

## Table of Contents

|   |                                     |
|---|-------------------------------------|
| About Fortress Power .....  | 2                                   |
| About FlexTower All-In-One Cabinet.....   | 3                                   |
| General Safety Precautions and Safety Instructions .....  | 4                                   |
| <b>Transportation and Handling</b> .....  | 6                                   |
| Response To Emergency Situations.....   | 7                                   |
| <b>Required Tools &amp; Materials</b> .....   | 8                                   |
| Included with FlexTower:.....   | 9                                   |
| <b>FlexRack Installation Steps</b> .....  | 10                                  |
| Grounding and Stability .....   | 17                                  |
| Paralleling Multiple FlexTowers .....   | 16                                  |
| Spacing Precautions / UL9540 .....  | <b>Error! Bookmark not defined.</b> |
| External Views.....   | 17                                  |
| Internal Views .....  | <b>Error! Bookmark not defined.</b> |
| Fan Operation .....   | <b>Error! Bookmark not defined.</b> |
| <b>Inverter Installation</b> .....  | <b>Error! Bookmark not defined.</b> |
| Inverter & Battery .....  | 19                                  |
| Heating for Flextower.....  | 21                                  |
| Fan Maintenance.....  | 22                                  |
| Operating Temperatures .....  | 23                                  |
| Fortress batteries will charge at 32°F or above and discharge at -4°F or above when powered on. Cold operation reduces battery life, and so Fortress batteries will de-rate charging and discharging when internal battery temperature drops below 50°F. Relative humidity should be kept to less than 95%..... | 23                                  |
| Storage and Self-Discharge .....  | 23                                  |
| SolArk 15kW Wire Diagram Example .....  | 24                                  |

# About Fortress Power

Our mission is to provide compact, user-friendly, and affordable energy storage solutions using the latest technology for all homes and businesses. Fortress solar energy storage batteries can easily integrate with new and existing PV systems and work with a wide range of existing inverter and charge controller manufacturers for ease in system design.

## Contact Information

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# About FlexTower All-In-One Cabinet

The FlexTower All-In-One cabinet is designed to hold up to a 15kW inverter in the upper cabinet with up to four eFlex 5.4 KWH lithium batteries in the lower cabinet, in an indoor or outdoor setting. The cabinet is NEMA3R rated and the battery compartment was made part of the eFlex UL9540 large-scale fire testing.

The cabinet includes a combining busbar, battery cables to the busbar, inverter cabinet cooling fan control powered from the batteries directly. It also includes multiple side knockouts for flexible expansion, including paralleling two FlexTower cabinets, or adding in multiple sources of power (grid, generator, EV charger, communication lines etc). The cabinet should stand level on a stable foundation. It includes anchor bolt to optionally secure the DuraRack to a concrete pad.

At this time, power conductors between the battery combining busbar and inverter are not included. Battery heaters are not included, but can be added to the lower battery cabinet through included din-rail mounting options discussed within the eFlex section of the Fortress support portal (<https://support.fortresspower.com>)



*FlexTower All-in-One*

# General Safety Precautions and Safety Instructions

All types of damage to the product may lead to a leakage of electrolyte or flammable gas. During installation of the battery, the utility grid, solar input must be disconnected from the Battery Pack wiring. Wiring must be carried out by qualified personnel. The battery pack contains no user serviceable parts. High voltage or current is present in the device. The electronics inside the Battery Pack are vulnerable to electrostatic discharge.

Observe the following precautions:

- Risks of explosion
  - Do not subject the battery pack to strong impacts.
  - Do not crush or puncture the battery pack.
  - Do not dispose of the battery pack in a fire.
- Risks of fire
  - Do not expose the battery pack to temperatures in excess of 122°F (50°C).
  - Do not place the battery pack near a heat source such as a fireplace.
  - Do not expose the battery pack to direct sunlight.
  - Do not allow the battery connectors to touch conductive objects such as wires.
- Risks of electric shock
  - Do not disassemble the battery pack
  - Do not touch the battery pack with wet hands
  - Do not expose the battery pack to moisture or liquids
  - Keep the battery pack away from children and animals.
- Risks of damage to the battery pack
  - Do not allow the battery pack to come in contact with liquids.
  - Do not subject the battery pack to high pressures.
  - Do not place any objects on top of the battery pack.



