

ADDAX™

FORGED ON EARTH. TESTED IN HELL.™

OWNER'S MANUAL:

OVERLAND TRAILER



Owners/operators must read and comprehend the instructions in this Owner's Manual before using the Addax Overland Trailer, as it contains instructions that if not followed could result in death or serious injury. Reach out to CustomerService@addaxoverland.com for any questions.

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1. Introduction to the Owner's Manual

Congratulations on your purchase of The New ADDAX Overland Trailer! This manual provides a guide to its use to help you thoroughly enjoy your purchase. Given the numerous applications and conditions this product could be used in, it is not possible to cover all specific risks. Users must be aware when operating this or any trailer. Always operate the trailer consciously and prudently. Owners must read and comprehend the instructions in this Owner's Manual *before* use. Following the instructions in this Owner's Manual is just a part of the safety precautions. Users must always be alert to individual situations arising during use. Be safe!

If the Owner's Manual does not address a specific question, please contact your dealer for assistance. ADDAX Overland is not responsible for damage to property or person resulting from misuse of any kind.

This Owner's Manual identifies a potential risk and its related level by the following signal words:



NOTICE - Indicates information needed to prevent a situation that could result in damage to the equipment or other property.



CAUTION - Indicates information needed to prevent a hazardous situation, which, if not avoided, could result in minor or moderate injury.



WARNING - Indicates information needed to prevent a hazardous situation, which, if not avoided, could result in death or serious injury.



DANGER - Indicates information needed to prevent a hazardous situation, which, if not avoided, WILL result in death or serious injury.

2. Breaking in a New Trailer

First time use checklist:

- Level the trailer, ensuring at least two jack legs are dropped for support.
- Take the tongue out of the trailer and install it in the front of the trailer (Electrical Panel Side). Connect the 7-way plug to the trailer.
- There is a bolt with a ring nut and a hitch pin. Install them into the tongue under the trailer. You can use the hitch pin to tighten the ring nut. These are removable if needed.
- Install the trailer side of your CU offroad hitch into the end of the tongue.
- Install the saddle onto your vehicle stinger. Ensure the height is correct by measuring from the ground to the top of the vehicle receiver opening and the height of the trailer from the ground to the bottom of the tongue. Use the difference of these measurements to adjust the stinger level.
- Proceed to hitch the trailer, using the red pin to engage the hitch.
- Walk around the trailer and verify you have 7 pins: 3 pins from the truck to the trailer; 4 pins holding the jack feet up.
- Turn on the power switch and verify the fridge turns on.

If there are any issues with these steps, contact your dealer.

When first operating your ADDAX Overland Trailer, you must check the Wheel lug nuts after the first 10, 25, and 50 miles of driving. Additionally, check the pins and bolts that hold the trailer tow components in place, and ensure they have not settled or loosened after manufacturing after the first 10, 25, and 50 miles. The tow saddle, tongue, stinger, and hitch components must all be checked and tightened.



Warning - Wheel lugs can shift and settle quickly after being first assembled, and must be checked after the first 10, 25, and 50 miles of driving. Likewise, all hardware between the trailer and tow vehicle are susceptible to the same loosening. Failure to perform this check may result in a wheel coming loose from the trailer, causing a crash leading to death or serious injury.

Retighten Lugs after doing any off-road activity. Improper tightening of the lug nuts or bolts voids the axle warranty. Tighten nuts or bolts to:

100 ft-lbs

Tighten the lug nuts or bolts in three stages to the final torque of 100 ft-lbs. Use a calibrated torque wrench to tighten the fasteners. Verify that wheel studs are free of contaminants such as paint or grease, which may result in inaccurate torque readings. Over-tightening will result in breaking the studs or permanently deforming the mounting stud holes in the wheels and will void the axle warranty. See your dealer for more wheel nut or bolt torque specifications.



Warning - Users must regularly inspect the primary hitch bolt before and after EVERY trip. The regular motion of the trailer will loosen these components over time.



