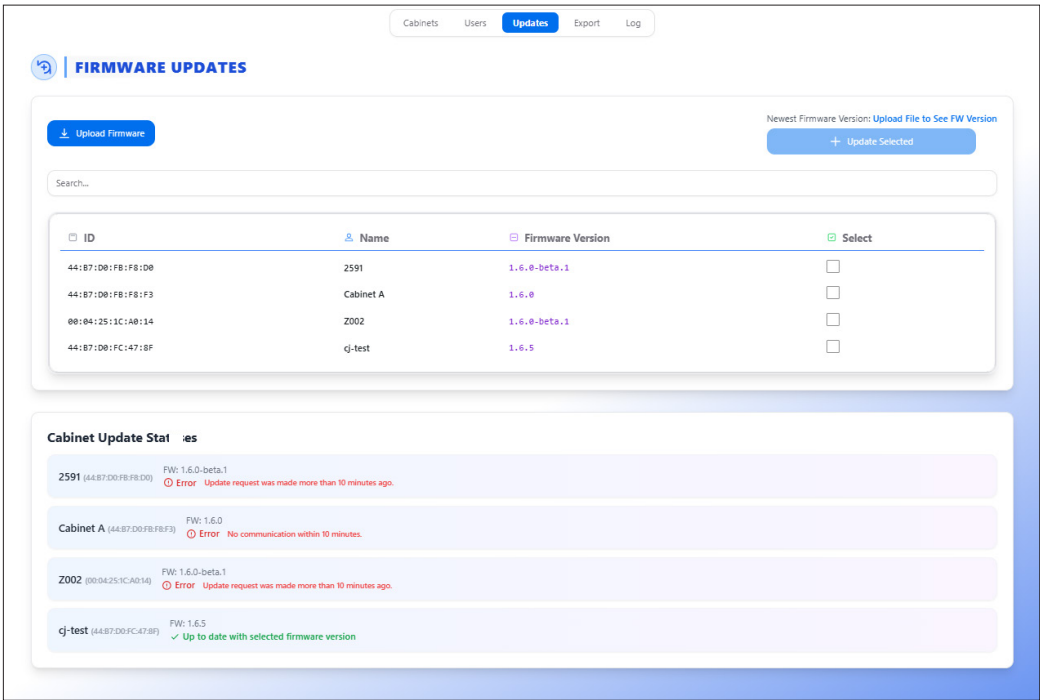


Figure 31- Viewing + initiating system Firmware Updates via the Updates tab

Export Tab

Also accessible via Cabinet Actions is the Export page. At Step 1, select the preferred date range and export rate, then hit next. By selecting **Standard Export Rate**, the first 5 minutes of data are exported at 1 second intervals and the remaining data is exported as follows: 1s for Discharge Data, 1 min. for Charge Data, and 15 min. for Standby Data.

At Step 2, select the related cabinets and preferred export rate. At Step 3, if all information is correct, select Proceed to download a .zip folder of .csv files containing all battery, cabinet, and system related data. Selecting the Advanced: Raw Parquet option provides a raw data file.

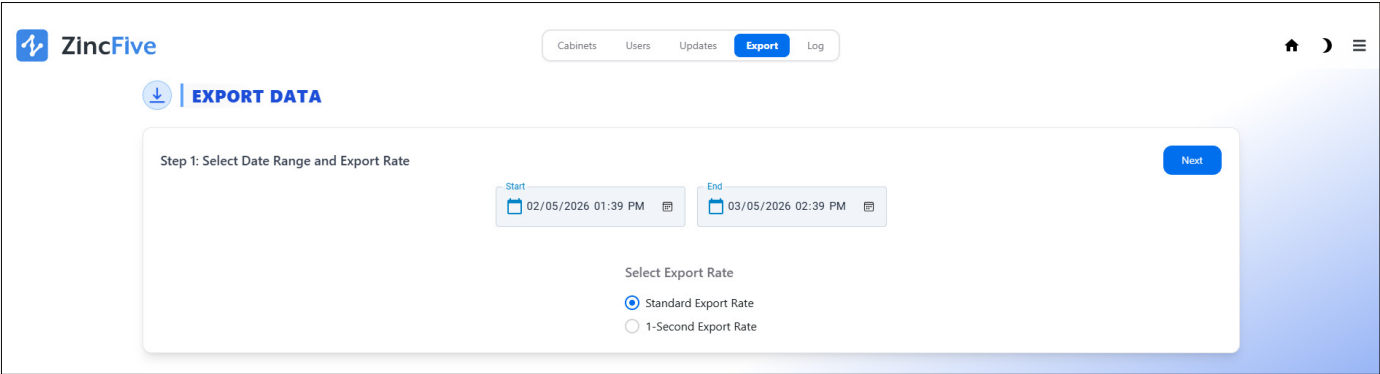


Figure 32- Step 1, exporting data via the Export tab

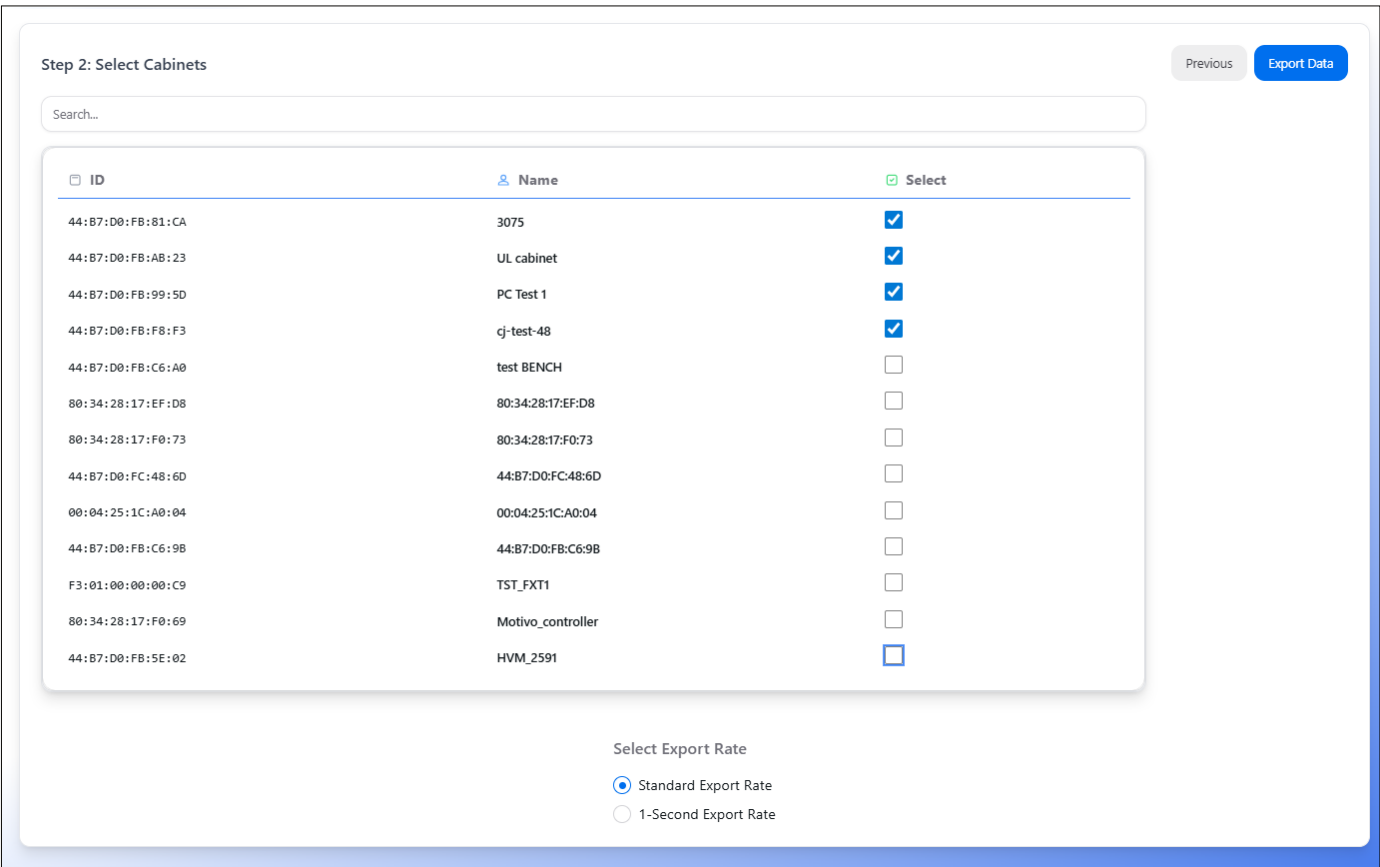


Figure 33- Step 2, exporting data via the Export tab

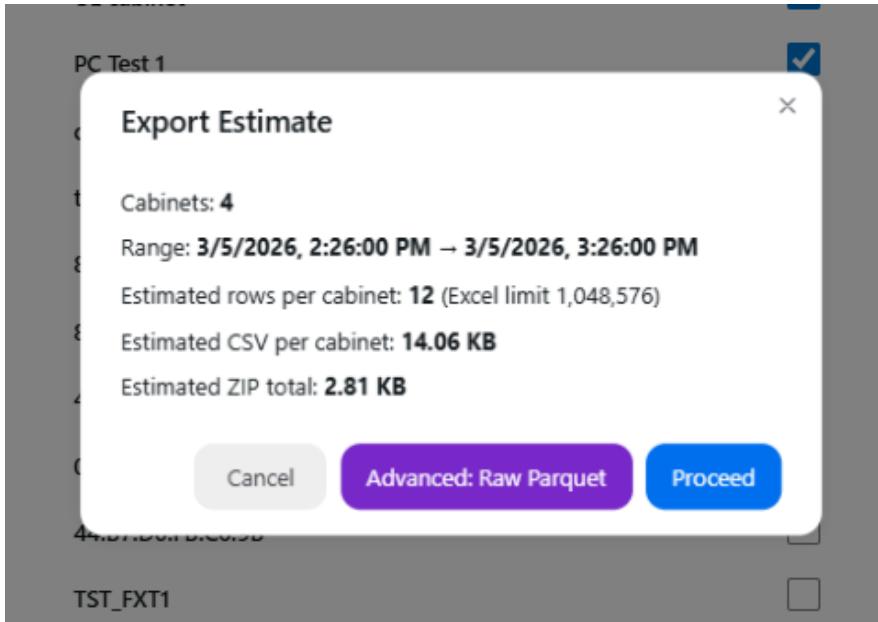


Figure 34- Step 3, exporting data via the Export tab

Logs Tab

Available to all users, the Logs page provides detailed system tracking of all cabinet events.

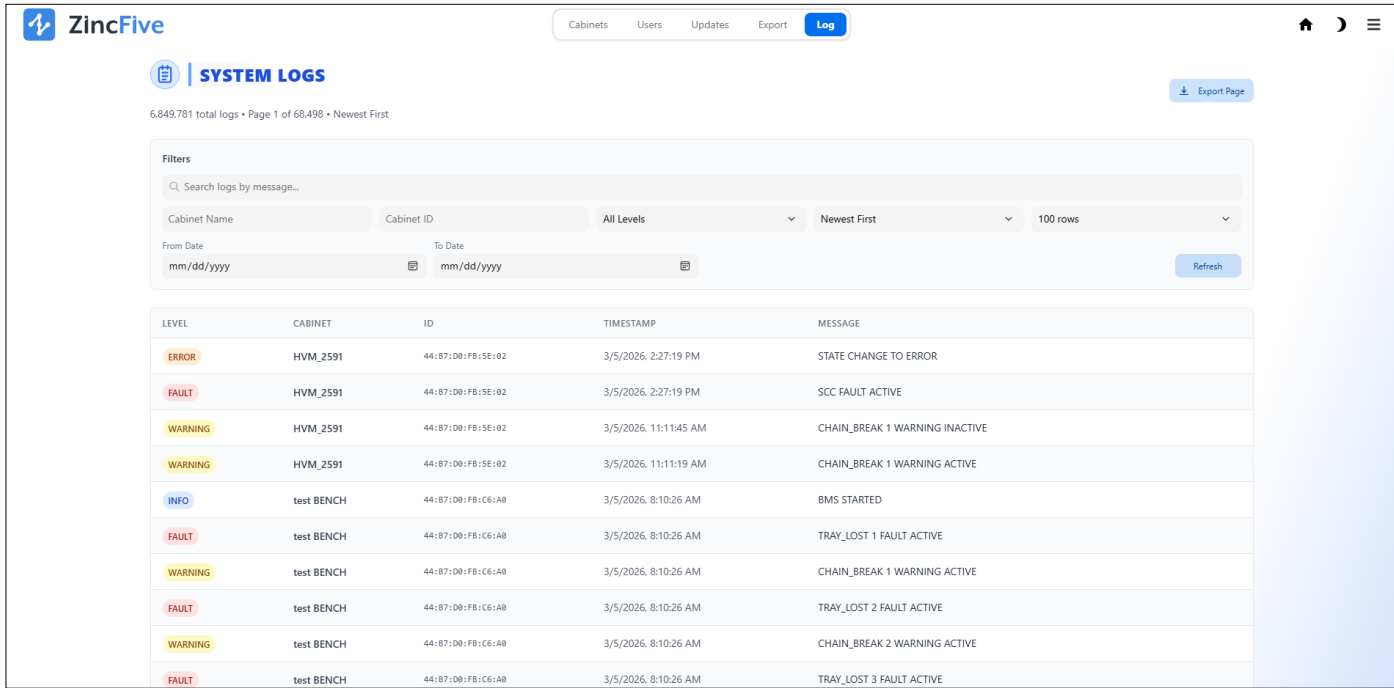


Figure 35- Viewing system logs via the logs tab

Navigating The Cabinet Details Page

Clicking the desired cabinet ID directs users to the **Cabinet Details** page, which displays all data pertinent to the health and function of the selected cabinet's batteries at the top of the page. This data updates every five seconds.