**IMPORTANT NOTE:** Circuit Breakers, Disconnects and Fuses should be employed throughout the energy storage and generation installation to isolate effectively and protect all components of the system against faults, short circuits, polarity reversals or a failure of any component in the overall system.

**Fuses, breakers, wiring ratings and values should be determined by established standards and evaluated by certified electricians, licensed installers, and regional code authorities. The FlexTower must always be installed and commissioned with settings to protect the batteries from open PV voltage and other high voltage charging sources. The Battery Management System (BMS) alone will not protect the batteries from these extreme electrical events. Failure to adhere to installation protocol will void the warranty.**



CAUTION! Verify polarity at all connections with a digital voltmeter before energizing the system. Reverse polarity at the battery terminals will void the warranty and destroy the batteries. Do not short circuit the batteries.

Most batteries pose some risk of shock or sparking during the installation and initial wiring and connection process. Wearing insulated gloves, clothing and footwear and using electrically insulated tools are required when working with batteries. Cover or remove jewelry or conductive objects (metal bracelets, rings, belt buckles, metal snaps, zippers, etc.) when working with any electrical or mechanical device. Cover or restrain long hair and loose clothing when working with any electrical or mechanical device.



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

# Transportation and Handling

- Do not knock, drop, puncture, or crush the battery;
- Do not expose battery to flames, incinerate or direct sunlight;
- Do not open battery case or disassemble the battery;
- Do not lift battery by the terminal cables;
- Do not vibrate battery;
- Do not expose battery to water or other fluids;
- Do not expose battery to open flame;
- Do not place the product nearby highly flammable materials, it may lead to fire or explosion in case of accident; Store at cool and dry place;
- Do not store in greenhouses and storage areas for hay, straw, chaff, animal feed, fertilizers, vegetables or fruit products;
- Store the product on a flat surface; A ventilated area is strongly recommended for handling the product;
- Store the product out of reach of children and animals;
- Do not transport battery upside down.

# Response To Emergency Situations

The battery pack consists of multiple batteries and a sophisticated Battery Management System that are designed to prevent hazards resulting from failures. However, Fortress Power cannot guarantee their absolute safety.

- Leaking Batteries
- If the battery pack leaks electrolyte, avoid contact with the leaking liquid or gas. If a person is exposed to the leaked substance, immediately perform the actions described below.
- Inhalation: Evacuate the contaminated area and seek medical attention.
- Contact with eyes: Rinse eyes with flowing water for 15 minutes and seek medical attention.
- Contact with skin: Wash the affected area thoroughly with soap and water, and seek medical attention
- Ingestion: Induce vomiting, and seek medical attention
- Fire
- In case of fire, make sure that an extinguisher is available near the battery pack. If possible, move the battery pack to a safe area before it catches fire.
- Water, carbon dioxide, dry chemical powder and foam are the most effective means to extinguish a Lithium Ferrous Phosphate (LFP) battery fire
- Use ABC Fire extinguisher, if the fire is not from battery and has not spread to it yet.

# Required Tools & Materials

The following tools and materials are required:

- Positive and negative battery cables, we recommend copper cable starting at 1/0 AWG for runs of less than 10ft. Please refer to your adopted version of the National Electric Code or Local Authority Having Jurisdiction for more guidance (not included)
- Positive and Negative Terminal lug recommendation: M8 (diameter: 8mm or 5/16in). Note that the ring terminal size for the terminal lug is 3/8ths or larger.
- Screwdriver (not included) • Battery parallel communications cable (included)
- Inverter to Battery CAT5/5e communications cable (not included)
- Communication Bus Terminator: to Match Impedance during parallel setup
- RS 485 cable
- Wall Mount Stabilizers (included)
- OSHA approved personal protective equipment such as the following (not included)



Insulated gloves



Safety Glasses



Safety Shoes



# Included with FlexTower

## FlexTower Upper Inverter Cabinet

fasteners for upper and lower inverter mounting rails



## FlexTower Lower Inverter Cabinet (DuraRack)

4 x red and black battery cables

2 x battery combiner blocks with 3 mounting ring terminal + bolts and 2 x low amperage connections (for DC fan + fan controls)

2 x din rails + bolts for din rail mounting

4 x floor mount expansion bolts



# FlexRack Installation Steps

## 1. Open boxes and confirm all components are included and in working order.

Contact Fortress power if the box is damaged prior to opening. Open box, Tilt Box on edge with top side up then slide out of box. The rack boxes are heavy [lower cabinet (DuraRack) 150 pounds, upper cabinet (FlexTower) 134 pounds].