3. General Guidelines

Driving a vehicle with a trailer in tow is vastly different from driving the same vehicle without a trailer in tow. It is highly recommended the user spend time adjusting to the different feel and maneuverability of the tow vehicle with a loaded trailer.

Find an open area with little or no traffic for your first practice. Before you start towing the trailer, you must follow all of the instructions for inspection, testing, loading and coupling. Before you start towing, adjust the mirrors so you can see the trailer as well as the area to the rear of it.

Drive slowly at 5 mph to get the feel of how the tow vehicle and trailer combination responds. Make some right and left hand turns. Watch in your side mirrors to see how the trailer follows the tow vehicle. Turning with a trailer attached requires more room.

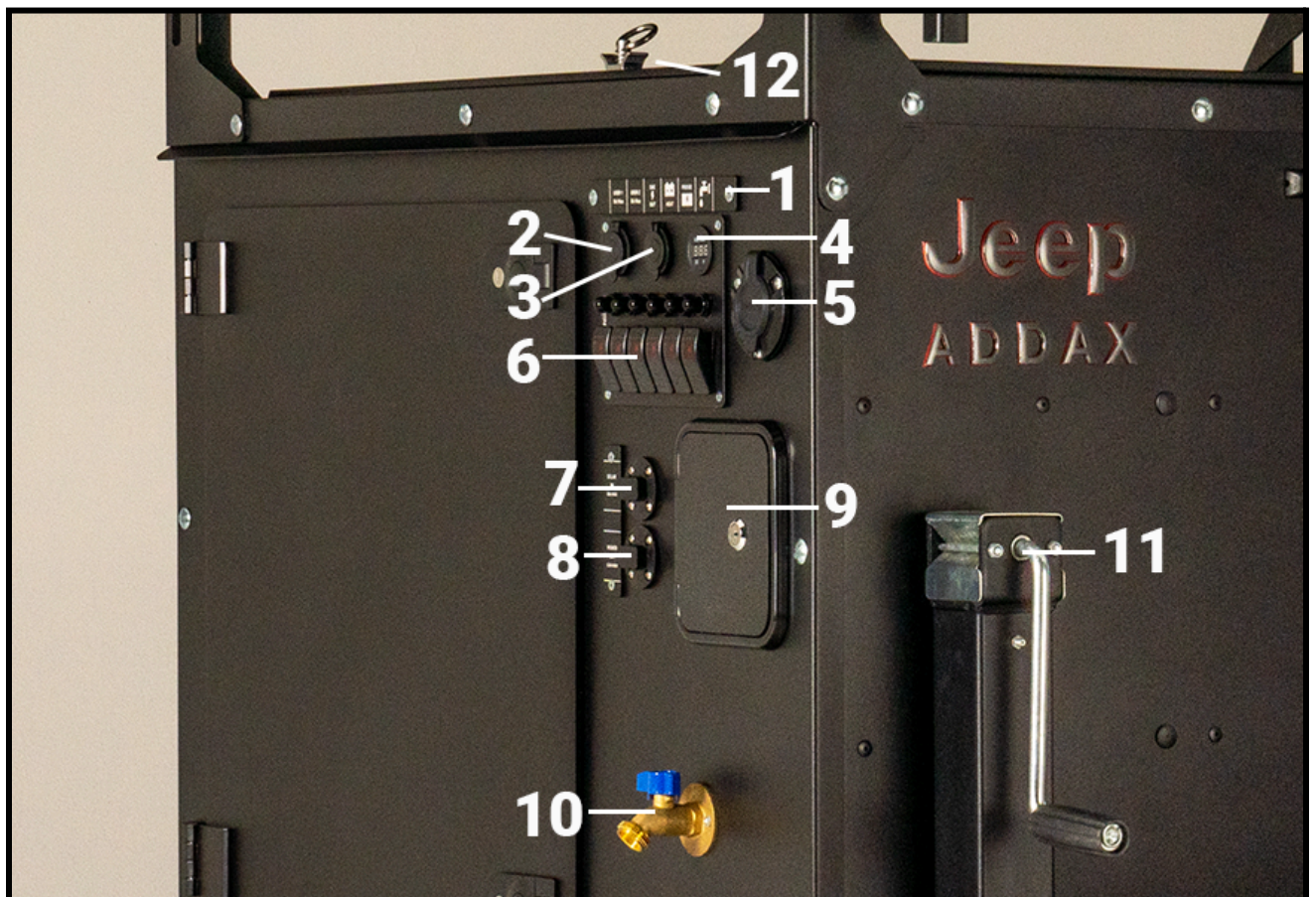
It will take practice to learn how to back up a tow vehicle with a trailer attached. Before backing up, get out of the tow vehicle and look behind the trailer to make sure that there are no obstacles.