The bottom half of the page acts as the central Web UI navigational tool for each individual cabinet.

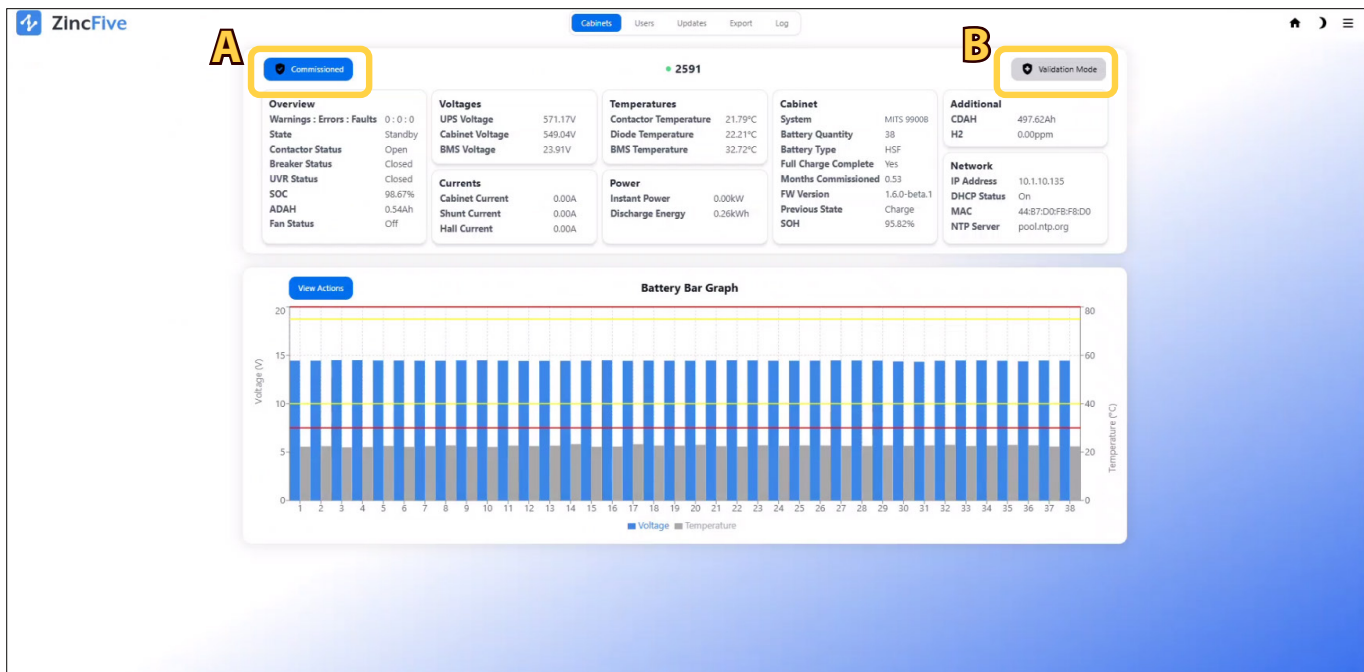


Figure 36- Cabinet Details page. A- Commissioned button, B- Validation Mode button

Users with assigned permissions can also:

1. Toggle the **Commissioned** status button (Fig. 36-A) between ON and OFF. A blue background color indicates ON.
 - a. When the cabinet is initially constructed or if all batteries are replaced, reset Commissioned status.
 - b. Only the Site Admin or users with assigned permission can edit the Commissioned status.
2. Toggle **Validation Mode** status between ON and OFF. The gray background color indicates OFF.
3. Use the **View Actions** button, which is the central navigational tool of the web UI. The user actions available are divided into four categories: data, configure, update, and IO control.
 - a. See the View Actions - Data section (pgs. 30-35) for further detail.

View Actions - Data

Data related actions allow the user to view and download various system related data in multiple forms.

- 1. Battery Bar Graph: This is the default action when viewing the Cabinet Details page. Users can toggle between viewing battery voltage, temperature, or both by clicking the corresponding boxes at the bottom of the bar graph.

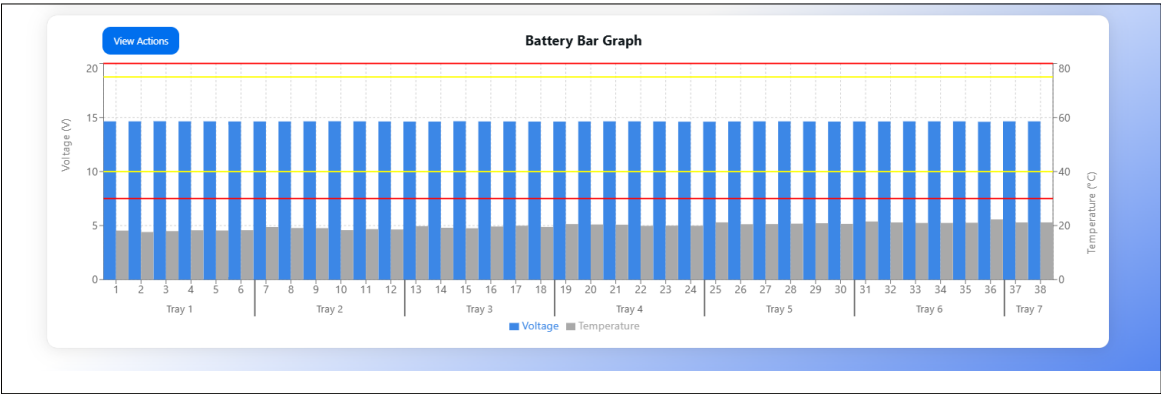


Figure 37- Battery Bar Graph

- 2. System Line Graph: This view represents system string voltage, system current, SOC, and BMS temperature.

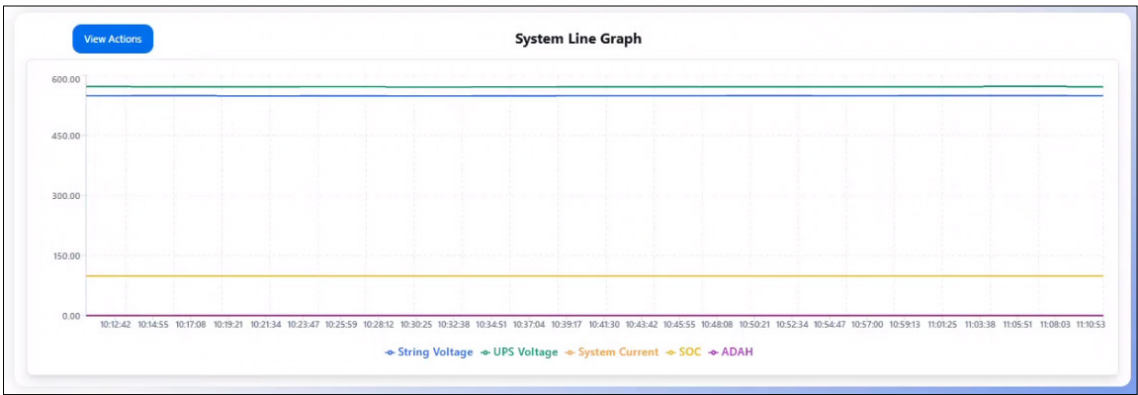


Figure 38- System Line Graph

- 3. State History: This view shows users the state history of the cabinet over a selected time range.

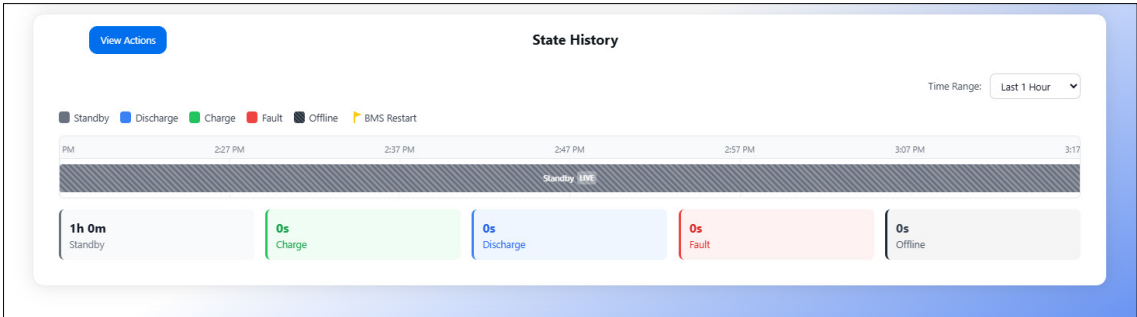


Figure 39- State history

4. **Alarms:** This view provides the latest data on cabinet and battery alarms. The user can sort the alarms list by type (Warnings, Errors, or Faults) at the cabinet or battery level.

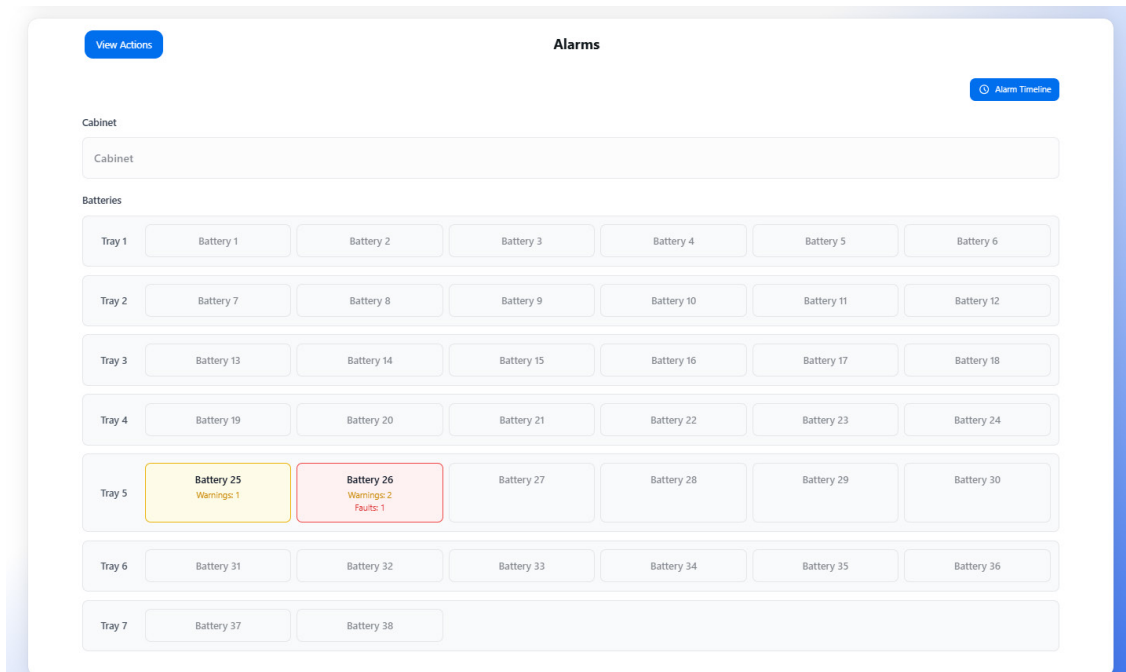


Figure 40- Alarm status

5. **Export:** This view provides allows the user to download a .csv file of all battery, cabinet, and system related data from a selected time range.