Turn on eFlex batteries and confirm battery voltage using a voltmeter or Guardian monitoring hub. Individually pre-charge each eFlex to within 1/2V of the other batteries.



Record the serial number of the upper and lower battery cabinet units, inside the door at the lower hinge.

## 2. Install at desired location.

The FlexTower is designed to be pad or floor mounted. There are 4 mounting holes provided. When mounting on pad there are 4 Concrete expansion bolts provided. If PAD mounting typically a 3 inch pad is used but strength is dependent on sub base. The M10 expansion bolts have a 12mm sheathing so a 1/2" masonry drill. Drill approximately 1/2" deeper than the intended depth of the sleeve anchor bolt, at least 1.5" deep. Position the nut to protect the threads when using a hammer drill to mount the anchor bolts into place. If installing multiple FlexTowers, space at least 1" apart to maintain UL9540 large scale fire test compliance of the lower cabinet and at least 6" apart if also using multiple upper inverter cabinets to maintain proper fan ventilation of upper inverter cabinet. If installing outdoors, use raintight conduit parts at minimum.



The DuraRack cabinet contains a floor plate that allows for ground mounting using M10 bolts.

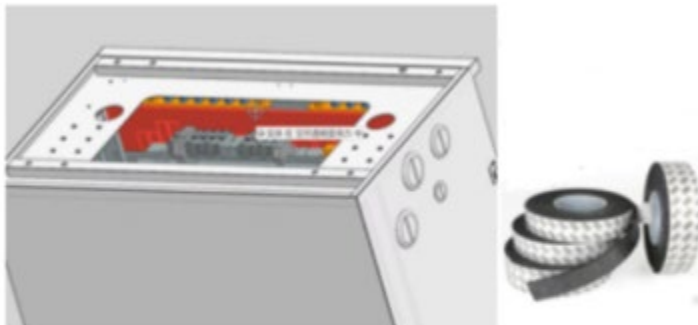
3. **Set the cabinets on top of each other.**

When installing the upper battery cabinet on top of the lower battery cabinet, remove the two top watertight feedthrough covers on the lower cabinet, using a razor knife on cabinet gromet.



Set the upper inverter cabinet on top of the lower cabinet and then affix the two cabinets together using provided 8 attachment screws. **Do not perform this step with the batteries or inverters inside the cabinet.**

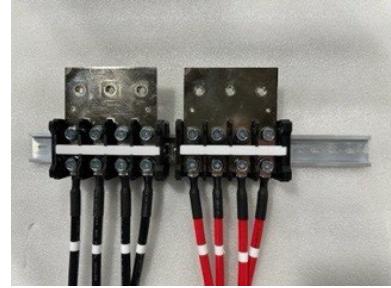
Use the waterproofing tape around the interior edges of the Flextower to



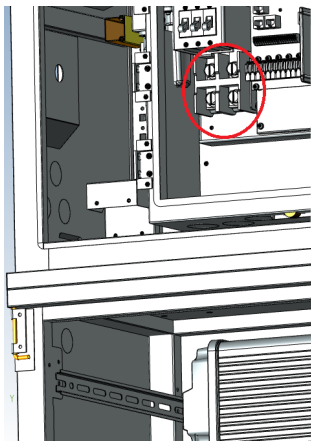
*Waterproofing Sealing Tape*

#### 4. Mounting and wiring Combiner Block

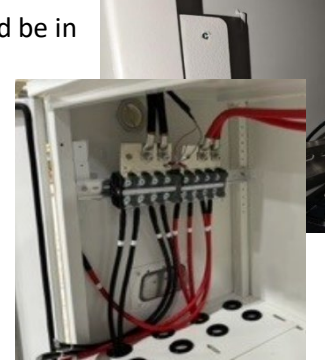
Connect the included battery-to-combiner power cables to the busbar, if not pre-wired. Use red for positive and black for negative, taking care not to reverse these cables. If the battery-to-busbar power cables are pre-wired, remove any cables which will not be used. Only install the correct number of battery cables, equal to the number of eFlex batteries. Torque the connections to 7-9 ft lbs / 10-12 Nm.



