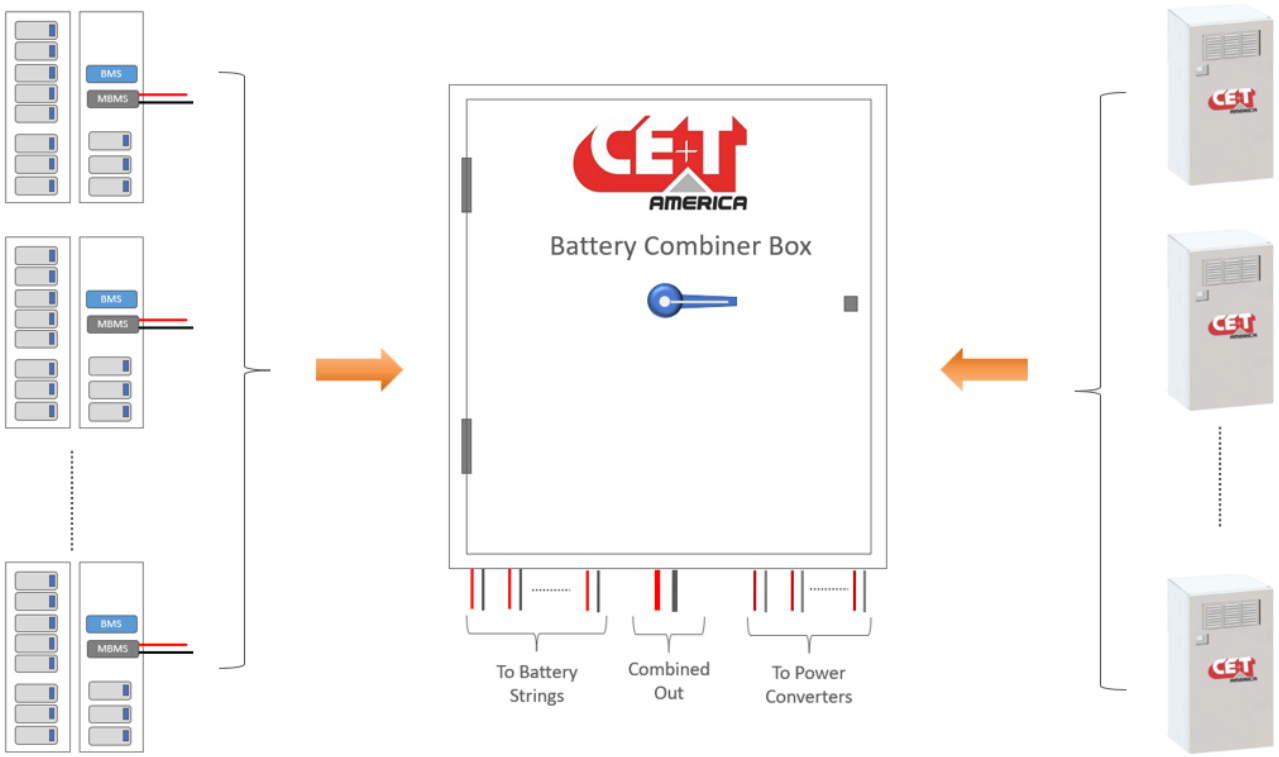
Leading Conversion and Storage Technology for Energy Saving and Power Resilience

Battery Combiner Box

Instruction manual



Disclaimer

This document is provided “as is” and CE+T America makes no representations warranties, expressed or implied, with respect to the information contained herein. CE+T America has made reasonable efforts to ensure the accuracy of information herein and at the time of publication. However, information is constantly evolving and CE+T America does not purport the information provided is correct, comprehensive, or exhaustive. This document is for informational purposes only. You should not act upon information without consulting CE+T America or its authorized distributors.

Contents

Table of Figures:

1. About This Document

This document is CE+T America proprietary. It is a customer facing document aimed to serve as a guide for field wiring Battery combiner box.