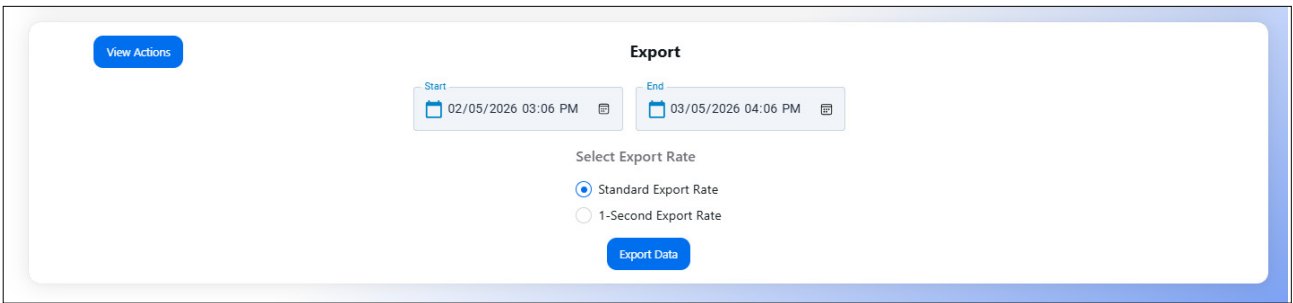


Figure 41- Exporting a CSV of system data

6. **Blackbox:** Download a full record of event logs and data for the entire system.

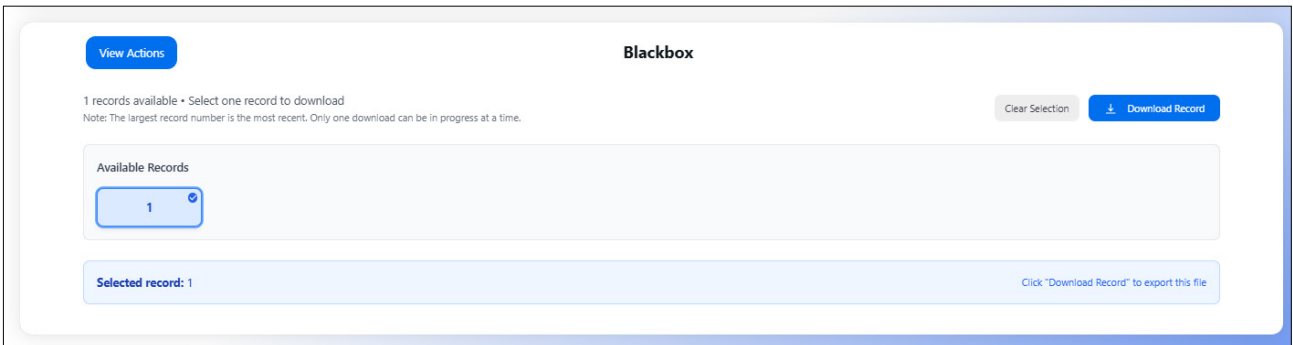


Figure 42- Downloading Blackbox system data

View Actions - Configure

Configuration related actions allow the user to establish and adjust BMS and component parameters.

1. Cabinet: The user can change the Battery Quantity, Battery Type, IP Address, DHCP Status, Server Address, and RTU Address, then Configure the BMS.

View Actions

Cabinet Configuration

Battery Quantity (BMS Value 38):

36

37

38

39

Battery Type (BMS Value HSF):

HSF

USF

IP Address (BMS Value 10.1.10.137):

New IP Address

DHCP Status (BMS Value Enabled):

Enable

Disable

Server Address:

New Server Address

RTU Address (BMS Value 1):

Select RTU Address (1-247)

Configure BMS

Clear

Figure 43- Cabinet configuration

2. Batteries: Select recently replaced batteries to update the BMS.

View Actions

Replace Batteries

Select All

Clear Selection

Replace Selected (0)

Tray 1 None	Battery 1	Battery 2	Battery 3	Battery 4	Battery 5	Battery 6
Tray 2 None	Battery 7	Battery 8	Battery 9	Battery 10	Battery 11	Battery 12
Tray 3 None	Battery 13	Battery 14	Battery 15	Battery 16	Battery 17	Battery 18
Tray 4 None	Battery 19	Battery 20	Battery 21	Battery 22	Battery 23	Battery 24
Tray 5 None	Battery 25	Battery 26	Battery 27	Battery 28	Battery 29	Battery 30
Tray 6 None	Battery 31	Battery 32	Battery 33	Battery 34	Battery 35	Battery 36
Tray 7 None	Battery 37	Battery 38				

Figure 44- Battery replacement interface

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3. Calibrate: Input measured current, voltage, and SOC values as well as reset SOH, ADAH, CDAH.
 - a. Measuring currents and voltages follow a similar process.
 - To calibrate Hall and Shunt Current, use the current clamp to measure at different set points. For the Shunt there are four set points: -1200 to -100 A, 0 A, 20 to 50 A, above 50 A. For the Hall, there are three points: $-200 < \text{point 1} < 0$, $\text{point 2} = 0$, $0 < \text{point 3} < 50$.
 - Once a stable reading is obtained, enter the value in the text field. The BMS automatically detects the point used for calibration and adjusts.
 - b. If all batteries are replaced at once, State of Health (SOH) should be reset to 100%.
 - c. Only a Site Administrator or user with assigned permission can manage communication from the UI to BMS and can reset SOH, SOC, Actual Discharge Amp Hour (ADAH) or CDAH.
 - d. Select the question mark on the right side of the section for additional help.

Figure 45- Battery calibration

4. Validation: Input voltage and temperature values to configure validation.
 - a. If any of the user-configured voltage or temperature thresholds are met while Validation Mode is enabled, the cabinet will transition to the fault state and the breaker will trip.

Figure 46- Validation mode battery settings

View Actions - Update

Firmware is updated by individual cabinet or full system. First, update the individual cabinet through the View Actions - Update button, as shown in Figure 47 below.

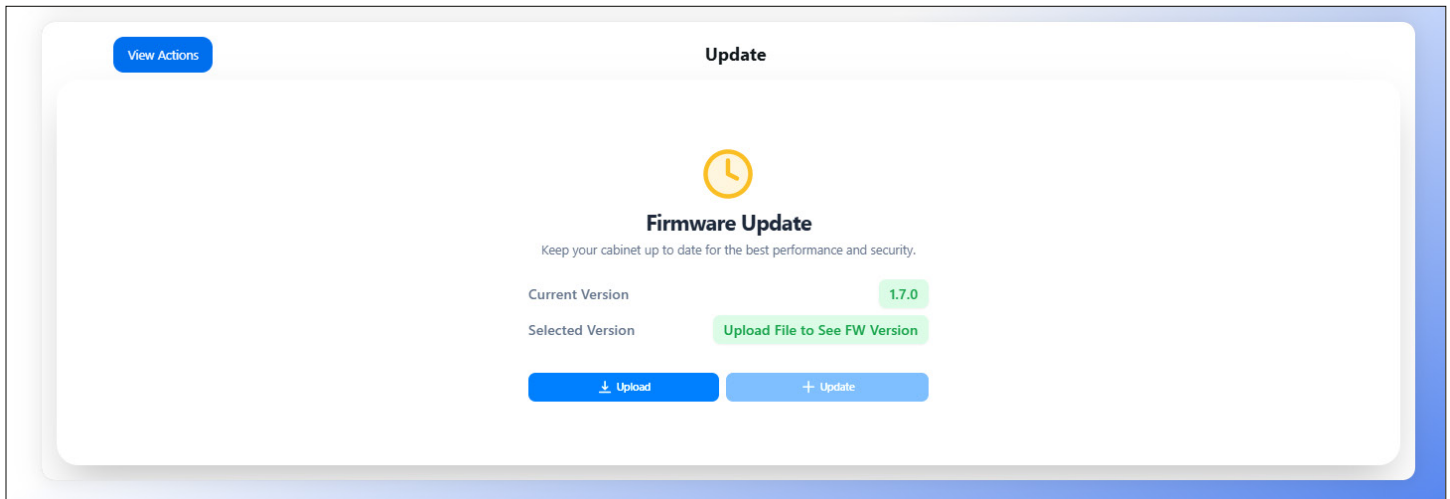


Figure 47- Firmware updates via Cabinet Actions

By using the **System Updates** tab, the Site Administrator or user with assigned permission can update the full system. This tab displays the new firmware version, and the version loaded on the BMS. If a new firmware version is required, contact your administrator to request the file. To update the full system firmware:

1. Navigate to the Home page and select the Updates tab.
2. Select Choose File and upload the latest firmware file with a clear naming convention.
3. The uploaded file will appear in the box in the center of the screen. Click the box next to the desired file and select Upload Firmware.
4. Once uploaded, select the Update Firmware button. The progress bar will display the status of the update.
 - a. If a failure message appears, retry the update, and power cycle the BMS. If the update is still unsuccessful, contact ZincFive Service + Support via phone: 888.517.777 or email: productsupport@zincfive.com.

View Actions - IO Control

This section is only allows the the Site Administrator to take over fans, the contactor, and UVR control. The Site Administrator must return control to the BMS for the BMS to function normally.

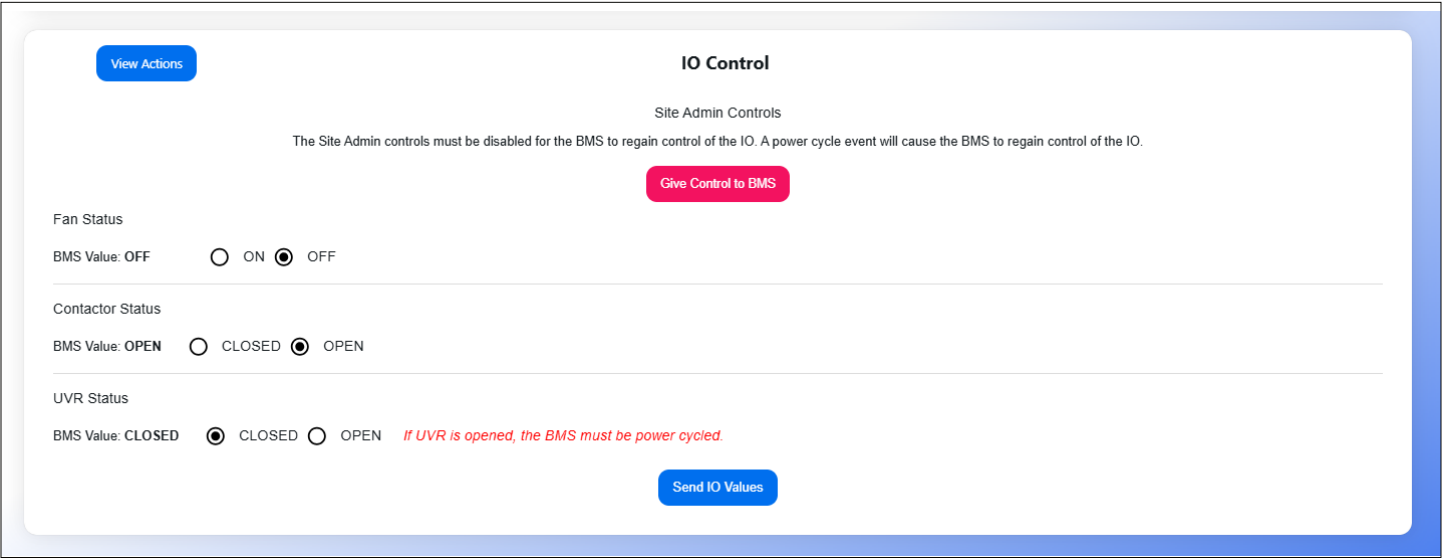
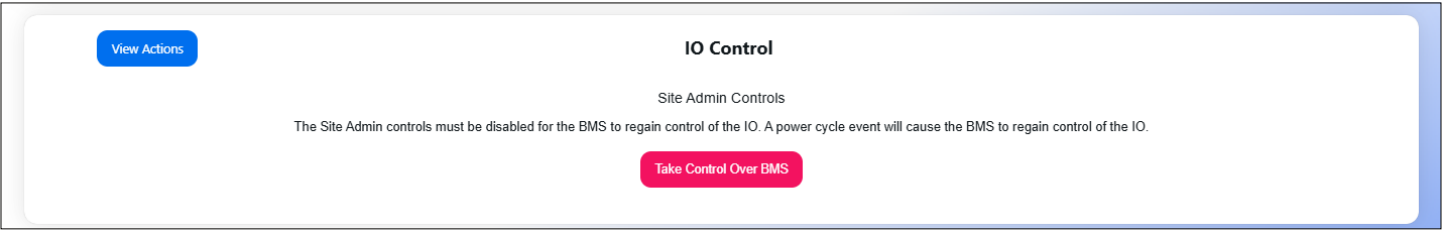


Figure 48 (TOP)- Initiating IO Control over BMS
Figure 49 (BOTTOM)- Full system IO control of the BMS

System State Definitions

There are four possible System States: Standby, Charge, Discharge, and Fault. For details, refer to the Overview, Voltages, and Currents sections, marked by yellow boxes in the following images.

