STEP

ROVER



Rover Communications Trailer — Field Operations Manual

This manual serves as a guide for safely setting up, operating, and powering down the Rover's power and communications systems.

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Rover Communications Trailer — Field Operations Manual

1. Introduction

This manual explains how to safely set up, operate, and shut down the STEP Rover, a solar-powered communications trailer, called "the Rover" throughout this document.

Read this manual carefully. It contains important instructions that need to be followed during installation, operation, and maintenance for safe use.

If you are unsure of the appropriate installation, operation, or maintenance of the Rover, or if something does not look right, the equipment appears damaged or inconsistent with the instructions provided herein, **STOP and contact the STEP Customer Care Center at (844) 478-0045 or email customersupport@stepcg.com before continuing installation, operation, and maintenance.**

Important Safety Instructions – Read & Follow all warnings!

- Please read the documentation supplied with this product first, so that you are familiar with the safety signs and directions before using the product.
- This product is designed and tested in accordance with international standards. The equipment should be used for the designated application only.

WARNING: SPEED LIMIT

- The recommended speed limit for towing this unit is 55 MPH. Do not exceed this limit.

WARNING: HEIGHT CONSTRAINT

- The unit measures 8'8" when in towing mode. This could be a hazard in some areas. Be aware of height constraints while driving. Do not pull the trailer through a drive-through, parking garages, or other areas with height constraints.

WARNING: RISK OF FALLING OBJECTS

- The mast has two set extension levels. These are indicated by the slot cut into the pole extension following the outer part of the mast. The final slot is followed by a red mark indicating the end.
- The mast is designed so it will not overextend; however, excess cranking on the winch could cause the unit to fail. ***Severe injuries can occur.***
- The mast has a maximum lifting capacity of 65lbs; do not exceed this weight. The mast could collapse on itself and injure anyone underneath.
- Ensure all anchors are used when attaching the top of the pole extension to the fixed mast. Loose anchors can cause the extension to fall over if they become undone or broken from wear caused by the two metals rubbing against each other, weakening the anchor.

- Ensure that every item attached to the top of the pole extension is secured properly and will not fall off, injuring someone below.

WARNING: ELECTRIC SHOCK HAZARD

- The product is used in conjunction with a permanent energy source (battery). Input and/or output terminals may still be dangerously energized, even when the equipment is switched off.
- The product has no internal user-serviceable components.
- Do not remove the front plate or operate the product if any panels have been removed.
- All services must be undertaken by qualified personnel.
- The AC output is isolated from the DC input and the chassis. Local regulations may require a true neutral. In this case, one of the AC output wires must be connected to the chassis, and the chassis must be grounded.
- Ensure that the equipment is used under the correct ambient conditions.
- Never operate the product in a wet or dusty environment.
- Never use the product where there is a risk of gas or dust explosions.

Additional Electrical and Battery Safety

- Avoid sparks, open flames, and other ignition sources near the battery bank; batteries can release explosive gases.
- Treat battery terminals, DC conductors, AC conductors, and connected equipment as energized until properly isolated and verified safe.
- This product is designed and tested in accordance with international standards. The equipment should be used for the designated application only.

Warning: Things settle during shipping: You must tighten the lug nuts to 100ft-Ibs before first use. You must tighten axle mounting bolts and nuts to 80ft-Ibs before first use.

Warning: Purchaser shall not modify or change the Trailer without prior written approval. Any unauthorized modification is deemed material misuse and may create hazards not addressed by the instructions in this Manual.

Changes or modifications not expressly approved could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.

• Increase the separation between the equipment and receiver.

• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected connected.

• Consult the dealer or an experienced radio/TV technician for help.

This device contains a transmitter with FCC ID SH6MDBT42Q.

These instructions provide general information for typical use conditions. You are solely responsible for evaluating the site of use, identifying hazards, and implementing controls appropriate to the site and your operations, including compliance with applicable law. You are responsible for ensuring only qualified personnel tow, deploy, operate, inspect, service, or repair the Trailer and that such personnel are trained on these instructions.