Document Revision History:

Date	Revision	Notes
Dec 7th, 2021	A	Initial draft
Dec 9th, 2021	B	Changes to 100 amp, parallel connection etc
Jun 6th, 2022	C	Update per UL1741-3

Contact Information
CE+T America, Austin, Texas
g.mittal@cet-power.com

2. Glossary of Terms

Acronym of Term	Full Expression
AWG	American wire gauge
CEC	California Energy Commission
GFDI	Ground fault detection current
IMI	Isolation monitor interrupter
BESS	Battery energy storage system, specifically e-ON's. Based on context in the manual, BESS may refer to complete system including eON batteries and PCS.
PCS	Power conversion system, specially Stabiliti 30C3
PV	Photovoltaic
LCD	Liquid Crystal Display
RSS	Rapid shutdown system
RSE	Rapid shutdown equipment
BoS	Balance of system components
BAMS	Battery array management system
MBMS	Master battery management system
CAN	Communication protocol
Modbus	Communication protocol
SoC	State of charge of batteries, specified in percentage.
UPS	Uninterrupted power supply
HMI	Human machine interface, touch screen or web interface
PPE	Personal Protective Equipment
CCS	Customer Control System

3. IMPORTANT SAFETY INSTRUCTIONS

The following safety symbols are used in this manual:

DANGER – Procedure or situations that require action to prevent personal injury/death or damage to equipment/environment.

WARNING – Indicates a potentially hazardous situation that, if not avoided, can result in serious injury or death.

IMPORTANT INFORMATION: Includes key information for the operation of this equipment or specific instructions to maintain the warranty.

PERSONAL PROTECTIVE EQUIPMENT: This symbol means that use of personal protective equipment is highly recommended. This includes insulated gloves, steel toed boots, hard hat, reflective fire-resistant vests, and protective eye goggles.

NOTE THAT THE EQUIPMENT MUST BE HANDLED, INSTALLED, AND OPERATED BY QUALIFIED ENGINEER/TECHNICIAN WITH PROPER TRAINING ON HANDLING HIGH/MEDIUM VOLTAGE ELECTRICAL EQUIPMENT. LOCAL AND NATIONAL ELECTRICAL CODE MUST BE USED DURING INSTALLATION AND OPERATIONS. FAILURE TO OBSERVE SAFETY STANDARDS COULD RESULT IN PERSONAL INJURY OR DAMAGE TO EQUIPMENT/ENVIRONMENT.

DANGER - All instructions regarding the configuration of this device must be followed. Failure to follow may result in injury, death, or damage to equipment.

DANGER - To avoid an electric shock, verify that the Converter's external AC and DC Disconnects are open (off). A minimum wait time of five (5) minutes is required after opening AC and DC Disconnects to assure that the Converter's internal capacitors have discharged to zero voltage before performing any work on the Converter. Utilize lockout procedures to ensure that both AC and DC Disconnects remain in the off position during all service periods.

DANGER – The enclosure contains exposed high voltage conductors. The enclosure front access door must remain closed, except during installation, commissioning, or maintenance by trained service personnel. Do not remove the front doors if extreme moisture is present (rain, snow, or heavy dew).

DANGER – To avoid an electric shock, verify that the Converter's external AC and DC Disconnects are open (off). A minimum wait time of five (5) minutes is required after opening AC and DC Disconnects to assure that the Converter's internal capacitors have discharged to zero voltage before performing any work on the Converter. Utilize lockout procedures to ensure that both AC and DC Disconnects remain in the off position during all service periods.

WARNING – These instructions DO NOT contain any information on the operation of battery systems outside of this product. Refer the manufacturer for the battery system for installation and servicing instructions.

DANGER – Ensure that the equipment is adequately installed and grounded per NFPA and all applicable NEC codes.

DANGER – Do not leave foreign objects in the enclosure. Keep the area around the enclosure clear of trash, debris, and other combustible materials.

WARNING – Personnel Qualification: Inspections and operations requiring access to lethal AC or DC voltages, should only be performed by qualified personnel.