1. Standby State – This is the operation ready state of the battery system, the breaker will be closed, and the user will be allowed to perform a charge or discharge. If the system's State of Charge is below 90%, the system will remain in charge state and will only go into Standby if an end of charge condition is reached.

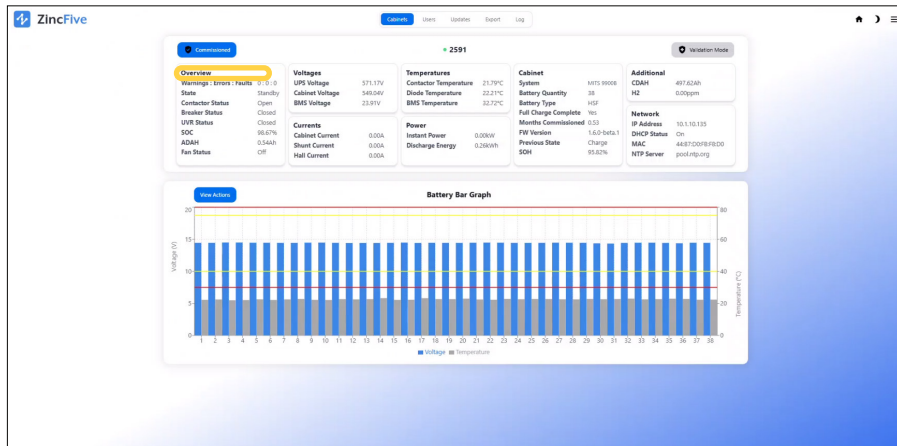


Figure 50 - Standby State, visible in the top left of the Cabinet Details page

2. Charge State – If the SOC is below 90% or previous charge cycle was not completed or system has just been powered up, and all batteries temperatures are between 15°C and 40°C, the system will enter charge state. The contactors will close and will allow a positive current into the system.

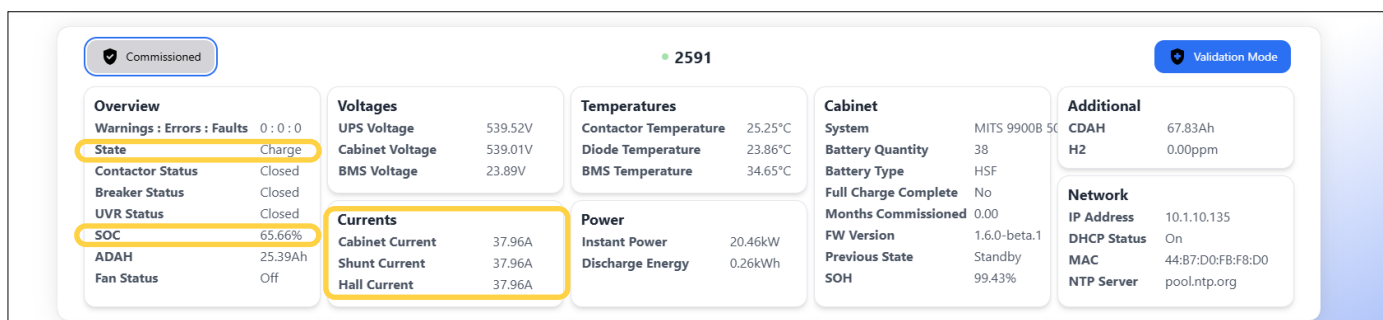


Figure 51 (TOP)- Charge State details

Figure 52 (BOTTOM)- Charge State viewable via the Cabinet Details page

3. Discharge State – The system will enter discharge state if a load with a current draw below -15 A is connected to the system. The system will continue to discharge until the load is disconnected or the current draw is greater than -2 A normal mode.

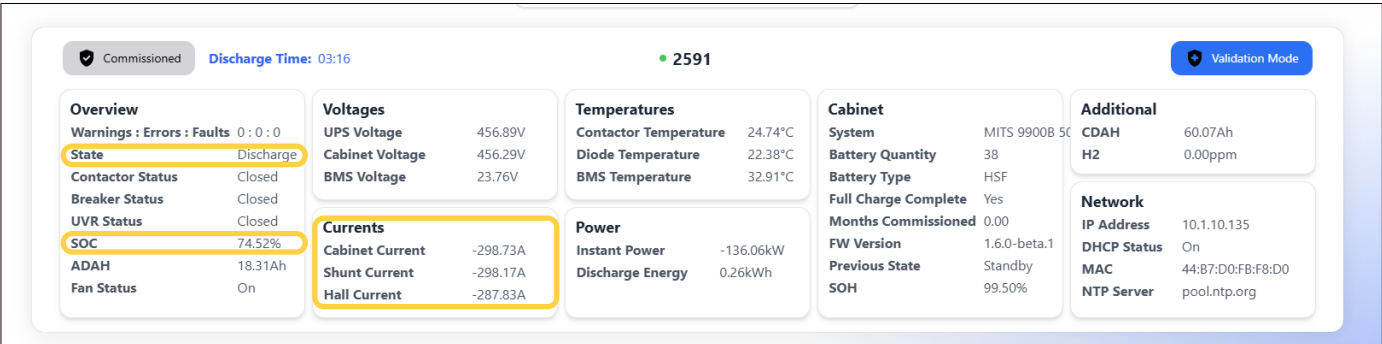


Figure 53 (TOP)-Discharge State viewable via the Cabinet Details page, Figure 54 (BOTTOM)- Discharge State details

4. Fault State – The system enters a fault state while in validation mode. A condition was reached that triggered a fault causing the breaker to trip and contactor to open.

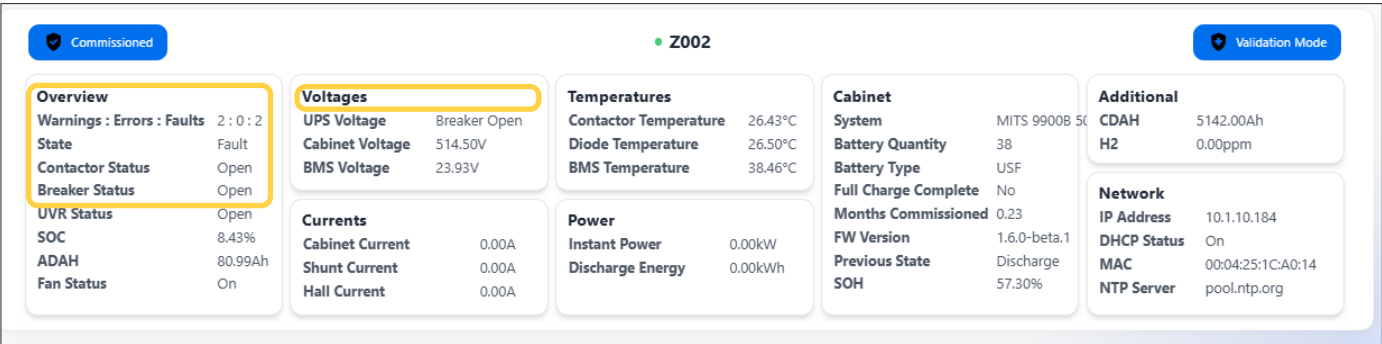
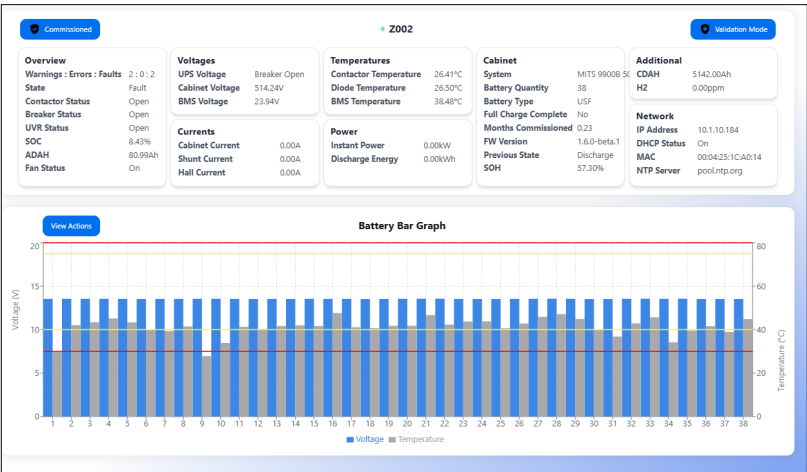


Figure 55 (TOP)-Fault State viewable via the Cabinet Details page, Figure 56 (BOTTOM)- Fault State details

Cabinet Sync Charge

To ensure operational efficiency and avoid cabinets discharging into one another, Cabinet Sync Charge is the preferred customer charge method. Cabinet Sync Charge functionality is a requirement in the setup process, and in order to do so, the customer site must be capable of hosting a multicast group.

To set up Cabinet Sync Charge:

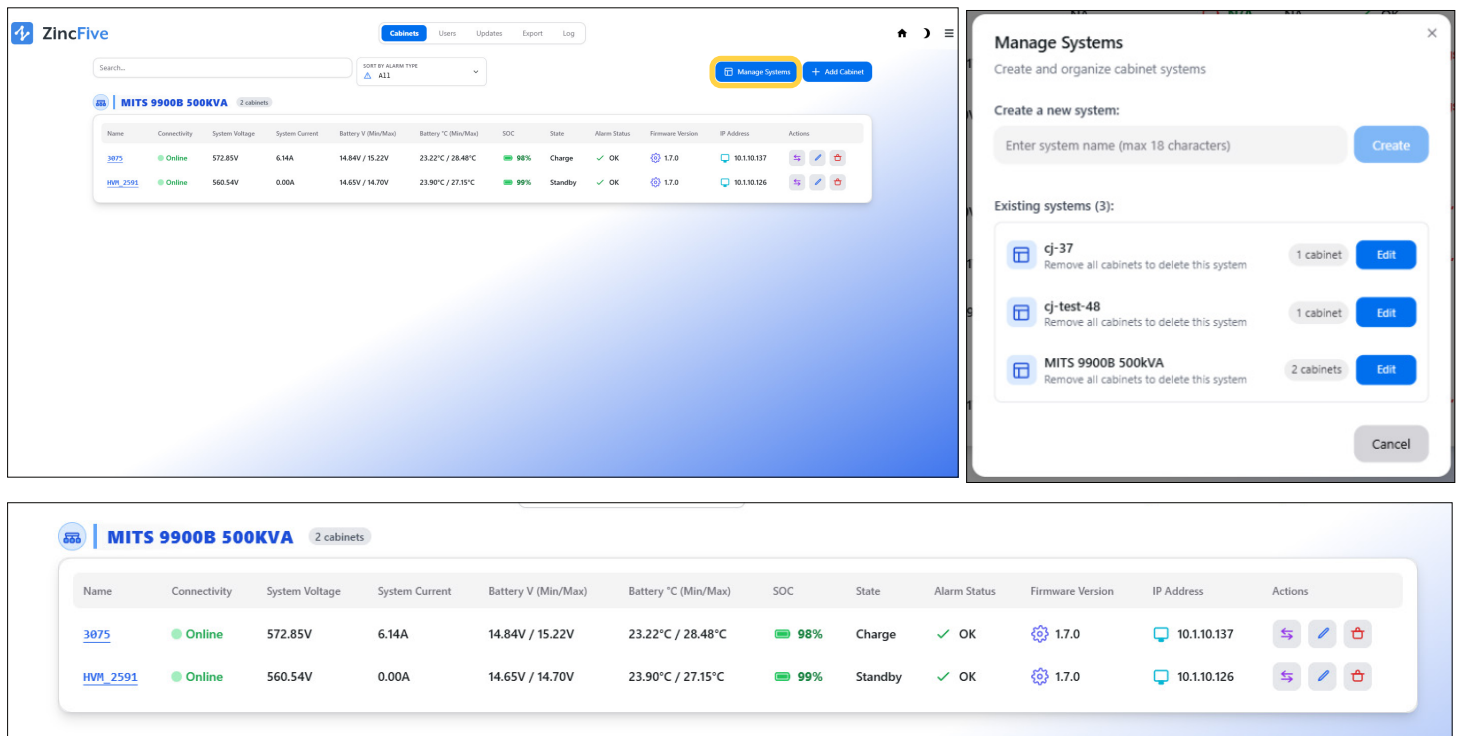


Figure 57 (TOP LEFT)- Manage systems button on the Cabinet Overview Page.

Figure 58 (TOP RIGHT)- Creating and organizing systems using the Manage Systems button.

Figure 59 (BOTTOM)- Viewing cabinets under the same System name e.g. MITS 9900B 500KVA

1. On the Cabinet Overview page, select the manage systems button (Fig. 57).
2. Use a maximum of 17 characters in the System Name field to set the System name for the cabinets. Click Configure BMS to update the system (Fig. 58).
3. In order to synchornize the charge, all cabinet BMS units in the system must be connected to the Web UI during this process. The cabinet will use a UDP Multicast group on IP Address 239.255.255.250 and Port 55555.
 - a. Any time a new cabinet is added to the system, all cabinets must be online and connected to the UI in order for the cabinets on that system to receive updated data.
4. Cabinets on the same system will synchronize their charges, initiating a charge cycle only when both a cabinet needs to be charged and all cabinet batteries are at an appropriate charging temperature.