When reversing a trailer, steering feels reversed. Some drivers place their hands at the bottom of the steering wheel, and while the tow vehicle is in reverse, “think” of the hands as being on the top of the wheel. When the hands move to the right (counter-clockwise, as you would do to turn the tow vehicle to the left when moving forward), the rear of the trailer moves to the right. Conversely, rotating the steering wheel clockwise with your hands at the bottom of the wheel will move the rear of the trailer to the left, while backing up.

4. Features and FAQs



Notice - This section provides some basic information for the safe operation of features and accessories. **You must read and follow these instructions before using the accessory** to avoid damaging it. Contact your dealer for further questions.



4.1 Illustration Key

1. Switch Board Label - This Label will indicate what the corresponding switch and fuse will control.
 - **User 1** - a customizable circuit of up to 12 amps
 - **User 2** - a customizable circuit of up to 12 amps
 - **12 Volt SAE power out control** - Arrow 8 above locates the SAE power out port. This is a standard port used to control many camping products.
 - **Battery Warmer** - Thermostat regulated battery blanket allowing the user to charge the battery when under temperatures of 35 degrees.
 - **Fridge** - This circuit controls the fridge. (If equipped)
 - **Water pump** - This circuit will turn on and off the water pump.
2. A 12-Volt Cigaret-style Outlet
3. Two USB Charging Outlets (5 volts, 1 amp, and 5 volts, 2.1 amps)
4. The Battery Voltmeter - Monitor the voltage of your trailer's battery.
5. Shore Power In - Plug your trailer directly into an external power source to charge.
6. Switches - These control other instruments on the trailer. See the label (arrow 1).
7. Solar Power In - This port is equipped with a solar controller. Just plug your panels in here for off-grid charging! **Set up for a maximum of 200 watt solar panels.**
8. SAE power out port. This is a standard port used to control many camping products.
9. Water Tank Intake - This locking cap and panel protect your freshwater inlet. Fill your water tank here. (If equipped.)
10. Water Spigot - This standard hookup will be where your water tank empties (If equipped.) Also note what switch on the control panel activates your water pump. See arrow 1 for details.
11. 8,000 lb. Jack - One of four 8,000 lb. Jacks equipped on your trailer for stability. Note that some models provide a removable crank.
12. Adjustable rack clip - Pull upwards on the wings while pushing on the button to adjust the clip's location.

4.2 Features

- **Removable Tongue and Hitch**
 - This feature is designed to allow for easier storage, and increased mobility around the trailer when camping. To remove the tongue, locate the pins and/or bolts below the trailer that hold the tongue in place. Remove these fasteners. The tongue should now slide out of the trailer freely.



- **Rear Hitch Receiver**

- The rear hitch receiver is intended for accessory purposes. Never chain multiple trailers of any kind together. This could result in serious injury.