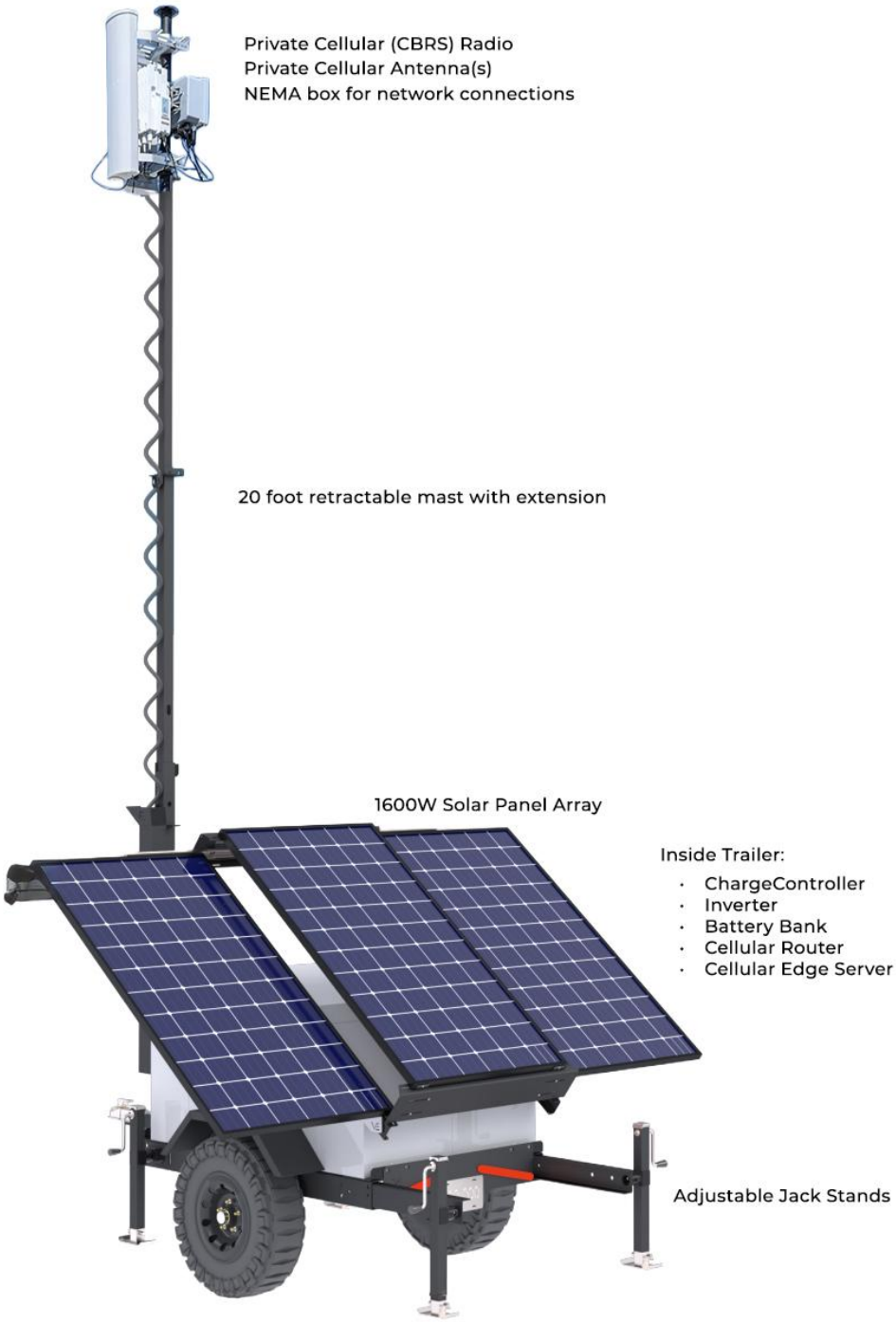
Towing and operating the Trailer involve inherent hazards that may be open and obvious to a reasonable operator, including pinch/crush points, towing hazards, electrical shock hazards, falls from height, and overhead clearance risks. The absence of a specific warning for a particular hazard does not mean the hazard does not exist or that the Trailer may be used without appropriate precautions.

2. System Overview

The STEP Rover communications trailer provides a self-contained private cellular and local Wi-Fi network providing internet connectivity powered by a battery bank which is recharged by solar panels.

Main Components

- **Solar Panels:** Collect sunlight to charge the battery bank. The Starlink antenna bracket is mounted to the upper rail of the solar panel. Users may provide a Starlink antenna and mount it on this bracket. The antennas for private cellular and Wi-Fi are also attached to the outer sides of the solar panel.
- **Charge Controller and Inverter:** Manage power conversion to operate 120V AC outlets and communications gear.
- **Battery Bank:** Stores energy for nighttime or cloudy-day operation.
- **Communications Drawer:** Contains the Cradlepoint router and cellular edge server for the private cellular communications.
- **CBRS Radio & Antenna Mast**: Supports private cellular radio and antennas for better signal coverage. A National Electrical Manufacturers Association (NEMA)-rated enclosure is mounted to the upper mast extension. Mast cable connections will be connected to the ports on this enclosure.


Private Cellular (CBRS) Radio
Private Cellular Antenna(s)
NEMA box for network connections
20 foot retractable mast with extension
1600W Solar Panel Array
Inside Trailer:
· ChargeController
· Inverter
· Battery Bank
· Cellular Router
· Cellular Edge Server
Adjustable Jack Stands