The combiner blocks are mounted on the upper bay din rail. The dinrail should be in the lowest position, if not mounted already. You may make up the combiner blocks before installing the dinrail, or install the din rail and then make up the combiner block wiring.

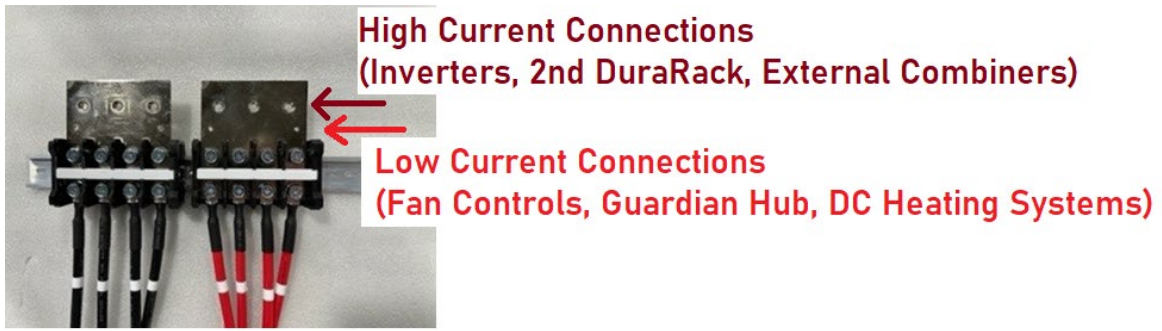


Make and connect the combiner-to-inverter power cables (not included). Space is provided on the combiner to accommodate single or parallel cable runs. Use fine stranded cable, with a manufacturer required minimum wire size of 2/0 on single conductor runs 10' or less, or up to 4/0 maximum. Note: if using 4/0 cable, check terminal lug width to ensure compatibility with inverter port. UL battery cable is recommended. DLO cable can be used, but is difficult to bend in the space provided. If using parallel conductor runs to an inverter (Ex. Envy 12k, Sol-Ark 15k configurations), use 1/0 cable minimum when running parallel power conductors to the inverter. Do not use larger



than 2/0 cable for parallel runs.

The combiner block provides 3 positions for connecting 2/0 using 5/16 lugs. The combiner block also provide 2 positions for low current connections supporting Flex Tower Fan and Guardian Power. You may double lug on either of these lower power connections, or single lug. **MAKE ALL OF THESE CONNECTIONS TO THE COMBINER BEFORE INSTALLING EFLEX INTO THE LOWER BATTERY CABINET.**



The DC fan power cables are also powered by the battery. The entire system has a 48V DC power lead which is to be routed through the FlexTower to land on the busbar terminals inside the lower battery cabinet.



## 5. Install, wire, and secure the eFlex batteries.

Up to four batteries can be installed using the supplied mounting brackets. The batteries each weigh over 100 pounds and the Dura Rack has limited space. Wire each eFlex at an angle, as it is being placed into the cabinet. Load the eFlex batteries from back to front, landing the battery-to-combiner conductors onto the combiner block as you go. Additionally, use the security straps to secure the eFlex batteries to the cabinet as you go.

Attach the metal strap to the back of the eFlex, using the lower T-slot channel. The strap hugs the bottom of the eFlex and is secured by a bolt in the front.

The front of the metal strap is secured to a mounting hole at the front of the shelf of the FlexTower.



## 6. Install the battery-to-battery and battery-inverter communication circuit.

See Fortress inverter guides in our online knowledge base for inverter-specific instructions at <https://support.fortresspower.com>. You may also find useful information in the Guardian installation manual.