WARNING – All field wiring must conform to the codes set forth in the National Electric Code ANSI/NFPA 70.

WARNING –Replace damaged warning and precautionary labels.

Refer to “Reference Documents” section of this manual for details on manuals/documents that should be read first before proceeding.

4. Overview

This document serves as a guide to field wire multiple battery strings and multiple power converter system (PCS), like Stabiliti to a Battery Combiner Box.

5. System Rating

This box is designed for connecting PCS and battery strings rating up to 1000 Volts DC. Note that each PCS input connection will be fused at 100 amps on both positive and negative connections. There is no fusing on battery inputs so ensure there is an existing fused disconnect associated with each battery string. The combined output is not fused. Note that an 80 or 90-amp fuse may be used in lieu of 100 amp if there are ongoing supply chain issues.
Enclosure is type 1 indoor use only and Ambient temperature range is -10° to 33°C.

6. Reference Document

6.1. MAN - 00115 – Stabiliti Series 30 KW – Installation and Operation Manual – V1.0

6.2. MAN - 00114 – Stabiliti Series 30 KW – Quick Start Guide – V1.0

Also refer to any applicable PCS or battery vendor's guide before proceeding.

7. Battery Combiner Box Application

Typically, in a system where multiple battery strings along with multiple converters are utilized, they all need to be connected to same connection point or a common bus. Each battery string has a set of positive and negative cable and so does a PCS's DC port like shown below:

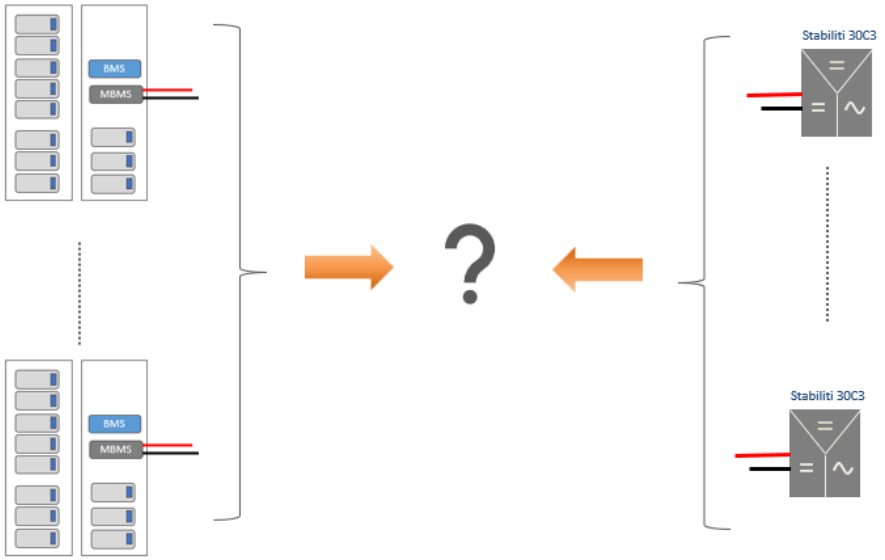


Figure 1 - Connecting Battery Strings to PCS

Battery combiner box serves sole purpose of forming a common DC bus where multiple PCS and battery strings can be connected. Note that the voltage itself is maintained by either batteries or PCS. All components within Battery combiner box are passive.