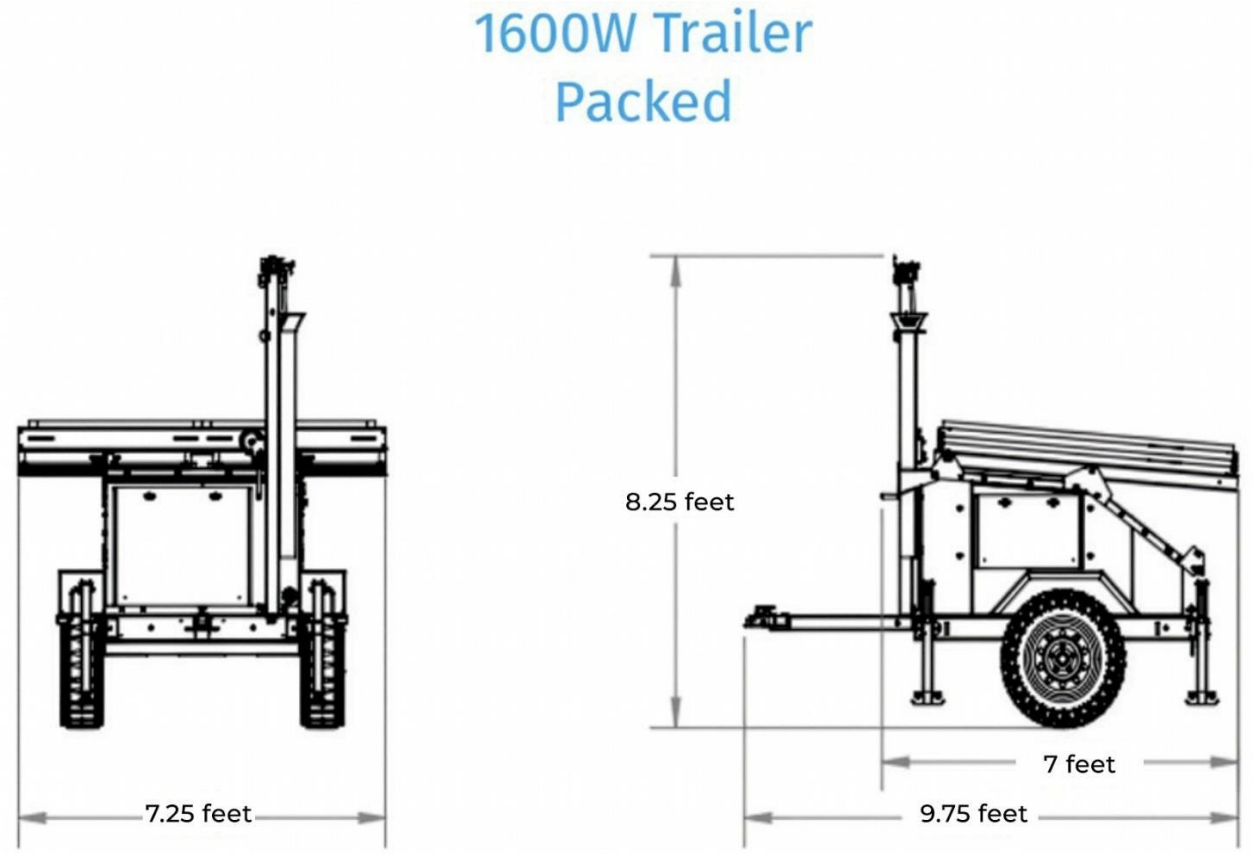
Electrical Components

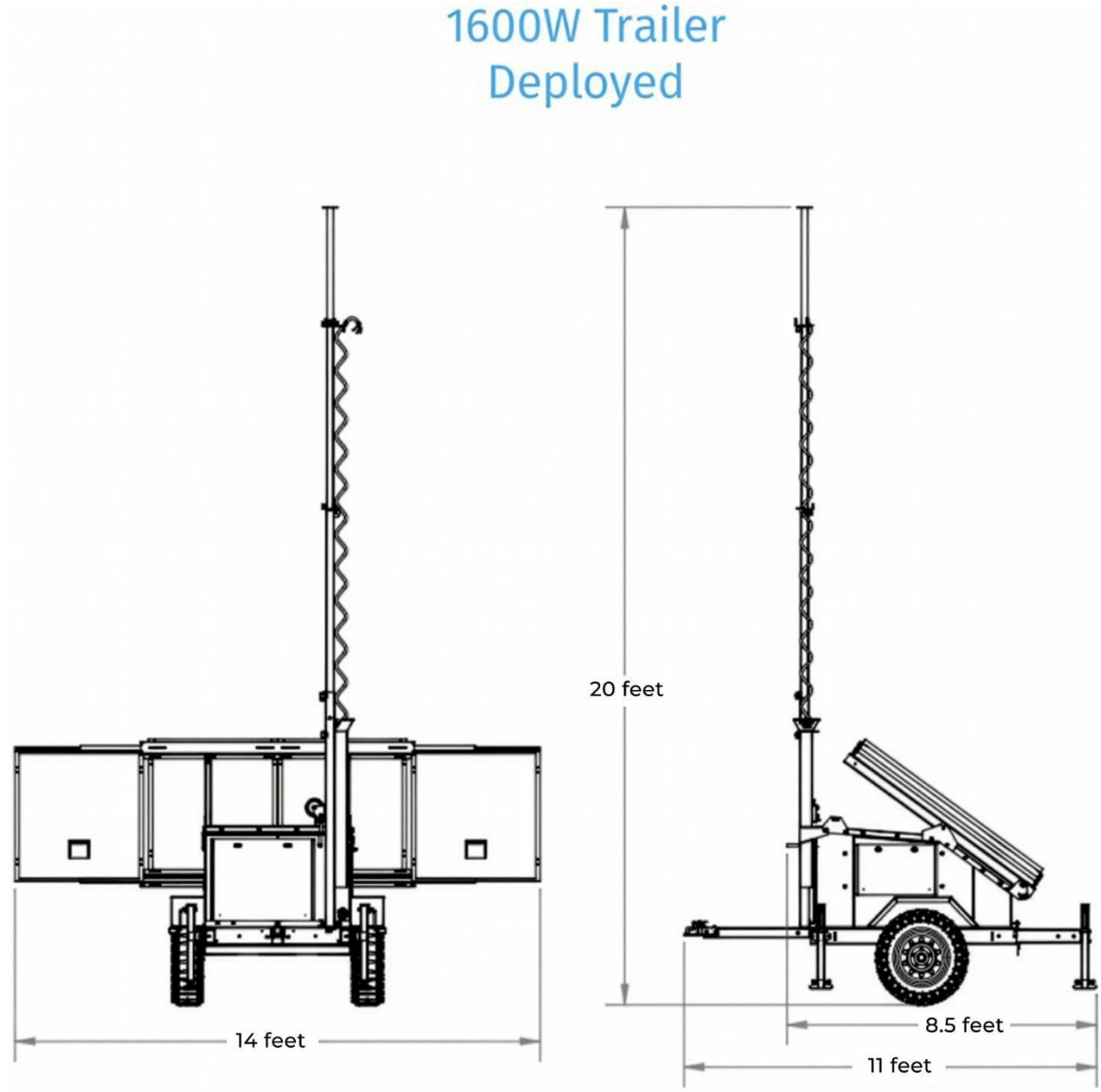
The following components are housed in the smaller cabinet compartment located on the side of the Rover. Two wing knobs are located along the top of the door. One knob is keyed, and the other is not. When opening the door, use caution, as the door is held together in compression, which removes the need for hinges.