Do not forget the RJ45 pinout connector between the eFlex and the inverter (which contains a canbus terminator), as well as the canbus terminator on the final communication port at the end of the eFlex communication circuit. If installing a Guardian monitoring hub, this final canbus terminator will be replaced by the canbus terminator contained within the Guardian hub.

## 7. Install the inverter.

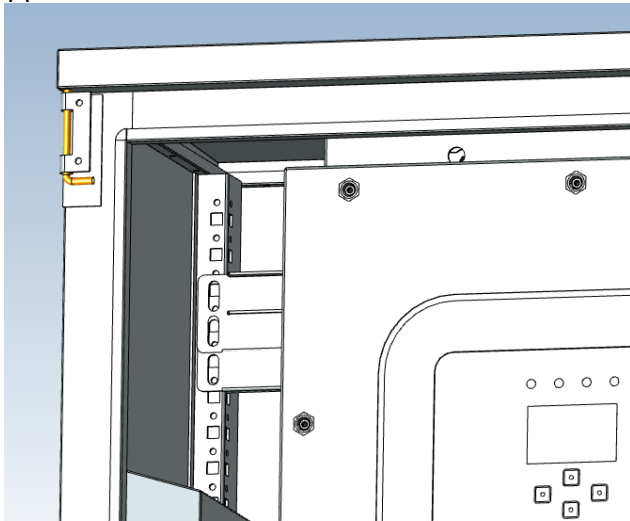
Three adjustable height mounting rails are included to attach to any inverter using the inverter-supplied wall mounting brackets. The rail locations are flexible to accommodate different inverter mounting plates.

Most 8kW inverters have plenty of room to fit inside the Flextower, starting with the 2<sup>nd</sup> mounting location from the top of the rail supports. *Note: The Outback Mohave inverter does not fit inside the FlexTower*



If installing a 12k or 15k inverter, position the upmost rail in the top mounting slot. The FlexTower is designed to exhaust heat from the cabinet through 48V DC fans mounted to the side of the inverter, sized for inverters of this class.

If in doubt on rail placement, start with the tallest mounting location – especially if using a 12k or 15k inverter. Some inverter mounting plates may require custom attachment to the back inverter support rails.



## 8. Commissioning the System

Fortress Power maintains documentation on its batteries and inverters within its Product Manuals, which can be found at <https://support.fortresspower.com>

When using a 3<sup>rd</sup> party inverter, please refer to our Inverter Guides, also found on the Fortress Power support page linked above.

# Multiple FlexTowers / Spacing Requirements

It is recommended that FlexTower be spaced at least 6" inches apart to ensure proper air flow and installation ease. The minimum required spacing between FlexTower units to remain compliant with UL9540 large-scale fire testing is 1".

The Flextower is a NEMA3R cabinet which be stacked adjacent to other FlexTower units including just the lower battery cabinet (i.e. the DuraRack).

The internal battery combiner block is rated for 500A and intended for direct paralleling of up to two battery cabinets.

When installing more than two cabinets, external battery combiners (even if mounted within the DuraRack) are be necessary, particularly where battery inverter power sources exceed 500A DC.

It may be necessary to provide battery-battery CAT6 communication cables when paralleling multiple battery cabinets together for battery-battery communication.





# Torque Specifications

\*\*Please note: Battery to inverter cables are for 3/8 ring crimp lug



Please use the following Torque Values for the above steps:

| Bolting Specification     | Torque Value (Nm) |
|---------------------------|-------------------|
| M4*8 Hexagon socket screw | 1.0~1.8           |
| M6*15 Ground Bolt         | 3.6~4.8           |
| M8*20 Combining Screw     | 9.8~12            |
| M10 Expansion Bolt        | 19.6~32.2         |

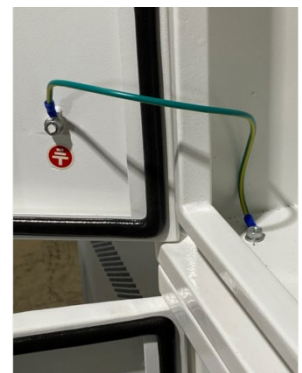
## Inverter Programming

See Fortress eFlex Guide for programming and commissioning the eFlex Batteries.