Alarms & Troubleshooting

To ensure continued functionality of the BMS and battery cabinets, continue to monitor all reading, errors & alarms, and keep the firmware updated to the latest version. (See Firmware Updates, pg.34)

 **MIT5 9900B 500KVA** 2 cabinets

Name	Connectivity	System Voltage	System Current	Battery V (Min/Max)	Battery °C (Min/Max)	SOC	State	Alarm Status	Firmware Version	IP Address	Actions
3075	Online	527.10V	0.00A	-1.82V / 13.94V	18.15°C / 22.18°C	93%	Fault	1 Warnings, 1 Errors, 1 Faults	1.7.0	10.1.10.137	  
HVM_2591	Online	557.44V	0.00A	14.61V / 14.66V	17.20°C / 21.13°C	99%	Fault	1 Faults	1.7.0	10.1.10.126	  

Figure 60- Viewing system alarms via the Cabinet Overview pages

Alarms

Alarms alert the user of a malfunction or an unexpected parameter reading on the battery system, to ensure continued protection of the operator and equipment. See Appendix A for the full list of alarms. There are three categories of alarms that can be thrown:

- 1. Warnings: Alerts the user of a potential concern that should be resolved. The system will remain in operation and the breaker will not be forced open (if closed). Warnings are yellow-colour-coded.
- 2. Errors: This alerts the user of a serious concern that cannot be ignored. Errors are orange color-coded, latched, and will not disappear from interface unless BMS power is cycled.
- 3. Faults: This alerts the user of a parameter that has severely deviated from operational limits. Faults are red color-coded and automatically open the breaker.



Alarms



Cabinet

Cabinet

Batteries

Tray 1	Battery 1	Battery 2	Battery 3	Battery 4	Battery 5	Battery 6
Tray 2	Battery 7	Battery 8	Battery 9	Battery 10	Battery 11	Battery 12
Tray 3	Battery 13	Battery 14	Battery 15	Battery 16	Battery 17	Battery 18
Tray 4	Battery 19	Battery 20	Battery 21	Battery 22	Battery 23	Battery 24
Tray 5	Battery 25 Warnings: 1	Battery 26 Warnings: 2 Faults: 1	Battery 27	Battery 28	Battery 29	Battery 30
Tray 6	Battery 31	Battery 32	Battery 33	Battery 34	Battery 35	Battery 36
Tray 7	Battery 37	Battery 38				

Figure 61 - Viewing cabinet and battery alarms via Cabinet Actions

Recycling and Disposal of the Battery Pack



PROPER DISPOSAL OF ANY ZINC/FIVE BATTERY IS REQUIRED. REFER TO YOUR LOCAL CODES FOR DISPOSAL REQUIREMENTS

1. Do not dispose of the battery in a fire as it may explode.
2. Do not open or mutilate the battery.
3. Do not discard the UPS or the UPS batteries in the trash.

BMS Specifications

Module	ZincFive Battery Management System (BMS) Controller + Tray Monitor
System Electrical	
Input Voltage	24 VDC
Power	12 W - Controller, .7 W Tray Monitor
Current	.5 A - Controller, .7 W - Tray Monitor
System Environment	
Operational Temperature Range	0°C to +50 °C, Indoor Use Only
Storage Temperature Range	-20°C to +70°C, Indoor Storage Only
Humidity Range	0-90%, Non-Condensing
Altitude	4000 Meters
Polution Degree	PD2
Overvoltage Category	OVII
Ingress Protection	IP20 (Indoor Only)
Controller Functions	
Memory	1 MB RAM, 8 MB Flash
Display	Internal / External LEDs (Panel Mount RBG LED)
Configuration Interface	Serial Terminal (Tera Term, Putty, etc.) - Initial Comissioning only.
Communication	Micro USB: USB 2.0 Ethernet Port 1: 10/100Base-T Ethernet Ethernet Port 2: 10/100Base-T Ethernet
Debugging (Service Only)	Micro USB port (Serial debug interface at 115,200 baud, line endings are LF)
Protocols	Modbus TCP/IP Modbus RTU (19,200 Baud, no parity, 8 data bits, 1 stop bit, Device ID = 1) MQTT (TCP/IP, TLSv1.3) UDP
Onboard data storage	32 - 64 GB EMMC
Relay outputs	(2) Relays (N/O, N/C, COM): 0.5 A at 125 VAC / 1 A at 24 VDC
Digital Inputs	Push Button
ADC	Able to read up to 600 VDC UPS/Battery Cabinet Voltages
Dimensions: Width, Depth, Height, Weight	216 mm x 160 mm x 24 mm, 660 g
Tray Monitor Functions	
Capability	Supports voltage and temperature data collection of up to 6 batteries
Display	Heartbeat LEDs
Configuration Interface	ZF Battery Management System Controller
Communication	isoSPI: isoSPI Port A isoSPI: isoSPI Port B
Dimensions: Width, Depth, Height, Weight	32 mm x 200 mm x 114 mm, 200 g 1.26 in x 7.87 in x 4.49 in, 7.05 oz
Minimum PC Requirements	
Processor	x86-64, 4+ cores
Operating System	Ubuntu LTS 20.04+, Debiam 11+, RHEL 9/Alma 9, Windows 10/11 Pro (WSL 2)
RAM	8+ GB
Storage	10 GB
Monitor	Headless
System Certifications	
Safety (UL + CAN/CSA-C22.2)	61010-1, Edition 3; 61010-1, UL 61010-2-030, Edition 3
EMC	IEC/EN 61326-1; EN 55032:2015+A11:2020; EN 55035:2017+A11:2020; FCC Part 15 Class A
Others	FCC, CE, UKCA, REACH, RoHS

BC 2 Specifications

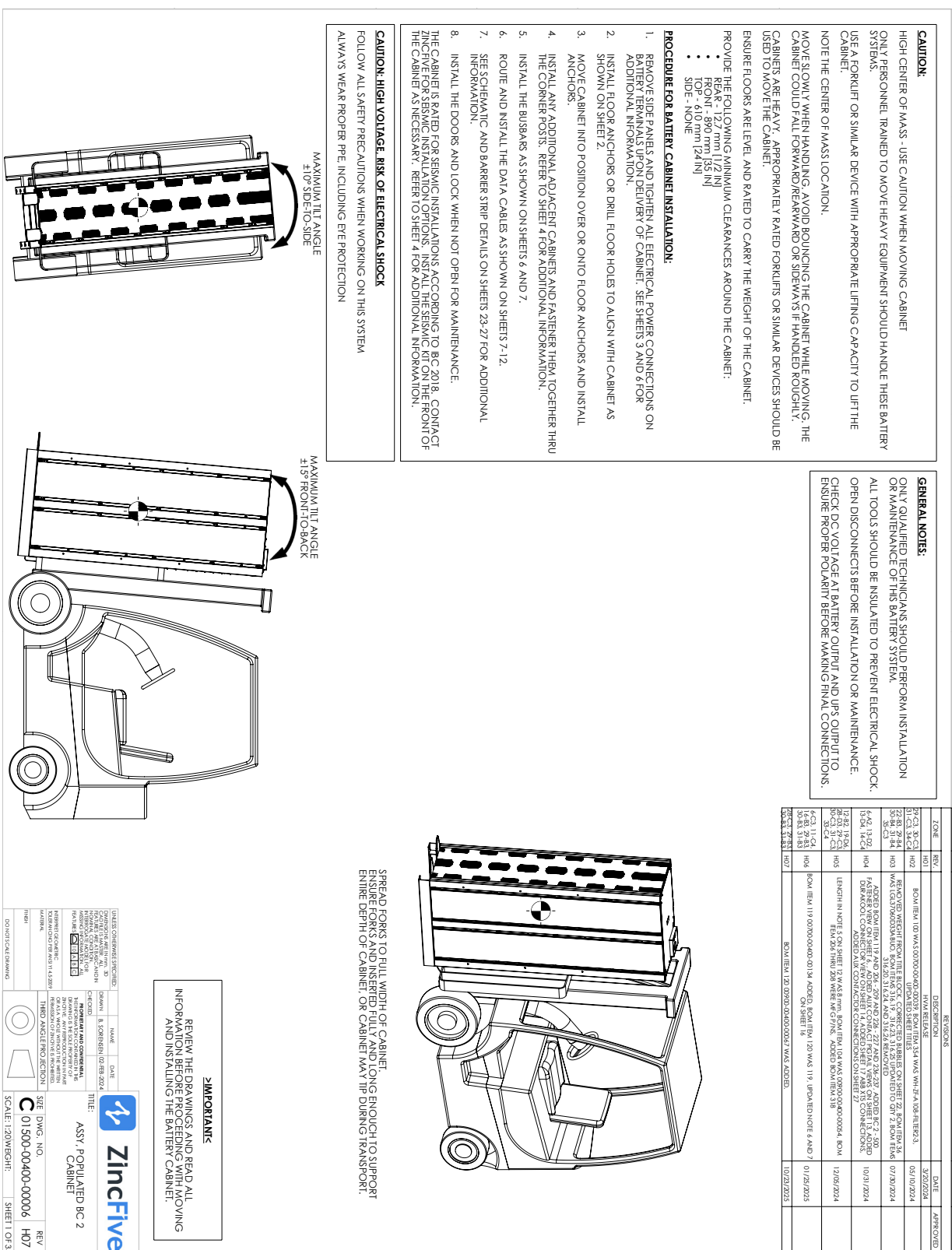
	ZincFive BC 2	ZincFive BC 2 - 300X	ZincFive BC 2 - 500
Battery Count	36s, 37s, 38s, and 39s Available	36s, 37s, 38s, and 39s Available	36s, 37s, 38s, and 39s Available
Electrical			
Nominal Voltage	468 Vdc (36s), 481 Vdc (37s), 494 Vdc (38s), 507 Vdc (39s)		
Charge Voltage Range	537 - 555 Vdc (36s), 552 - 570 Vdc (37s), 567 - 585 Vdc (38s), 582 - 600 Vdc (39s). See the <i>Installation & Operation Manual</i> for more detail.		
Minimum and Maximum Charge Current	20 A minimum; 160 A maximum		
Standard Charging Current	80 A	90 A	
Charge Time	Ranges from 2 hours to 5 hours for 0-100% SOC, dependent on charge current		
Low Voltage Cutoff	360 Vdc - 390 Vdc / 10 Vdc per battery		
Battery Option	Z5 13-80 H S F	Z5 13-90 U S F	
Nominal Capacity C/2 at 25°C	>80 Ah	>90 Ah	
Nominal Energy Storage at C/2	36 kWh (36s), 37 kWh (37s), 38 kWh (38s), 39 kWh (39s)	43 kWh (36s), 44 kWh (37s), 46 kWh (38s), 47 kWh (39s)	
Maximum Discharge Current	800 A		1200 A
Application	High-Rate discharge Less than 5 minute runtime	High-Rate discharge Greater than 5 minute runtime	Ultra-High-Rate discharge Less than 5 minute runtime
Battery Chemistry	Nickel-Zinc		
Electrolyte	Wet, Alkali Filled		
Single String Battery Configuration	36, 37, 38, 39 battery modules per battery string		
System BMS Functions			
Monitoring	BMS manages charge functions and monitors full suite of parameters during discharge and standby including battery voltage, temperature and current.		
Power Supply	120/240 VAC 50/60 Hz standard. Additional 120/240 VAC and 600 VDC redundant supply options available		
Data Communications	Ethernet, Modbus TCP/RTU, USB, Local Server, and Cloud options		
Safety and Environmental			
Safety	Batteries exhibit no thermal runaway as per UL 9540 A		
Breaker Protection	Circuit breaker is accessible with door closed and (manual or upon fault) disconnects batteries from inverter. Various kA rated breakers available depending on configuration.		
Operating Temperature Range ¹	20 - 35 °C		
Storage Temperature Range ²	-20 °C - +50 °C		
Storage Period	6 months at 25 °C before batteries need charge		
Humidity Range	0-90%, Non-Condensing		
Cooling	Forced Ventilation Standard		
Certifications			
Cabinet	UL 9540, UL 1973, UL1778, CAN/CSA C22.2 No. 107.3, IEC 62040-1, IEC 62040-2, CE, UKCA, RoHS, EU 2023/1542		
Battery	UL1989, EU 2023/1542, CE, RoHS, CSA C22.2 No. 60950-1, ANSI/CAN/UL1973		
Seismic	IBC 2021, ICC AC156 - S _{DS} 2.29		
Mechanical			
Height	82.5" (2096 mm) for Cabinet / 83.5" (2121 mm) with High Voltage Box		
Width	21" (533 mm)		
Depth	36" (914 mm)		
Total Weight	2050 lbs. (929.9 kg)	2131 lbs. (966.4 kg)	2140 lbs. (970.5 kg)