The door comes off completely giving full access to the compartment.

The front of the Rover has a similar door of a much larger size that **provides access to the battery compartment. Use caution with this door, as it uses the same locking method as the smaller door but is much heavier.** The batteries have been pre-wired prior to shipping. The solar array connection cable is also located in this space. This too has already been wired in the optimal manner to provide the best solar production.

Dimensions





3. Setup and Power-On Procedure

Brief Setup Overview – Detailed Setup follows

1. **Arrival and Preparation**:
    - When you pull up to level deployment site, place the tow vehicle in park and set emergency brake.
    - Deploy right and left rear jack arms.
    - Deploy front and rear jacks on all four corners.
    - Detach Rover from tow vehicle.
    - Use the jacks at the front and back of the Rover to stabilize and level the unit.
2. **Inventory Check**:
    - Conduct an inventory check of all the gear inside the Rover, including the guy wires and other necessary items.

- Ensure you have an 8-foot A-frame step ladder and at least two people for the deployment process.

3. **Mast Assembly**:
   - Remove the mast extension from the Rover, which is bolted in for transport.
   - Attach the masthead to the mast and make the necessary connections.
   - Stand the masthead up and bolt it into place.
4. **Guy Wires and Electrical Connections**:
   - Attach at least one guy wire to the mast before raising it, but it is advisable to deploy all three guy wires.
   - Make all the necessary electrical and network connections, which should only be two.
5. **Mounting Equipment**:
   - Mount any cameras and gear to the mast.
   - Connect the Power over Ethernet (PoE) and network cables to the appropriate ports on the mast.
6. **Raising the Mast**:
   - Raise the mast and secure it with the guy wires.
   - Ensure all connections are secure, and the mast is stable.
7. **Solar Array Deployment**:
   - Deploy the solar array as needed.
   - If applicable, deploy the Starlink system for additional connectivity.
8. **Powering Up**:
   - Turn on the necessary breakers to power up the unit.
   - Conduct a safety check to ensure everything is properly set up and secure.
9. **Final Checks**:
   - Double-check all connections and ensure the Rover is buttoned up for operation.
   - Ensure all safety pins are in place, and the unit is ready for use.

Detailed Setup Instructions

Tools Required:

- 8+ft. A-Frame ladder
- ½" Wrench
- ¾" socket & ratchet or impact driver
- Hammer (for guywire ground stakes)
- 2 people are required for a safe deployment of the Rover

Site Preparation

a. Park the Rover on level ground with full sun exposure.

b. Park the trailer in a low-traffic area

c. Consider line of sight in trailer placement decisions. Consider the landscape and infrastructure signal interruption.

d. Park the Rover with the solar panels facing south, or as close to south as possible

e. Ensure no overhead obstacles block solar panels or mast extension.

f. Chock the wheels.

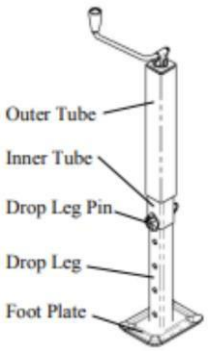
Trailer set-up

Extend right and left rear jack arms

Remove two ¾" bolts in the frame rail, extend the inner frame rail, and reinstall the bolts

- Rotate all jacks to the down position and jack down until contact is made with the ground.

The jacks equipped to each trailer are there to provide stability and the option to level the Rover and equipment in rough terrain. They consist of a three-part construction. There is an outer tube, inner tube, and a drop leg tube welded to a foot plate. The inner tube, when fully compressed, rests inside the outer tube. The drop leg rests inside the inner tube and is held in place with a "Drop Leg Pin". This design allows the jack to be very compact when not in use. The outer tube has a round jack mount welded on so that the jack can be mounted horizontally or vertically, or removed entirely.