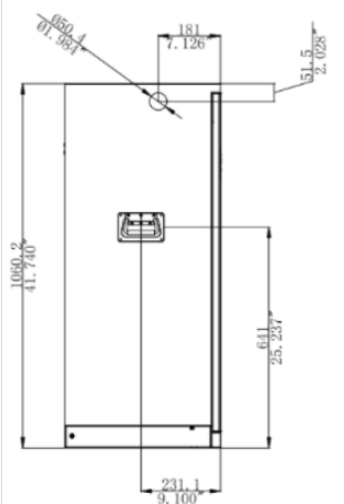
## Grounding and Stability

### Grounding Method

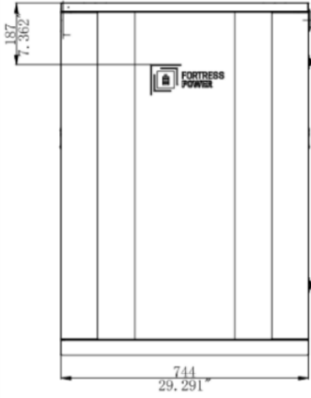
The green bonding cables are placed on cabinet doors to bond the doors to the rest of the cabinet. The FlexTower upper cabinet is bonded to the DuraRack via an included bonding jumper.



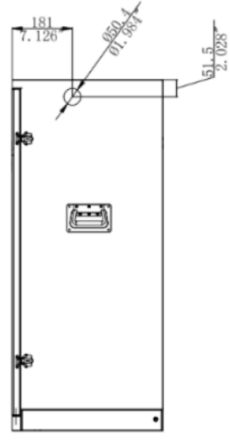
# External Views



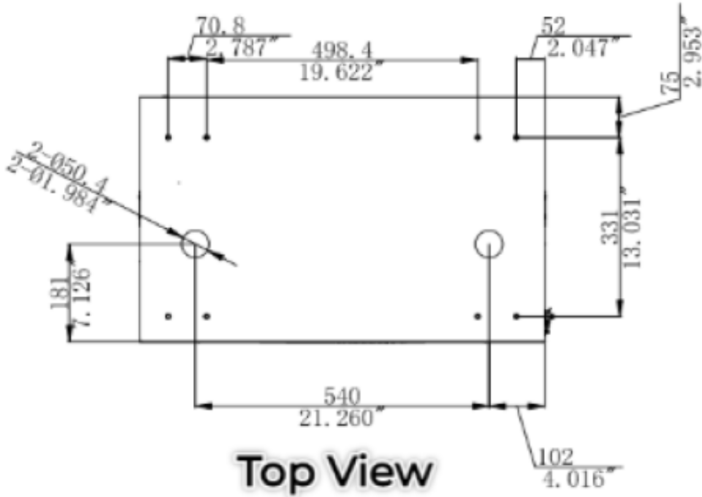
Left Side View



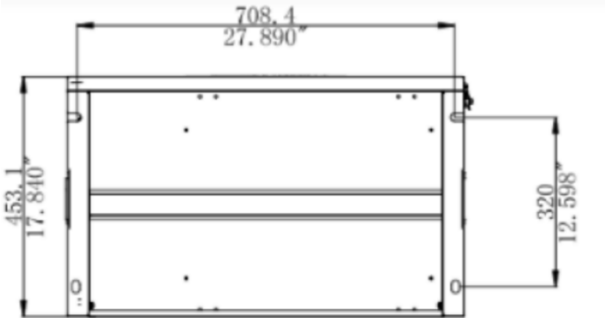
Front View



Right Side View



Top View



Bottom View

# Wire Sizing

The FlexTower includes a 500A busbar as well as #4 AWG Flexible Cable sized for each eFlex battery. Installers should use flexible cable if installing their own battery cable. The combiner-to-inverter run should be a minimum of 2/0 flexible cable, or 1/0 when a single inverter requires parallel conductors (4/0)

Refer to the **Inverter Guide** and **Product Manual eFlex 5.4** for the battery operation and maintenance information.

Please see the following for the required cabling between the inverter and battery:

**Battery Pack 4AGW cable: max bend radius:  $r=52\text{mm}$**



Cable connecting the inverter and busbar (2/0AWG): max bend

radius:  $r=94\text{mm}$ .