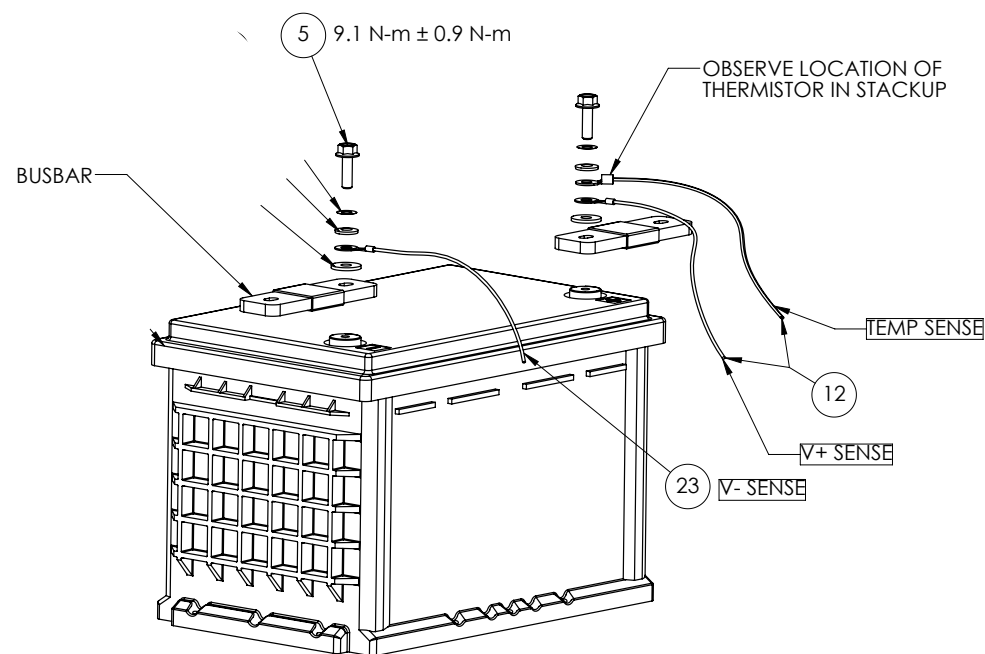
¹Consult with ZincFive for use outside this temperature range

²Refer to ZincFive's BC Series UPS Battery Cabinet Service Manual for storage details

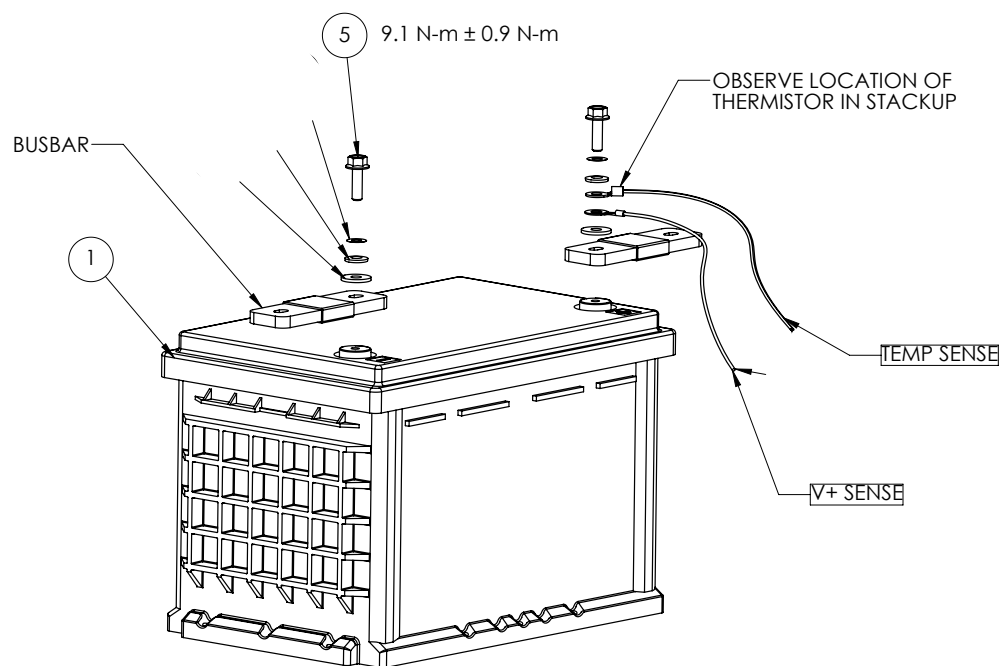
All Specifications valid at operating temperature range and subject to change

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BC 2, BC 2 - 300X, BC 2 - 500 BATTERY 1 STACK UP



BC 2, BC 2 - 300X, BC 2 - 500 BATTERY 2-6 STACK UP

Figure 54 - BC 2 Series Battery Stackup

BREAKER INFORMATION		
BREAKER PART NUMBER	AMPS	24 VDC UVR PART NUMBER
LL137080D3A8UO	600	S29410
		2A2B AUX. CONTACTS PART NUMBER
		S29450

S29450 CHARACTERISTIC			
OPERATIONAL CURRENT	AC		DC
	24 V	6 A	6 A
	48 V	6 A	2.5 A
	110 V	6 A	0.6 A
	220/240 V	6 A	-

CAUTION: HIGH VOLTAGE, RISK OF ELECTRICAL SHOCK

- FOLLOW ALL SAFETY PRECAUTIONS WHEN WORKING ON THIS SYSTEM
- ALWAYS WEAR PROPER SAFETY EQUIPMENT INCLUDING EYE PROTECTION

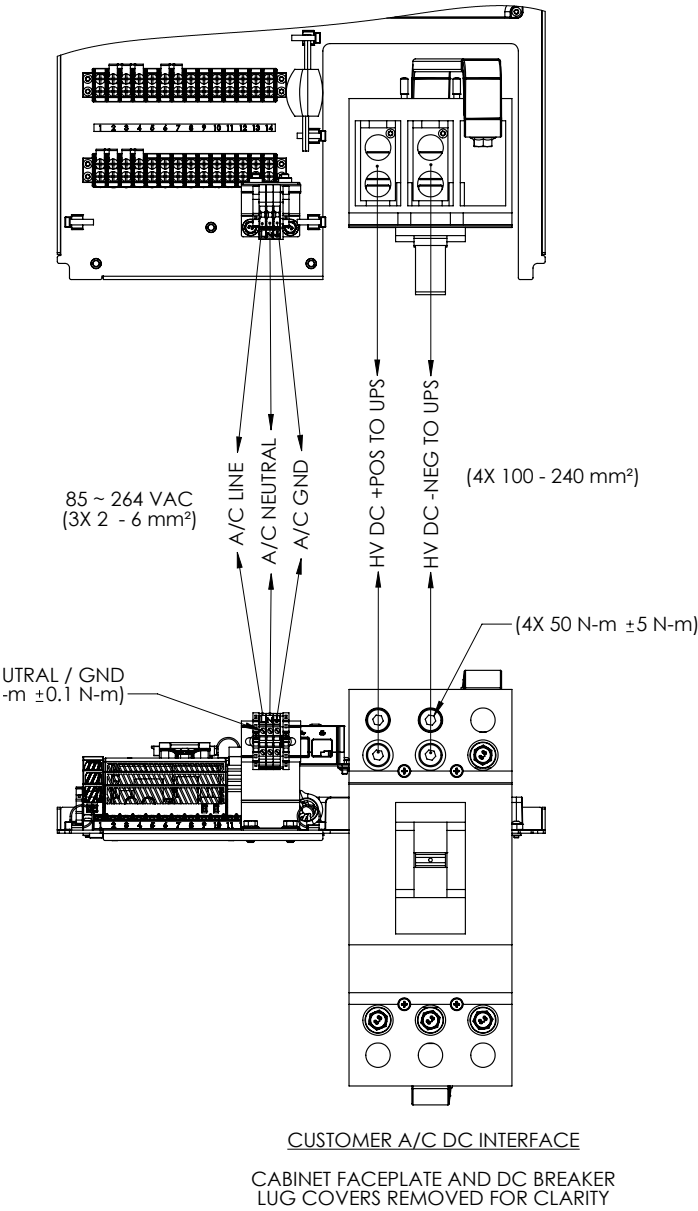


Figure 55- SQD Breaker Connections.

LUG INFORMATION				
LUG PART NUMBER	CONDUCTOR SIZE	STRIP LENGTH	TORQUE	NECESSARY TOOLS
AL600L552K3	2/0 AWG - 500 KCMIL	1.2 INCH	442 LB-IN	TORQUE WRENCH, RATED 500 IN-LBS 8 MM HEX WRENCH
MANUFACTURER DOCUMENT LINK				
https://download.schneider-electric.com/files?p_enDocType=Instruction+sheet&_File_Name=S1A14748.pdf&p_Doc_Ref=S1A14748				

Appendix D

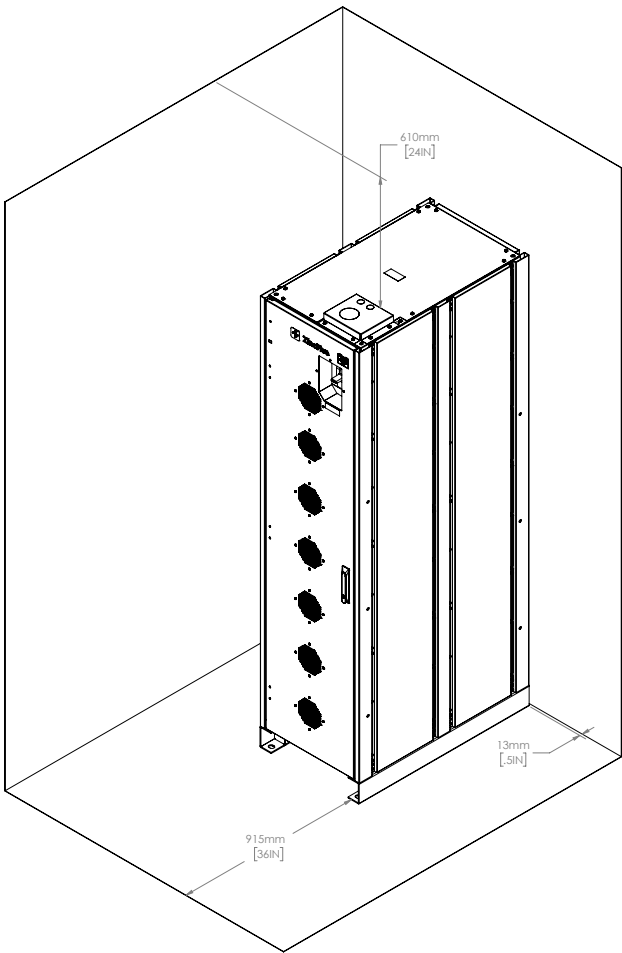
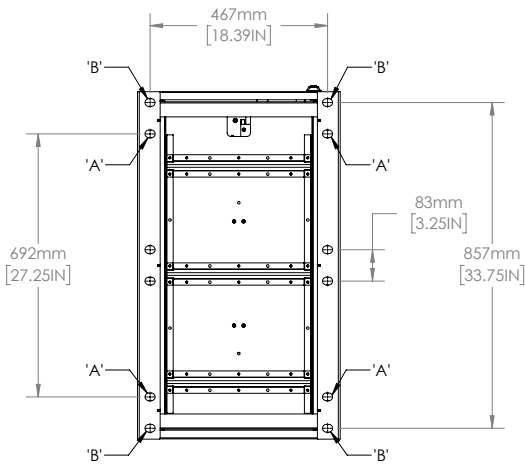


Figure 56 - Required Clearances.



MOUNTING HOLE PATTERNS MARKED 'A' OR 'B' ARE REQUIRED FOR INSTALLATION. OTHER HOLES ARE OPTIONAL.

BOTTOM VIEW OF CABINET

Figure 36 - Bolt hole locations for mounting.

Appendix E

Using model number **ZF-37B6SU011KB1-UZ000**, which corresponds with a BC 2 - 500 cabinet, the below provides a detailed breakdown of model nomenclature.