When attaching the jacks to the Rover, use the locking pin with chain to mount it securely on the round jack mount. This way the jacks can swivel from a horizontal position to a vertical position. The two rear jacks are attached to an outrigger-style bracket that can be extended when deploying the unit and retracted during travel from one site to another.

Before detaching the Rover from the vehicle, lower the jacks into a position where they can support the weight of the unit, and ensure all bolts are as tight as possible. They can become loose during travel and may need tightening. Remove the drop leg pin to extend the drop leg and foot plate as far as it will allow. Place the Pin back in the next available slot. Insert the drop leg back into the inner tube if the next slot is too far up. Make sure the pin is through both sides of the jack.

Once all four jacks have been extended, detach the Rover from the vehicle. The unit can then be leveled out by raising and lowering the jacks. The Rover can be lifted off the wheels when raising the jacks, but do not exceed a height of six inches. The foot plate is designed with a wide base; however, in areas of loose ground it is recommended to place some form of outrigger “pad” before raising the Rover.

- Unplug lights, remove safety chains, remove hitch ball pin, and unlatch hitch
- Alternating right and left front jacks, jack trailer up until hitch is clear from the ball
- Pull vehicle clear of the Rover
- Remove tongue pin, then remove trailer tongue from the Rover
- Remove trailer lights extension cable, or tidy cable underneath trailer
- Using all four jacks, level the Rover while maintaining ground contact with trailer wheels if possible.

Solar Deployment

- Rotate the solar panel assembly by removing the two retaining pins on the front of the Rover, tilting the assembly to approximately 35°, then re-insert the retaining pins to the lower brackets on the rear of the Rover to lock in place.

- Extend the two side panels. Depress the drawer slide levers on the top and bottom of the panel, then extend to full width. The drawer slides will lock in place once fully opened. Pull the panel out completely until both locks click into place. It may be necessary to tug on one end of the panel slightly to engage the lock. If this occurs, pull gently straight out while directly in front of the slide rail.
- ***Do not attempt to pull from the opposite end as this could bend the panel at an awkward angle and cause the panel to fracture.***

The solar panels fitted to the Rover are pre-wired, fixed to a pivot point on the Rover, and are incredibly durable. The design allows easy deployment using a slider rail system for the multiple panel systems. There is no need to connect wires as this was done before the unit left the factory. The pivot point allows the panels to be adjusted to two fixed positions: a flat position recommended as the towing position, and a tilted position, which is the deployed position. To accomplish this, the mounting rails have anchor slots at both ends. A pin slides through and secures the desired position. There are pins on both sides for stability. The panels are very resilient to head-on impact but are vulnerable to side impacts on their frame.

The orientation of solar panels is crucial for optimal solar power production. The panels need to be facing South. This will allow the panels to absorb the Sun's rays throughout the whole day. It is ideal to place the back end of the Rover facing South prior to unhitching and extension of the solar panels. Ensure the area surrounding the Rover is clear of objects that could prevent correct deployment. Ensure the unit is placed far enough to prevent shading from trees, buildings, vehicles, and any other tall objects in the area. Excessive shading leads to poor battery charging, causing the system to perform below expectations.