# Heating for Flextower

Heating must be added to the lower cabinet should if installed in environments which fall below sustained temperatures of 40F during the year to avoid throttling back or disconnection of battery power.

The colder environments, the larger and more important the need for external heating.

## AC-din rail heating options

An easy heating option is to route 120V AC power circuit to the lower battery cabinet

Example:

<https://www.stego-usa.com/products/heating/heaters/csf-060-50w-150w-w-thermostat/>

Part number 06001.0-00 is 50W and suitable for mild climates where winter temperatures get down below 40F each year. Part number 06011.0-00 is 100W and suitable for moderate climates where winter temperatures reach 20F each year. Part number 06021.0-00 is 150W and suitable for cold climates where winter temperatures fall below 20F each year.

## DC-din rail heating options

Another option is to install a DC-powered heating system, avoiding the need to run 120V AC power. Fortress has not found any readily-available, off the shelf heating solutions for 48V DC power. Installers may need to find separate heating elements, thermostats, and switch controls and wire these devices together to form a complete heating system.

Example (note: items may be difficult to source):

Heater: Stego 04640.2-00 – is a din-rail mounted heater.

<https://docs.rs-online.com/e1bf/A700000006486356.pdf>

Thermostat with integrated Switch: Stego 01011.0-31 or 01011.0-32 can be wired directly to the DC busbar inside the DuraRack. <https://www.stego-usa.com/products/regulating/regulators/dct-010-electronic-thermostat-dc-20-v-to-56-v/>

Other approaches may involve relays or switches that are separate from the thermostat, silicon heating mats, etc.

# Fan Maintenance

The FlexTower Upper Cabinet holds two vents for air circulation inside the FlexTower. The filters are placed in the interior to filter out dust as air enters the cabinet. For every two years, please visually inspect the filters for dust and clean or replace if necessary. Confirm that the pair of ventilation fans are in working order.

Vents Image:



# Operating Temperatures

Fortress batteries will charge at 32°F or above and discharge at -4°F or above when powered on. Cold operation reduces battery life, and so Fortress batteries will de-rate charging and discharging when internal battery temperature drops below 50°F. Relative humidity should be kept to less than 95%.

# Storage and Self-Discharge

Leaving a system powered on, in operation, is not the same as leaving the system in storage. To store a battery, the battery circuit/BMS should be off. Leaving the BMS powered on results in a faster discharge rate. Do not expose battery to high temperatures.

Fortress Lithium Batteries should be stored out of direct sunlight under the following temperature conditions:

Relative Humidity (Min./Max.): 5%~75% RH Storage Temperature (Min./Max.):

| Minimum storage temperature |             | Maximum storage temperature |      | Storage Duration | Minimum State of Charge |
|-----------------------------|-------------|-----------------------------|------|------------------|-------------------------|
| -20°C                       | -4°F        | 95°F                        | 35°C | 3 Months         | 50%                     |
| -10°C                       | 14°F        | 95°F                        | 35°C | 6 Months         | 40%                     |
| 0 - 15°C                    | 32°F – 59°F | 95°F                        | 35°C | 12 Months        | 20%                     |

### Every 1-3 months:

Systems should be put into storage at 60% SOC and checked to ensure the system SOC does not fall below 20%. The self-discharge rate of the battery is 1% when powered off and SoC is above 20%. Power the battery off while in long term storage.

### Every 6 months:

Cycle the battery every 6 months.