<u>ZF</u>	-	<u>37</u>	<u>B</u>	<u>6</u>	<u>S</u>	<u>U</u>	<u>01</u>	<u>1</u>	<u>K</u>	<u>B</u>	<u>1</u>	-	<u>U</u>	<u>Z</u>	<u>0</u>	<u>0</u>	<u>0</u>
I		II	III	IV	V	VI	VII	VIII	IX	X	XI		XII	XIII	XIV	XV	XVI

- I. Company Name Abbreviation: ZF = ZincFive, this is the same for every model number.
- II. Number of batteries in the cabinet: Reflects 36, 37, 38, or 39 depending on battery count.
- III. Monobloc Model Number: A = Z5 13 - 80 H S F battery (used only in the BC 2) and B = Z5 13 - 90 U S F battery (used only in the BC 2 - 300X and the BC 2 - 500).
- IV. Breaker Rating: 6 = 600 A.
- V. Breaker Manufacturer: A = ABB XT5LU360 – 50 kA, B = ABB XT5HU360 – 35 kA, C = ABB XT 5SU360 – 25 kA, D = ABB XT5VU360 – 70 kA, S = Square D (Schneider) LLL37060D33 – 50 kA, and T = Square D (Schneider) LGL37060D33 – 20 kA.
- VI. Relay Type: U = UVR and S = Shunt Trip.
- VII. Relay Voltage: 01 = 12 VDC, 02 = 24 VDC, 03 = 48 VDC, 04 = 120 VAC
- VIII. Power Path: 1 = BC 2 Ultra Power Path (270 mm², used with the BC - 2 500) and 2 = BC 2 Power Path (210 mm², used with the BC 2 and BC 2 - 300X)
- IX. Enclosure Manufacturer: K = Ometek, AmeriOmetek, American Metal Specialties, FI Company, or Harold Industries
- X. Enclosure Width: B = 21.1"
- XI. Power Supply Options: 1 = Single 120/240 VAC power supply, 2 = 110/240 VAC and 600 VDC power supplies, and 3 = Two 120/240 VAC power supplies, 4 = 480 VAC Power Supply
- XII. Communication Option: U = Universal, C = Cloud, L = Local Server, M = Modbus
- XIII. Battery Management System: Z = ZincFive BMS, A = ZincFive BMS with AI support
- XIV. Cabinet Color: 0 = Black and 1 = White
- XV. Undefined

Appendix F - Ratings Table

PRODUCT TYPE	BATTERY COUNT	NOMINAL VOLTAGE (VDC)	MAX SYSTEM VOLTAGE (VDC)	MAX ENERGY CAPACITY (kWh)	NONIMAL CAPACITY (Ah)	POWER RATING (kW)	RECOMMENDED CHARGING VOLTAGE (VDC)
BC 2	36	468	555	44	80	288	544
	37	481	570	45		296	559
	38	494	585	46		304	574
	39	507	600	48		312	589
BC 2-300X	36	468	555	50	90	288	541
	37	481	570	51		296	556
	38	494	585	52		304	572
	39	507	600	54		312	587
BC 2-500	36	468	555	50	90	432	541
	37	481	570	51		444	556
	38	494	585	52		456	572
	39	507	600	54		468	587

PRODUCT TYPE	BATTERY COUNT	CHARGING VOLTAGE RANGE (VDC)	CHARGING CURRENT RANGE (ADC)	MAX DISCHARGE CURRENT (ADC)	SHORT CIRCUIT RATING (A)	BATTERY MODEL
BC 2	36	537 - 555	20 - 160	800	5400	Z5 13-80 HSF
	37	552 - 570				
	38	567 - 585				
	39	582 - 600				
BC 2-300X	36	537 - 555	20 - 180	800	6200	Z5 13-90 USF
	37	552 - 570				
	38	567 - 585				
	39	582 - 600				
BC 2-500	36	537 - 555	20 - 180	1200	6200	Z5 13-90 USF
	37	552 - 570				
	38	567 - 585				
	39	582 - 600				

Appendix G - Alarm Summary

Type	Fault Name	Key	Condition	Result
Warning	Battery High Temperature Counter Warning	BHTC WARNING	The BHTC Warning (URS #43, Alarm Table #6) shall be triggered when a battery temperature has gone above 75 °C in six different discharges.	The BHTC_WARNING Modbus register shall be set TRUE at the position of the battery to notify the user of the warning.
Warning	Battery Low Temperature Charge Warning	BLTC WARNING	The BLTC Warning (URS Alarm Table #8) shall be triggered when a battery temperature falls below 15 °C in Charge, Standby, or Discharge	The BLTC_WARNING Modbus register shall be set True at the position of the battery to notify the user of the warning. Charging Start disabled if this is true.
Warning	Battery Pack Over Voltage Warning	BPOV WARNING	The BPOV WARNING (URS Alarm Table #1) shall happen when the string voltage has exceeded the following values in the Charge state: 36S > 547 V 37S > 562 V 38S > 578 V 39S > 593 V	The BPOV Warning shall set the BPOV_WARNING Modbus register to TRUE, thereby alerting the user of the warning.
Warning	Battery Pack Under Voltage Warning	BPUV WARNING	The BPUV Warning (URS Alarm Table #2) shall happen when the string voltage falls below the following values in the standby or discharge state: 36S < 360 V 37S < 370 V 38S < 380 V 39S < 390 V	The BPUV Warning shall set the BPUV_WARNING Modbus coil to notify the user of the warning
Warning	Charge Battery Temperature Warning	CBT WARNING	The CBT Warning (URS #13, Alarm Table #6) shall be triggered when a battery has exceeded 45 °C during Charge.	The CBT_WARNING Modbus coil shall be set TRUE to notify the user of the warning.
Warning	Charge Completed Low Voltage Warning	CCLV WARNING	The CCLV Warning (URS BMS Control Logic Definitions 5.1.7.3.) shall be triggered when a Charge completes with ADAh < 0, Current < 4 A, and String Voltage < BPOV - 18 with a persistence of 10 s	The CCLV_WARNING Modbus coil shall be set TRUE to notify the user of the warning.
Warning	Discharge Battery Temperature Warning	DBT WARNING	The DBT Warning (URS #13, #40) shall be triggered when a battery has exceeded 75C during discharge.	The DBT_WARNING Modbus coil shall be set TRUE to notify the user of the warning.
Warning	Discharge Current High Warning	DCH WARNING	The DCH Warning (URS #12) shall be triggered when the discharge current is below -800 A HSF, -1200 A USF.	The DCH_WARNING Modbus coil shall be set TRUE to notify the user of the warning.
Warning	Single Battery Over Voltage Warning	SBOV WARNING	The SBOV Warning (URS #12) shall be triggered when a battery voltage is over 15.5 V in the Charge state.	The SBOV_WARNING Modbus register shall be set TRUE at the position of the battery to notify the user of the warning.
Warning	Undercharge Warning	UC WARNING	The UC Warning (URS #8, #9) shall be triggered when Charge is finished with a voltage less than: 36s < 537, 37s < 552, 38s < 567, 39s < 585	The UC Warning shall set the UC_WARNING Modbus coil to True to notify the user of the warning.
Warning	Voltage Differential from Mean Warning	VDFM WARNING	The VDFM Warning shall be triggered in any state when a battery has a voltage that is 1 V greater than or less than the mean voltage of all batteries in the string.	The VDFM_WARNING Modbus register shall be set TRUE in the position of the battery to notify the user of the warning.
Warning	Chain Break Warning	CHAIN_BREAK	The Chain Break Warning shall be triggered when there is a break in the isoSPI chain and communication can not proceed via the respective cable.	The CHAIN_BREAK_WARNING register shall be set to TRUE at the position of the cable to notify the user of the warning.
Error	Battery Discharge Mean Delta Error	BDMD ERROR	The BDMD shall be triggered in the discharge state IF [Batt V < mean (Batt V)-1 V] AND "in Discharge for >5s" AND SOC > 30%]	The BDMD Error Modbus coil shall be set to TRUE, the battery shall be marked for replacement, and one recharge shall be allowed before charge is disabled
Error	Battery High Voltage and SOC Error	BHVS ERROR	The BHVs Error shall be triggered when a battery exceeds 15.5 V and the SOC is less than 50% while the system is in the Charge state.	The BHVS_ERROR Modbus register shall be set to True in the position of the battery to notify the user of the error and a replace battery error shall appear on the Web UI. The error shall persist power-cycle events.
Error	BMS Over Temperature Error	BOT ERROR	The BOT Error (URS #37) shall be triggered in any state when the BMS has exceeded 80 °C.	The BOT_ERROR Modbus coil shall be set to TRUE to notify the user of the error.
Error	Battery Over Temperature Discharge Error	BOTD ERROR	The BOTD Error (URS #13, #40, Alarm Table #6) shall be triggered when a battery temperature exceeds 85 °C during Discharge.	The BOTD_ERROR Modbus register shall be set True at the position of the battery to notify the user of the error.
Error	Battery Pack Over Voltage Error	BPOV ERROR	The BPOV Error (URS Alarm Table #1) shall be triggered when the String Voltage exceeds the following limits during Charge: 36S > 555 V 37S > 570 V 38S > 585 V 39S > 600 V	The BPOV_ERROR Modbus coil shall be set TRUE to notify the user of the error. The BMS shall end the Charge and go to Standby.
Error	Battery Pack Under Voltage Error	BPUV ERROR	The BPUV Error (URS Alarm Table #2) shall be triggered when the string voltage falls below the following values in the Standby or Discharge state: 36S < 342 V 37S < 352 V 38S < 361 V 39S < 371 V	The BPUV_ERROR Modbus coil shall be set TRUE to notify the user of the error.

Appendix G - Alarm Summary

Type	Fault Name	Key	Condition	Result
Error	Charge Current High Error	CCH ERROR	The CCH Error (URS #10, #45) shall be triggered when the charge current exceeds 160 A HSF, 180 A USF for 15 seconds.	The CCH_ERROR Modbus coil shall be set TRUE to notify the user of the error and the system shall open the contactor and wait for 135 seconds before attempting to charge.
Error	Charger-Battery Interaction Standby Error	CBIS ERROR	The CBIS error (URS #49) shall be triggered when the system is in standby and String Voltage - Inverter Voltage < 5V AND (Charge flag = True) AND End Of Charge Voltage - String Voltage < 5 V for two hours.	The CBIS_ERROR Modbus coil shall be set to TRUE to notify the user of the error.
Error	Contactor Temperature High Error	CTH ERROR	The CTH Error (URS #6) shall be triggered in all states when the contactor temperature is greater than 120 °C.	The CTH_ERROR Modbus coil shall be set to TRUE to notify the user of the error.
Error	Discharge Current High Error	DCH ERROR	The DCH Error (URS #12) shall be triggered when the discharge current is below -1000 A HSF, -1300 A USF.	The DCH_ERROR Modbus coil shall be set TRUE to notify the user of the error.
Error	Diode Temperature High Error	DTH ERROR	The DTH Error (URS #5) shall be triggered in all states when the diode temperature is greater than 100 °C.	The DTH_ERROR Modbus Coil shall be set TRUE to notify the user of the error.
Error	Supply Voltage High Error	SVH ERROR	The SVH Error (URS Alarm Table #20) shall be triggered in any state when the supply voltage is greater than 32.5 V.	The SVH_ERROR Modbus coil shall be set to TRUE to notify the user of the error.
Error	Supply Voltage Low Error	SVL ERROR	The SVL Error (URS Alarm Table #19) shall be triggered in any state when the supply voltage is less than 21 V.	The SVL_ERROR Modbus coil shall be set TRUE to notify the user of the error.
Fault	Battery Over Temperature Charge Fault	BOTC FAULT	The BOTC Fault (URS #13, Alarm Table #6) shall be triggered when a battery temperature exceeds 55 °C during Charge.	The BOTC_FAULT Modbus register shall be set true at the location of the battery to notify the user of the fault and the system shall transition to the fault state.
Fault	Charge Current Very High Fault	CCVH FAULT	The CCVH Fault (URS #10, #45) shall be triggered when the charge current exceeds 1000 A. The CCVH error shall cause the BMS to transition to the error state	The CCVH_FAULT Modbus coil shall be set TRUE to notify the user of the error and the system shall transition to the fault state
Fault	Charge Ended Due to Battery Voltage Fault	CEBV FAULT	The CEBV Fault shall be triggered when a battery reaches 15.5 V in three separate charges.	The CEBV_FAULT Modbus Coil shall be set to True to notify the user of the error and charge shall be disabled until the battery is replaced
Fault	Low ADAh Fault	LA FAULT	The LA Fault (URS Alarm Table #6) shall be triggered in the Charge or Standby state when the ADAh is below -40.	The LA_FAULT Modbus coil shall be set to TRUE to notify the user of the error. The current charge shall end and the system shall transition into the fault state
Fault	Open Circuit Voltage Fault	OCV FAULT	The OCV Fault shall be triggered IF [(OCV<13.2V) AND (OCV-OCVmean-0.3V) for 5 continuous sec) AND (Full Charge Flag=True) AND (In Standby for > 5min)] OR IF [(OCV-OCVmean-0.3V) for 35 continuous minutes) AND (Full Charge Flag=True) AND (In Standby for > 10hrs)]	The OCV Fault Modbus coil shall be set TRUE, the battery shall be marked for replacement, and charge shall be disabled until the battery is replaced
Fault	Single Battery Over Voltage Fault	SBOV FAULT	The SBOV Fault (URS Alarm Table #3) shall be triggered when a battery voltage is greater than 15.7 V in the Charge, Standby, or Discharge state.	The SBOV_FAULT Modbus register shall be set TRUE at the location of the battery to notify the user of the error and the system shall transition to the fault state.
Fault	Single Battery Under Voltage Fault	SBUV FAULT	The SBUV Fault (URS #39, #41, Alarm Table #4) shall be triggered when a battery voltage is less than 7.5 V in the Standby or Discharge state with persistence of 2 s.	The SBUV_FAULT Modbus register shall be set TRUE at the position of the battery to notify the user of the error and the system shall transition to the fault state.
Fault	Standby Charge Current Fault	SCC FAULT	The SCC Fault shall be triggered when there is > 5.0 A for 5 s and the system is in the standby state	The SCC_FAULT Modbus Coil shall be set to True to notify the user of the error and the system shall transition to the fault state
Fault	Tray Inaccessible Fault	TRAY_LOST FAULT	The TRAY_LOST fault shall be triggered when communication with a tray monitor is lost on both isoSPI ports.	The TRAY_LOST_FAULT Modbus register shall be set to TRUE at the position of the tray.
Validation Mode Fault	N Batteries High Temperature Fault	NBHT FAULT	The NBHT Fault (URS #38, 51) shall be triggered in Discharge when N batteries, where N equals {1,2,3}, are above T, where T equals (75~85 °C).	The NBHT_FAULT Modbus coil shall be set to TRUE to notify the user of the fault, the fault state shall be entered, the contactor shall be opened, and the breaker shall be opened.
Validation Mode Fault	N Batteries Low Voltage Fault	NBLV FAULT	The NBLV Fault (URS #38, 51) shall be triggered in Discharge when N batteries, where N equals {1,2,3}, are below V, where V equals (7.7~10 V).	The NBLV_FAULT Modbus coil shall be set to TRUE to notify the user of the fault, the fault state shall be entered, the contactor shall be opened, and the breaker shall be opened.
Validation Mode Fault	String Voltage Low Fault	SVL FAULT	The SVL Fault (URS #38, 51) shall be triggered in the Discharge state when the string voltage is below V where V equals {350~450 V}	The SVL_FAULT Modbus coil shall be set to TRUE to notify the user of the fault, the fault state shall be entered, the contactor shall be opened, and the breaker shall be opened.