Radio & Mast deployment

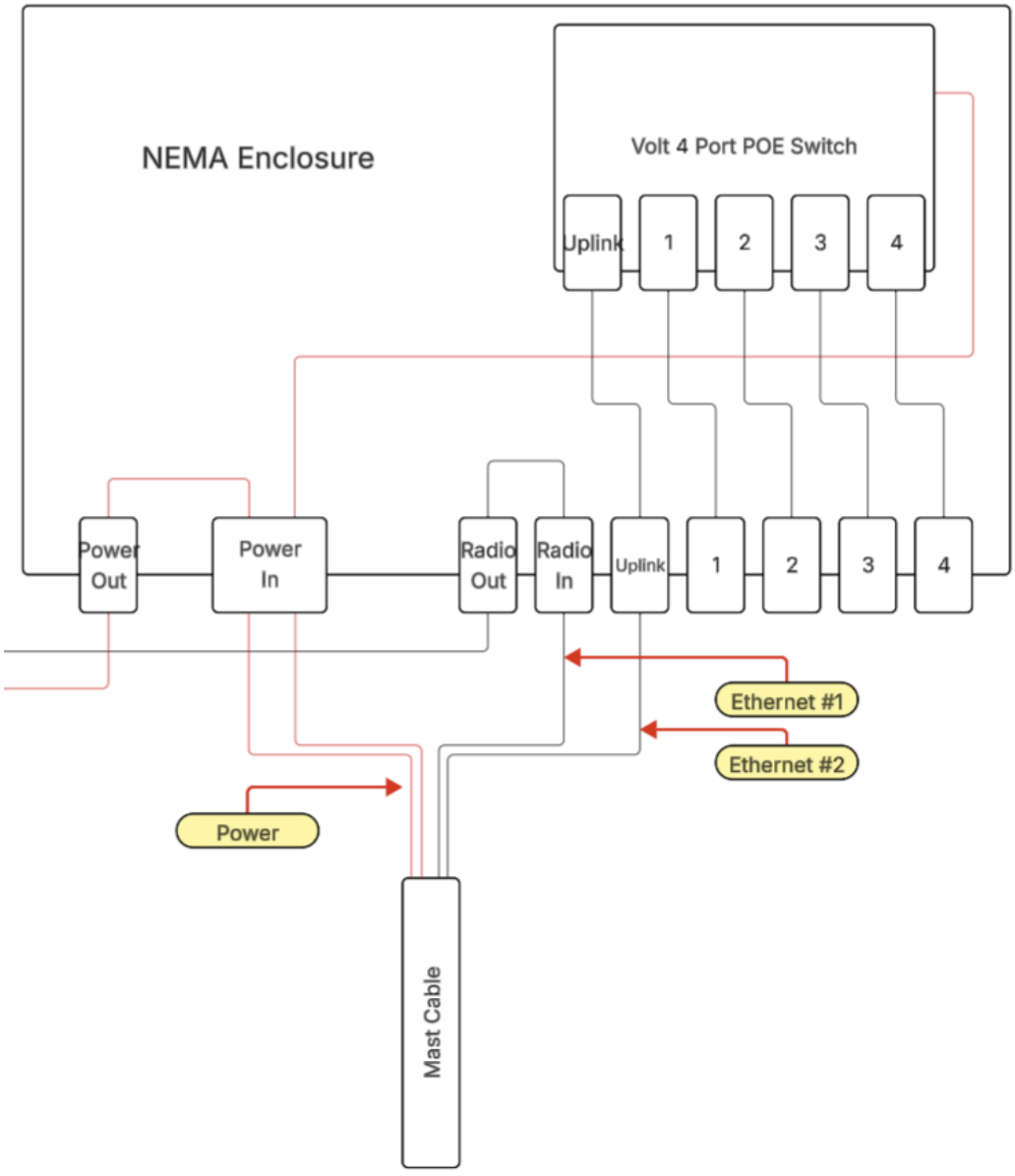
- Open and remove front panel
- Open drawer and remove mast head bolts
    - Do not lose bolts
    - Locate the square end of the mast head and note the orientation of the mast dog ears. This is the bottom of the mast extension.
- Remove the mast extension from the bracket on the drawer, then close the Rover drawer.
- Position the ladder to the front of the Rover for mounting the mast extension – do not place the ladder along the side of the Rover.

Raise the mast a few inches so the underside of the mounting plate and bolt locations are accessible before mounting the mast extension.

- Mount the mast extension onto the mast.
    - Use two people to mount the mast extension
    - Person 1 on the ground hands the mast extension to person 2 on the ladder
    - Person 2 holds the mast extension horizontally with the dog ears facing down.

- Slide the two dog ears into the holes on the mast mounting bracket, then rotate the mast extension to a vertical position. Do not let the mast extension hang by the two dog ears.
- Maintain control of the mast extension while installing the bolts – the extension may tip forward during installation before the bolts are installed.
- Install the first bolt in the hole farthest from the dog ears
- Once that bolt is installed, the extension should be secured from tipping forward.
- Install the second bolt in the front bolt hole and tighten.

- Locate the mast cable and connect cannon plug and two ethernet connectors in the correct positions on the mast NEMA enclosure. Match the cable designations to the labeled ports. (See Diagram Below)