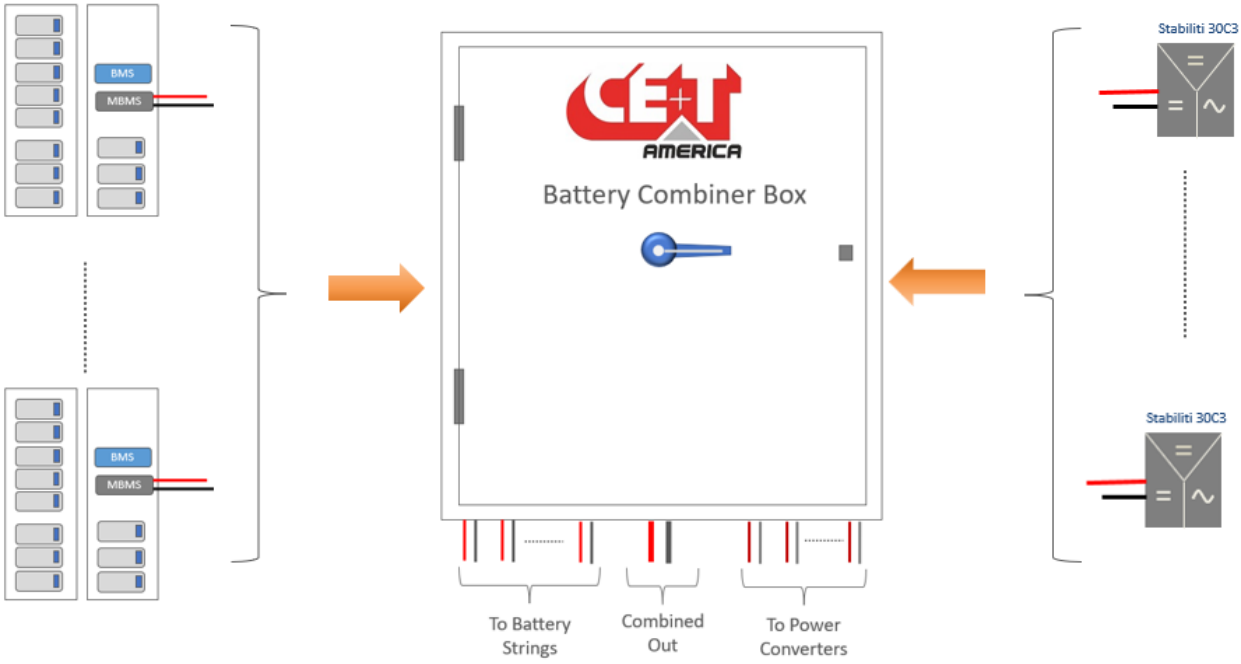


Figure 2 - Connecting Battery Strings to PCS using Battery Combiner Box

WARNING – Ensure that PCS and batteries are sized appropriately to work safely together. This DC combiner box is not a protective device and not designed to protect batteries and PCS.

This is how DC combiner connects the battery strings to power converters:

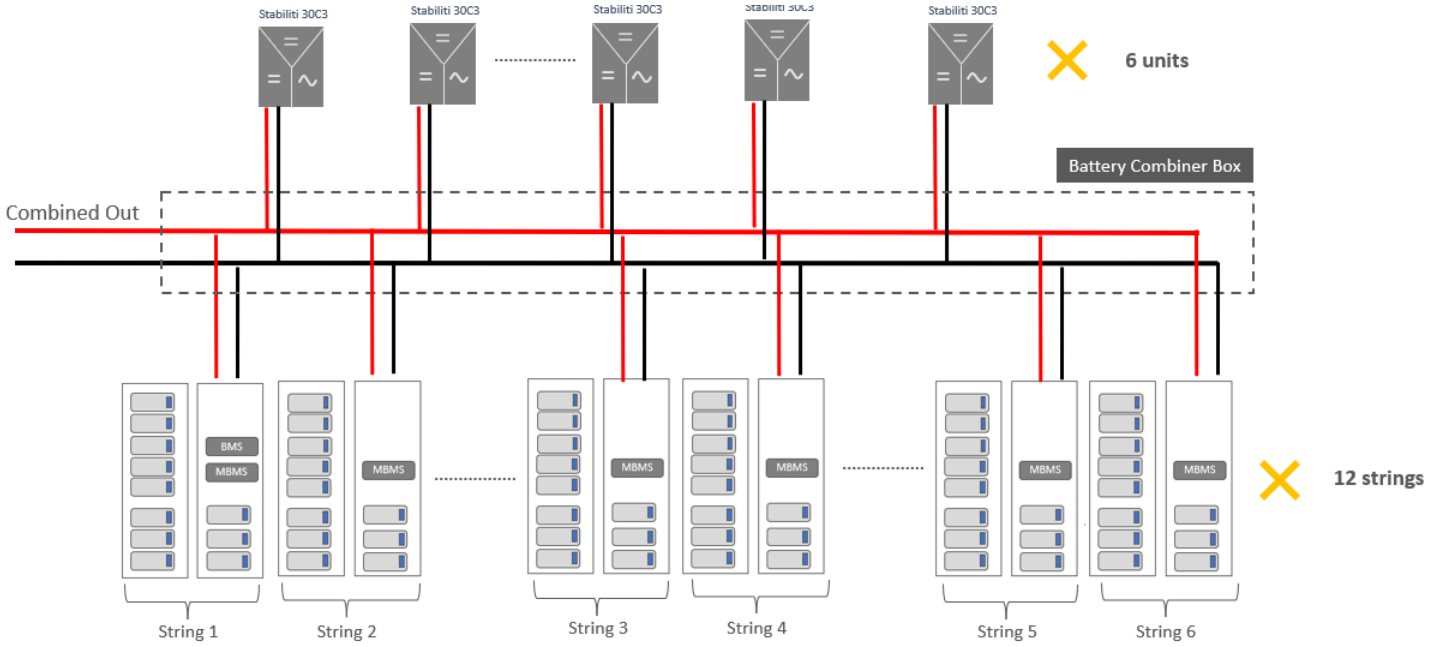


Figure 3 - Battery Combiner Box Wiring

8. Field Wiring and Installation

WARNING – Please follow PCS and BESS wiring instructions as specified in their respective manuals. Always follow local codes and guidelines provided by local AHJs. Failure to do so will result in damage to PCS or BESS or the Battery combiner box.

- Recommended wire gauge is #4 AWG Copper or Aluminum with 45 Inch – pound -> For all PCS (stabiliti) wiring, DC wiring from BESS to Stabiliti.
- It is recommended to have DC wires insulated to 1000 V, 105 C as per UL 1431
- For the combined output, size the wires appropriately as per rated load and per local NEC codes.
- It is recommended to have all wiring (except the wiring between modules) within metal conduit.
- Internally there is a 100-amp fuse for each positive and negative connection to PCS. But note the connection to battery strings is not fused and the battery strings must have its own fused disconnects.
- Use PPE as applicable