Appendix G - Alarm Summary

Type	Fault Name	Key	Condition	Result
Validation Mode Fault	Validation Single Battery Temperature Fault	VSBT Fault	The VSBT Fault shall be triggered in the Discharge state when a battery temperature is above T where T equals {75~100 °C}.	The VSBT_FAULT Modbus coil shall be set to TRUE to notify the user of the fault, the fault state shall be entered, the contactor shall be opened, and the breaker shall be opened.
Validation Mode Fault	Validation Single Battery Voltage Fault	VSBV Fault	The VSBV Fault shall be triggered in the Discharge state when a battery voltage is below V where V equals {7.6~10 V}.	The VSBV_FAULT Modbus coil shall be set to TRUE to notify the user of the fault, the fault state shall be entered, the contactor shall be opened, and the breaker shall be opened.

Appendix H - MODBUS Dictionary, Continuous Valves

Read using MODBUS Function Code 4 (Read Input Registers Only).

NOTE: Registers of type FLOAT32 require two registers to hold the voltage/current.

Voltage

Register #	Type	Description	Registers Implemented/Notes
40000-40001	FLOAT32	System Voltage	Yes
40002-40003	FLOAT32	Inverter Voltage	Yes
40004-40005	FLOAT32	Power Supply Voltage	Yes
40006	UINT16	Reserved	Yes
40007	UINT16	Number of Monoblocks	Yes
40008 – 400xx	FLOAT32	Monoblock Voltages	Yes

Temperatures

Register #	Type	Description	Registers Implemented/Notes
41000	UINT16	System Temperature	Yes
41001	UINT16	Diode Temperature	Yes
41002	UINT16	Contactor Temperature	Yes
41003	UINT16	Reserved	Yes
41004	UINT16	Reserved	Yes
41005 – 410xx	UINT16	Monoblock Temperatures	Yes

Appendix H - MODBUS Dictionary, Continuous Valves

System

Register #	Type	Description	Registers Implemented/Notes
42000	UINT16	State of Charge (SOC)	Yes
42001	UINT16	State of Health (SOH)	Yes
42002	UINT16	State 00 – Standby 01 – Charge 02 – Discharge 06 – Error	Yes
42003	UINT16	Previous State	Yes
42004-42005	FLOAT32	CDAH (Cumulative Discharge Amp Hours)	Yes
42006-42007	FLOAT32	ADAH (Actual Discharge Amp Hours)	Yes
42008-42009	FLOAT32	Instant Power (kW)	Yes
42010	UINT16	Cumulative Energy (Wh)	Yes
42011	UINT16	Firmware Major Version	Yes
42012	UINT16	Firmware Minor Version	Yes
42013	UINT16	Firmware Patch Version	Yes
42014	UINT16	Timestamp – Year	No
42015	UINT16	Timestamp – Month	No
42016	UINT16	Timestamp – Day	No
42017	UINT16	Timestamp – Hour	No
42018	UINT16	Timestamp – Minute	No
42019	UINT16	Timestamp - Second	No
42020-42021	FLOAT32	Months Since Commissioning	Yes
42022	UINT16	Elapsed Discharge Time	Yes
42023	UINT16	H2 Sensor Reading	Yes

Appendix H - MODBUS Dictionary, Continuous Valves

Current

Register #	Type	Description	Registers Implemented/Notes
43000-43001	FLOAT32	System Current	Yes
43002-43003	FLOAT32	Hall Current	Yes
43004-43005	FLOAT32	Shunt Current	Yes
43006-43007	FLOAT32	DIODE Current	No

Warnings

Register #	Type	Description	Registers Implemented/Notes
44000-44003	UINT32	VDFM Warning	Yes
44004-44007	UINT32	CBT Warning	Yes
44008-44011	UINT32	DBT Warning	Yes
44012-44015	UINT32	Reserved	Yes
44016-44019	UINT32	BHTC Warning	Yes
44020-44023	UINT32	SBOV Warning	Yes
44024-44027	UINT32	BLTC Warning	Yes
44028	UINT32	CHAIN BREAK Warning	

Appendix H - MODBUS Dictionary, Continuous Valves

Errors

Register #	Type	Description	Registers Implemented/Notes
45000-45003	UINT32	Reserved	Yes
45004-45007	UINT32	Reserved	Yes
45008-45011	UINT32	Reserved	Yes
45012-45015	UINT32	BOTD Error	Yes
45016-45019	UINT32	Reserved	Yes
45020-45023	UINT32	Reserved	Yes
45024-45027	UINT32	BHVS Error	Yes
45028-45031	UINT32	BDMD Error	Yes

Faults

Register #	Type	Description	Registers Implemented/Notes
46000	UINT16	Tray Lost Fault	Yes
46001-46004	UINT32	BOTC Fault	Yes
46005-46008	UINT32	OCV Fault	Yes
46009-46012	UINT32	SBUV Fault	Yes
46013-46016	UINT32	SBOV Fault	Yes
45017-45020	UINT32	CEBV Fault	Yes

Appendix H - MODBUS Dictionary, Coils

Read using MODBUS Function Code 0x01 (Read Coils). Write using MODBUS Function Code 0x0f (Write Multiple Coils).

Alarms

Coil #	Severity	Description	Registers Implemented/Notes
70	Warning	BPOV Warning	Yes
71	Warning	BPUV Warning	Yes
72	Warning	UC Warning	Yes
73	Warning	DHC Warning	Yes
74	Warning	CCLV Warning	Yes
75	Warning	FCLT Warning	Yes
76	Warning	FCHT Warning	Yes
77	Warning	H2 Sensor Warning	Yes
78	Warning	Reserved	Yes
100	Error	BPOV Error	Yes
101	Error	BPUV Error	Yes
102	Error	SVH Error	Yes
103	Error	SVL Error	Yes
104	Error	DTH Error	Yes
105	Error	CTH Error	Yes
106	Error	Reserved	Yes
107	Error	DCH Error	Yes
108	Error	Reserved	Yes
109	Error	Reserved	Yes
110	Error	CCH Error	Yes
111	Error	Reserved	Yes
112	Error	BOT Error	Yes
113	Error	CBIS Error	Yes
114	Error	Reserved	Yes
115	Error	H2 Sensor Error	Yes
130	Fault	SVL Fault	Yes
131	Fault	NBLV Fault	Yes

Appendix H - MODBUS Dictionary, Coils

Alarms

132	Fault	NBHT Fault	Yes
133	Fault	VSbv Fault	Yes
134	Fault	VSbt Fault	Yes
135	Fault	GROUND Fault	Yes
136	Fault	LA Fault	Yes
137	Fault	SCC Fault	Yes
138	Fault	CCVH Fault	Yes

System Values

Coil #	Description	Registers Implemented/Notes
40	System Mode (Online/Offline)	Yes
41	Circuit Breaker Status	Yes
42	Fan Status	Yes
43	Contactor Status	Yes
44	UVR Status	Yes
45	Full Charge Flag	Yes

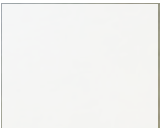
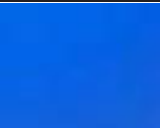
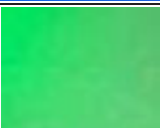
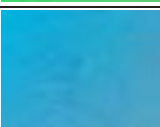
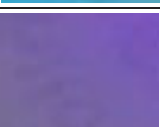
Appendix I - BMS Parts + Quantities

All items listed are included with BMS systems.

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	00200-00400-00035	ASY, CONTROLLER, ZINCFIVE BMS, METALLIC	1
2	00200-00400-00027	ASY, ZINCFIVE BMS, TRAY MONITOR	7
3	00410-00400-00112	CABLE ASY, BAT TRAY, ZINCFIVE BMS, POS, NEG	7
4	00410-00400-00113	CABLE ASY, BAT TRAY, ZINCFIVE BMS, POS	31
5	00410-00400-00111	CABLE ASY, ISOSPI, ZINCFIVE BMS, SHORT	6
6	00410-00400-00110	CABLE ASY, ISOSPI, ZINCFIVE BMS, LOOP	1
7	00410-00400-00081	CABLE ASY, ZINCFIVE BMS, CONTROLLER, 24V POWER	1
8	00410-00400-00106	CABLE ASY, ZINCFIVE BMS, CONT, HV +	1
9	00410-00400-00107	CABLE ASY, ZINCFIVE BMS, CONT, SHUNT	1
10	00410-00400-00084	CABLE ASY, ZINCFIVE BMS, CONT, 14 POS I/O	1
11	00410-00400-00085	CABLE ASY, ZINCFIVE BMS, CONT, 16 POS I/O	1
12	00410-00400-00086	CABLE ASY, ZINCFIVE BMS, CONT, 6 POS	1
13	00410-00400-00091	CABLE ASY, ZINCFIVE BMS, CONT, RS485	1
14	00410-00400-00108	CABLE ASY, PIGTAIL, SHUNT	1
15	00410-00400-00109	CABLE ASY, PIGTAIL, HV+	1
16	00410-00400-00094	CABLE, ASY, PIGTAIL, NTC, M4	1
17	00410-00400-00095	CABLE, ASY, PIGTAIL, NTC, M8	1
18	00410-00400-00097	CABLE ASY, PIGTAIL, HOYL	1
19	00410-00400-00100	CABLE ASY, PIGTAIL, LSIS	1
20	00410-00400-00124	CABLE ASY, CONTROLLER, LED-RESET SWITCH	1
21	00410-00400-00125	NETWORK RESET TO BMS TERM BLOCK	1
22	00410-00400-00126	CABLE ASY, CONTROLLER, LED	1

Appendix J - LED Status Indicator

There is an LED status indicator at the front of the cabinet that blinks in various colors to indicate system state and alarm status.

STATE	COLOR		EXTRN_LED 1 (RED)	EXTRN_LED 2 (GREEN)	EXTRN_LED 3 (BLUE)
Power On	White		ON	ON	ON
Standby	Blue		OFF	OFF	ON
Charge	Green		OFF	ON	OFF
Discharge	Cyan		OFF	ON	ON
Active Alarm	Purple		ON	OFF	ON
Active Alarm (Battery Replacement)	Yellow		ON	ON	OFF
Active Alarm (Breaker Trip/Charge Blocked)	Red		ON	OFF	OFF

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