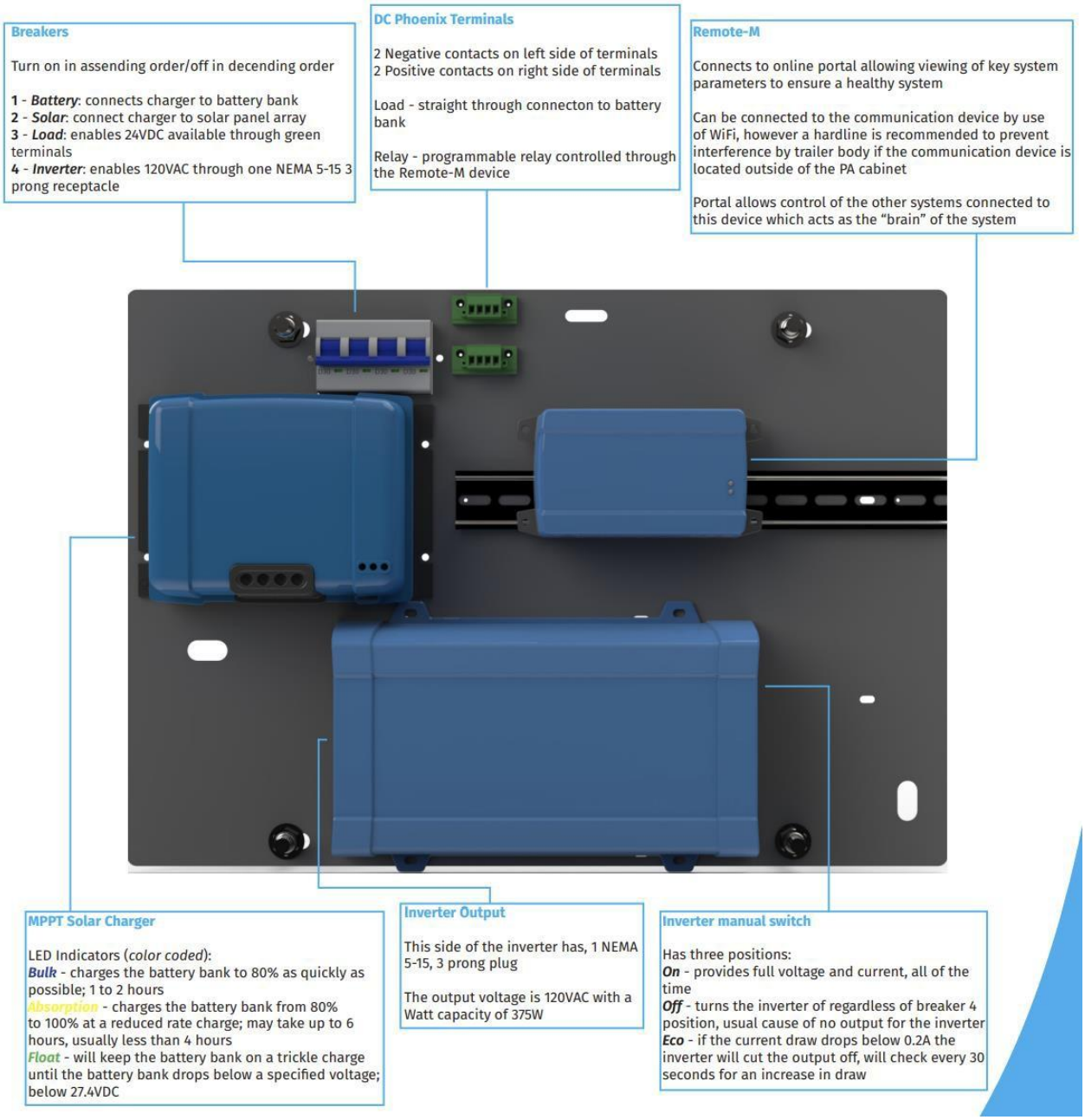
- Aim cellular antennas as needed by loosening antenna brackets and rotating on mast head until desired position and retighten brackets
    - The GPS antenna on the radio may need to be removed to rotate the antennas, depending on the position. Reinstall the GPS antenna. If an antenna is in the way, you may need to switch the two antennas since the brackets for one will clear the GPS antenna.
    - When rotating the antennas on the mast extension, be sure to manage the cables between the radio and NEMA enclosure, making sure they do not snag on the antenna bracket or mounting bolts.
- Check to ensure all brackets and bolts are tight, and all cables are clear of catch points.
- Locate the three guy wires and attach to mast attachment points with the attached carabiners
- Locate and remove the mast pin from the storage bracket on the mast
- Raise the mast to the top position where the mast pin hole is aligned and insert the mast pin
    - **When raising the mast, watch the mast pin hole**. There are two pin holes on the inner section for various heights. The first hole is used for mounting the mast at the halfway point; ***this mount cannot be used due to FCC height regulations for private cellular use.***
    - Continue raising the mast; you will see a stripe of red paint through the pin hole. Continue until you see the second inner hole for the mast pin. ***If the red paint rises above the first mast section, it has been raised too high.*** When the second inner pin hole is aligned with the outer, you will see the first inner pin hole above the outside section of the mast.
- Back hand winch to allow the pin to take the weight of the mast while maintaining light tension on the winch cable. ***Do not back the winch too far and leave slack in the cable.***
- Tighten the two retaining bolts on the mast to stabilize the inner mast sections.
- Once the mast height has been set, extend the three guy wires and insert stakes in the ground. If you are unable to drive the stakes into the ground (if parked on asphalt, for example), attach to a suitable anchor.
    - ***If you choose not to use the guy wires, attach at least one to the mast during deployment. It can assist with lowering the mast if debris gets inside the mast sections and causes any issues with lowering the mast.***
- Any additional customer-supplied hardware should be mounted to the square channel mast, not the mast extension.
    - POE power is available via Ethernet ports at the bottom of the NEMA enclosure. (See Previous NEMA Enclosure diagram.)

Powering on devices

- Remove the side door panel
- Locate the four breakers in the top left corner (See electrical panel diagram below.)
- The first two breakers should be on. If they are not, turn on breaker 1 then breaker 2.
    - ***Do not turn breaker 2 on before breaker 1.***

      Note: Breakers 1 & 2 can be left on during transport to continue charging the batteries during transit.
- Turn on breaker 3 for DC power
- Turn on breaker 4 to power on the inverter for AC power
- All devices on the Rover will automatically boot up once power is turned on.

Confirm that the Cradlepoint router status lights indicate power.
Confirm that the server LEDs indicate power.



Breakers -

Always ensure they are turned ON in ascending order and OFF in descending order

- 1 - Battery: connects charger to battery bank
- 2 - Solar: connects charger to solar panel array
- 3 - Load: enables 24VDC available through green terminals
- 4 - Inverter: enables 120VAC through one NEMA 5-15 3-prong receptacle

Inverter manual switch has three positions:

- On - provides full voltage and current, all of the time
- Off - turns the inverter off regardless of the breaker 4 position, usual cause of no output for the inverter
- Eco - if the current draw drops below 0.2A, the inverter will cut the output off; it will check every 30 seconds for an increase in draw

MPPT Solar Charger LED Indicators (color coded):

- Bulk (Blue)- charges the battery bank to 80% as quickly as possible; 1 to 2 hours
- Absorption (Yellow) - charges the battery bank from 80% to 100% at a reduced rate; may take up to 6 hours, usually less than 4 hours
- Float (Green) - will keep the battery bank on a trickle charge until the battery bank drops below a specified voltage; below 27.4VDC

4. Normal Operations

Daily Checks

- Confirm solar panels are clean and positioned toward the sun.
- Clean solar panels as needed with a soft cloth, mild soap, and water. Rinse thoroughly and dry with a soft cloth. Do not use abrasive materials.
- Check the battery level in the Navigator app. Connect the generator as needed. Unless auto-start / auto-stop generator is connected to the Rover.
- Ensure antennas and cables remain secure.