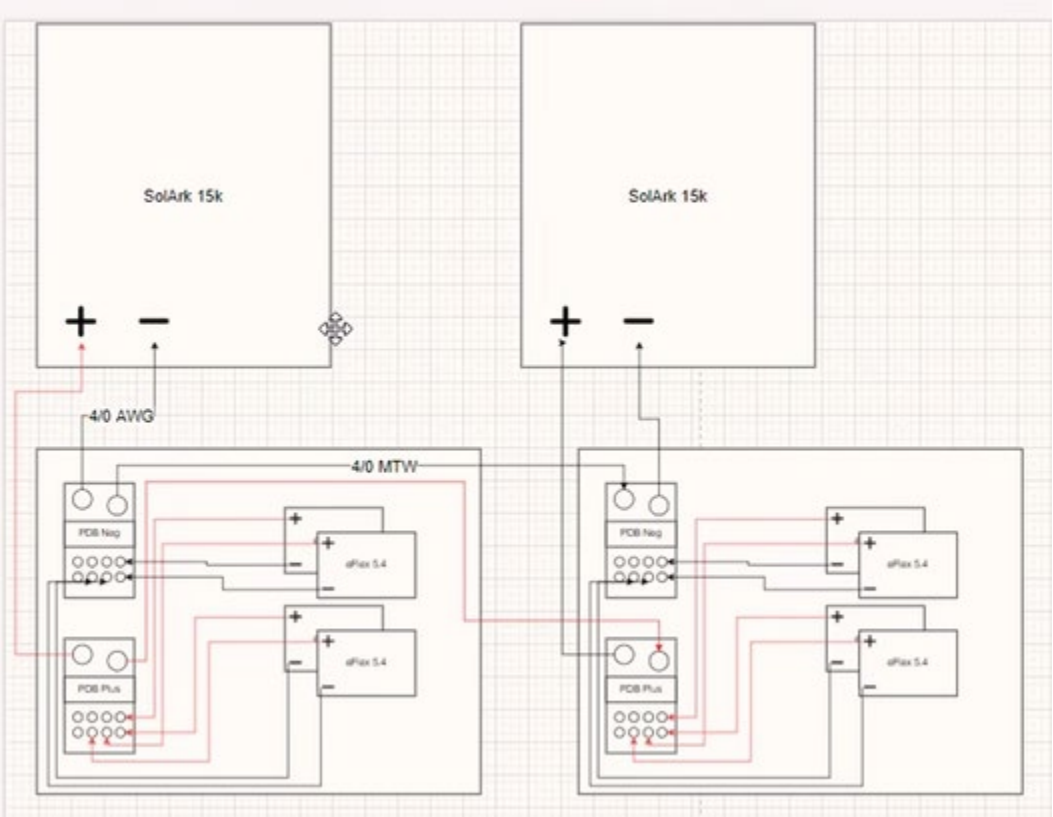
### Below 20% SoC:

At 20% SOC, the battery will self-discharge in approximately 2 months. The self-discharge rate will be even faster if the BMS is powered on.

### Note for leaving energized systems unattended for long periods of time:

If leaving the battery unsupervised for long duration, best results require regular use of a charging source. In areas of heavy snowfall, this can include an automatic backup generator. The inverter and battery management system components put a small load on the battery while in operation that can drain the battery if no charging sources are unavailable for long periods of time.

# SolArk 15kW Wire Diagram Example





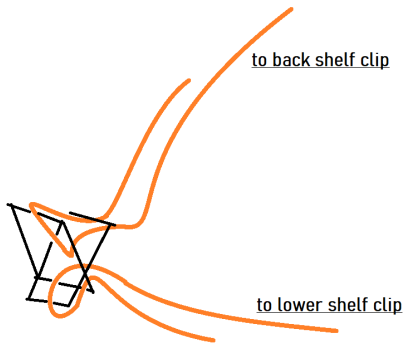
Ribbon strap instructions:

[DuraRack Ribbon Strap Installation Video](#)

- i) Insert shelf clip into back of cabinet, threading the orange strap through the clip
- ii) Install eFlex with terminals pointing towards the combiner block location (the Fortress Logo will be upright). The orange strap will go over the top of the eFlex on both passes.



- iii) Insert shelf clip into the front of the cabinet if two eFlex are installed per shelf, or into the middle of cabinet if only one eFlex is installed on the shelf.



iv) Lace the stability buckle through the orange strap and tighten.

Note on FlexTower DC fan power supply for early shipments:

The Flextower cabinets include a DC fan which runs off the battery voltage. However, the busbars for the first shipment Flextowers do not include mounting locations for the fans.

Installers should strip the M4 ring terminals off of the fan power cables and wrap a positive or negative battery lug above the battery cable lug, securing the with the washer, locknut, and bolt. The battery cable lug should remain flush with the busbar or battery terminal.

Installers may also request replacement busbars by filling out a support ticket at <https://www.support.fortresspower.com>