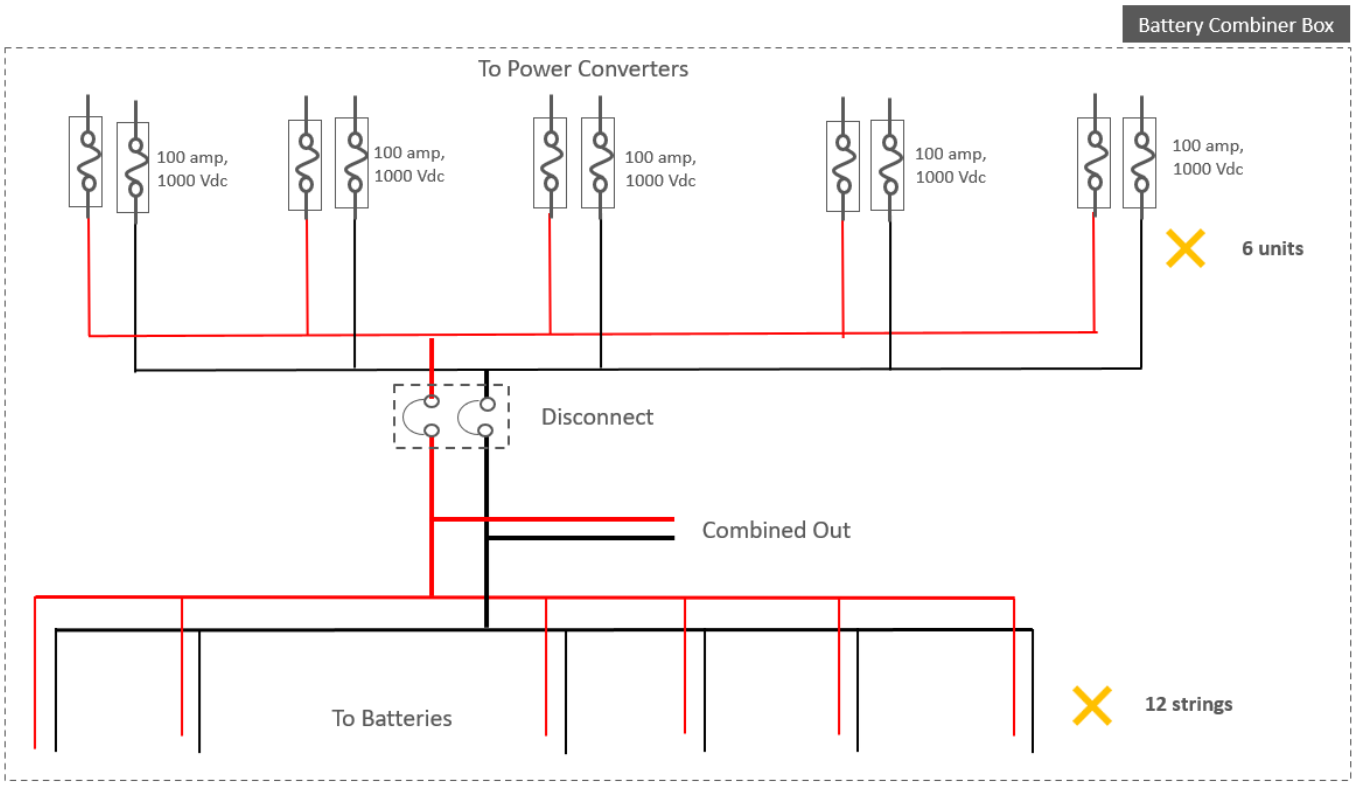


Figure 4 - Battery Combiner Box Wiring Details

WARNING- For combined output, note there when the disconnect is operated, the PCS are disconnected from the combined output, but battery strings are still connected. For complete disconnection, an external disconnect must be used to fully isolate systems connected to the combined output of the DC combiner box.

Below is a picture of internal wiring instructions:

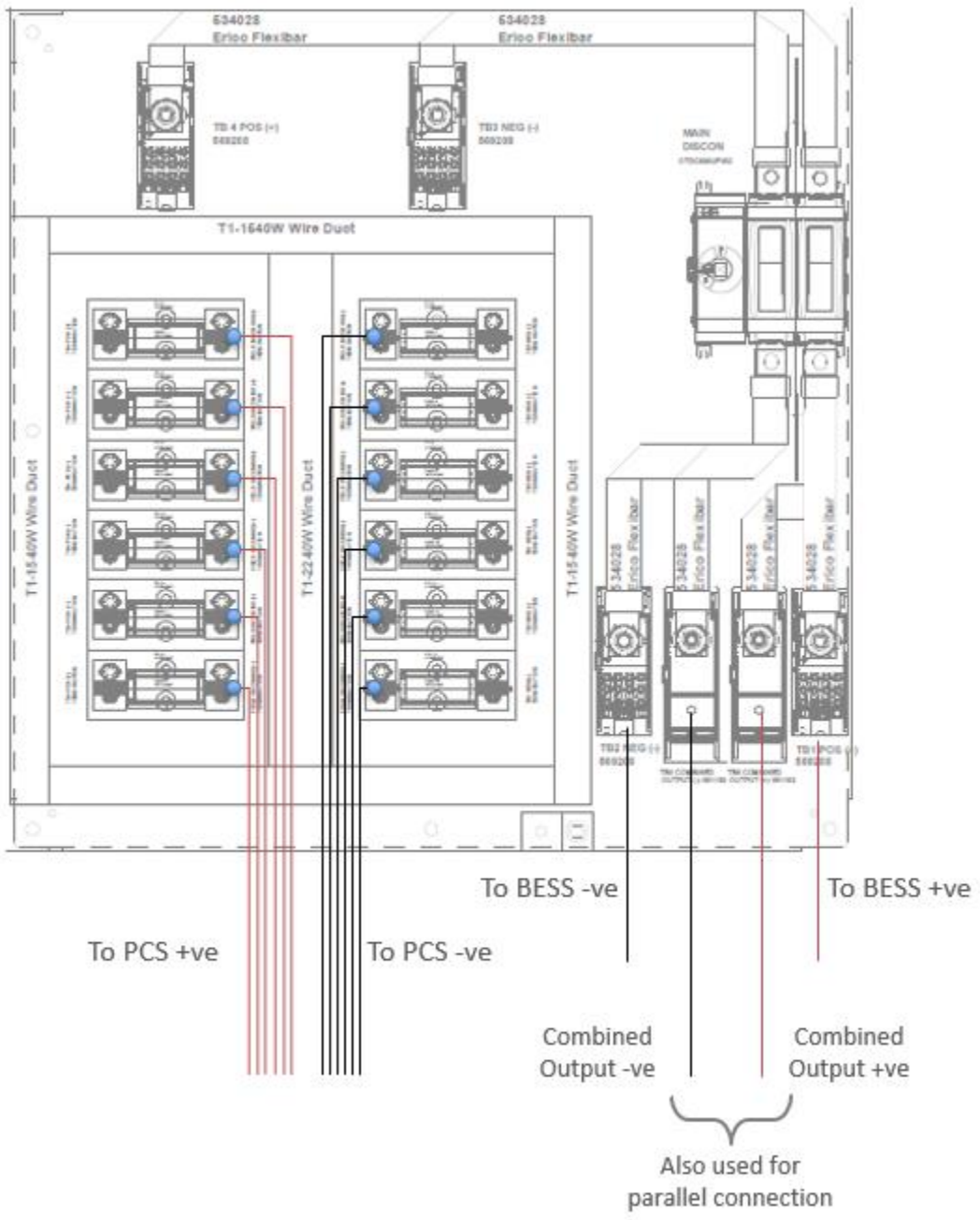


Figure 5 - Battery Combiner Box - Field Wiring

The box can be mounted on the wall. Two-person lift is required. Position the box so that its easier to route all wires from battery strings and PCS. Recommended spacing is 2 feet on all sides but follow local codes and guidelines provided by local AHJs. Box dimensions are as follows:

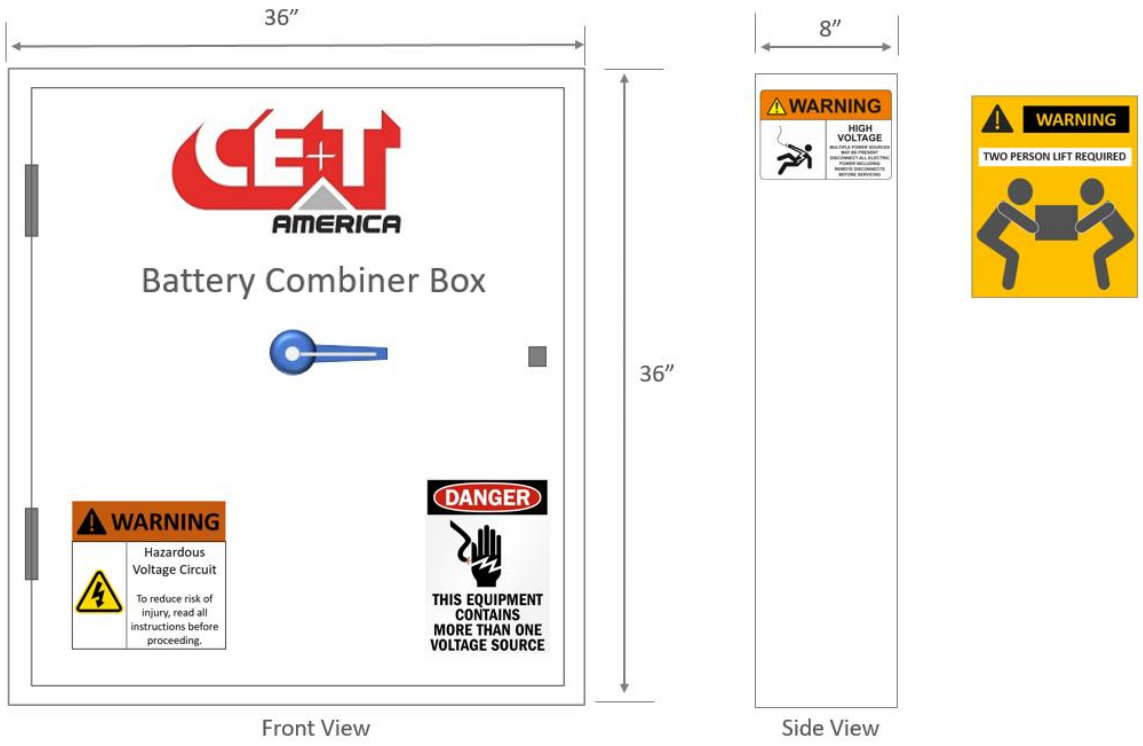
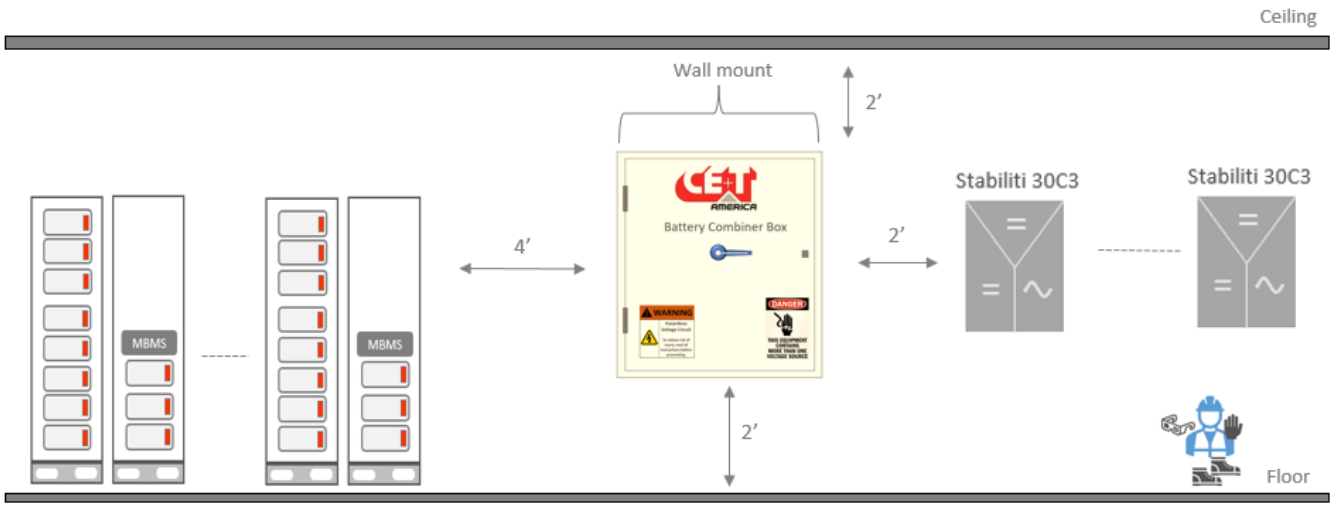


Figure 6 - Battery Combiner Box Dimensions

Below are some recommended spacing and installation guidelines. In general, space should be enough to allow for safe routing of conduits/wires and the ability to open the DC combiner box door for wiring and maintenance purpose. Conduits should be used if recommended by BESS or PCS vendors.



Note:

- For PCS and BESS, use spacing requirements as mentioned in their respective manuals.
- Spacing shown here are just recommended requirements. Follow local codes and local AHJ guidelines if applicable.

Figure 7 - Battery Combiner Box Spacing Requirements

End of Document