5. Teardown and Transport

- Begin by turning off the breakers: #4, then #3.
- Remove any cameras or gear from the mast.
- Lower the mast and remove the guy wires.
    - Inspect the cable for any signs of wear, such as kinks, knots, and fraying.
    - Remove the cotter pin from the safety pin, slide it out, and place it on the carry hook.
    - Insert the cotter pin once more to prevent the safety pin from becoming lost.
    - Turn the handle counterclockwise to lower; the piece will not make a clicking sound; the brake system is working.
    - Make sure all parts of the mast are coming down properly. If a section becomes jammed, use the guy wires to pull straight down. The sections could become stuck when the tension is not evenly distributed among the guy wires, as one section is pulled harder in that direction. On rare occasions, gently tapping the mast with a rubber mallet has been required. The only time masts have been reported to be stuck is after extended deployment of the units.
    - Make sure the coiled cable is retracting and returning to its storage tube properly when lowering the load on the mast. Remove the stakes from the ground to help with guy wire storage.
    - Once fully lowered, using a ladder, climb up to the equipment on the extension pole and disconnect the power and Ethernet cables and any other cables in preparation to remove the extension.
    - Remove the guy wires from the hooks; the proper way of storing them is to roll the wires up in a loose hoop. Be cautious of tangling up the wires, as this could cause them to deform, leading to potentially unsuccessful future deployments.
    - Use tape or string to keep each wire separate and tangle-free.
    - Remove the nuts and bolts from the anchor plates. Always remove the one closest to the hooks to prevent the extension from being violently flung out of your hands. ***This could cause injury to yourself, others, or damage to the equipment.***
    - Slowly unscrew the bolt opposite the hooks as the extension will want to fall in the direction away from the bolt. Firmly grasp the extension and lower it so it is 90° from the starting point. Slide the hooks out of their slots and lower the extension and equipment to the ground. Remove the handle from the crank and store the equipment for transport.
- Secure the mast extension back in the Rover compartment and bolt it in place.
    - If antenna positions prevent the mast extension from fitting through the Rover opening, loosen and rotate

the antenna brackets as needed, then retighten them after the mast extension is secured for transport.

- Remove jacks –
    - Lower the jacks until the wheels are back firmly on the ground. Attach the Rover back to the vehicle to prevent lifting of heavy loads. Retract the jacks back until inner tube is back fully inside the outer tube. Remove the drop leg pin, insert the drop leg and foot plate back into the inner tube. Replace the drop leg pin in the lowest slot possible. When all jacks have been raised, inspect the area for possible interference while towing. Always tow the Rover with the jacks positioned in a way that allows for maximum ground clearance.
    - The unit can be towed with the jacks mounted in place, and the jacks are turned to the horizontal When rotating the jacks horizontally, position each footpad toward the wheel and the crank handle away from the wheel so the tire tread cannot catch and damage the handle during transport position. It is recommended that the "Drop Leg Pin" be inserted from the top down. This will ensure the drop leg will not come loose and fall out during travel.

- Fold up the solar array and prepare the Rover for transport.
    - ***Ensure the panels are clean before packing begins.*** Check for chips or cracks to ensure the unit is good for your next project.
    - Then release the panel by pressing the tabs down by pressing down. This will disengage the lock, and the panel will be free to slide back and forth.
    - ***If the unit has been in extremely windy and dusty areas, it is recommended to spray the slide rails with lubricant to help with closing.*** You may need to spray the rail multiple times and slide the panel in and out repeatedly. For units with multiple panels, start by sliding the bottom panel back first and working your way up. Work on any tough panels individually with lubricant when needed. There should be no need to use excessive force when closing the panels.
    - Once the panels have been locked back into the closed position***, remove the locking pins from the mounting rails and gently lift the bottom of the panels.*** With the panels back in a flat position, lock the pins back into place. Always check that there is no excessive wiggle of the panels when locked in flat. Excess wiggle can cause serious damage to the solar array. When the panels are locked in flat, you are now able to tow the Rover to your next project location.

Lastly, conduct a final safety check to ensure everything is secure for transport.

7. FAQ

- **Q:** What if it rains or snows?

  A: Panels are weatherproof — just wipe off snow before operation.

- **Q:** How long does the battery last?

  A: Typically 12–16 hours depending on sunshine and load.

- **Q:** Who do I call if it stops working?

  A: Please call STEP Customer Care Center at (844) 478-0045 or email – customersupport@stepcg.com

These instructions should help ensure a smooth and safe deployment and teardown of the Rover unit. If you have any further questions or need additional details, please contact our support team.