- **Rooftop Tent (if equipped)**

- While the specific details of your rooftop tent will depend on your trailer's model, the general principles are the same. When deploying your tent, ensure you have ten feet of room around your trailer in any direction to avoid injury or damage.
- Always ensure all four jack legs are making firm contact with the ground before entering the tent.
- **Deploying the Tent:**
 1. Open the locks/latches
 2. Open the hardshell
 - Push upwards on the shell's non-hinged side. Some models have a handle. The gas shock absorbers will take over and open the tent automatically.
 3. **Pull out the ladder**
 - Raise the ladder slightly and **pull it out backwards to full length**.
 - It is very important that the ladder "clicks" at every joint, to indicate they are locked. Pull back an extra time to ensure this.
 4. Open the tent
 - Use the ladder as leverage to open the last section of the tent, pulling down on the ladder, forcing the section into an upright position.
 - Pull outwards with the ladder, to open the tent up completely.
 - Bring the ladder all the way back so that the tent now hangs freely in a horizontal position, with all sections unfolded.
 - Some models are equipped with an elastic band across the tent to assist in pack-up. Store this band in the groove on the lip of the tent base.
 5. Adjust the ladder
 - It is very important to adjust the ladder correctly as it carries some of the weight of the tent.
 - When the ladder is fully extended, start from the top of the ladder, adjusting one joint at a time.
 - Click each of the two top buttons on the ladder, one with each hand, and lift up the ladder to collapse the first rung. The top rung should collapse into the next. Repeat this with the next rung, and the next, until the ladder is at about a 15 degree angle from upright and holding some of the weight.
 - The angle of the ladder should be slightly sloping so that it is easier to climb up and down but there is still full support.
 - **!IMPORTANT:** The ladder must be fully supported on the top step. The tent must NOT be able to move up and down. Ensure the ladder is holding some weight.
 - It is recommended to mount a storm protection strap on the tent from the top step of the ladder and down to the car's wheels, as this secures the tent.
 6. Fit the rainfly
 - Use the 2 long rods for the upper rainfly.
 - Bend the rod up against the rainfly and mount the rod on the rainfly. Do not be afraid to bend the rod.

7. Window Awning There are two options for setting up the side windows.

- For everyday use: Roll up the window overhang and fasten with the 2 buckles.
- In case of rain and wind: Mount the overhang with the short poles , in the same way as the long rainfly poles.

8. Flex tent cloth

- Make sure that the flex fabric where the tent folds in the sides is correctly mounted inside and outside with the small elastic straps from side to side.

- **Lithium battery (if equipped)**

- The battery may be kept charged either by the tow vehicle, by an auxiliary charger or by using a solar panel. If the trailer is used daily, it is recommended that the battery be charged after each day's use.
 - Note that many tow vehicles will continue to provide power through the tow hitch even AFTER the engine has shut off. It is recommended that you **unplug the ADDAX Overland trailer from your tow vehicle when not in tow** to prevent the trailer from draining the vehicle battery.
- **The accessory battery must be kept in a charged condition during storage.** Letting the battery completely die will reduce the lifespan of your battery. Periodically connect the trailer to a power source to prevent this.
- **Master Power Switch:** To power your trailer from the lithium battery, turn the master power switch knob to the on position. This knob is located in the right hand side of the front door frame. Open the front door, and access the switch to your right.
- Note that the battery will not charge if the temperature falls below 35 degrees. To prevent this situation, before entering a cold climate, activate the ADDAX Overland trailer's battery warmer feature. See the switchboard for more information.
- **Resetting the battery charger in the event that the battery goes completely dead**
 - Make sure you are plugged into a power source.
 - Check that the power light is lit on the NOCO battery charger (Located inside the front trailer door).
 - Push and hold the mode button (several seconds) until the battery type lights light up.
 - Push and release the mode button until the blue light (Lion) lamp is lit.
 - Notice that the blue light is blinking slowly and the battery has started to charge.
 - Push and release the mode button again until the blue light is solid.

- **Water tank (if equipped)**

- The water tank can hold 11-22 gallons of water (depending on your model).
- Do not run the electric pump when the tank is dry.
- **How to prime the pump when it has gone completely dry:**

Turn on the water pump using the switch on the front of the trailer. Open the spigot. (if the battery is low keep on charge source while performing)

Use a garden hose to fill the tank.

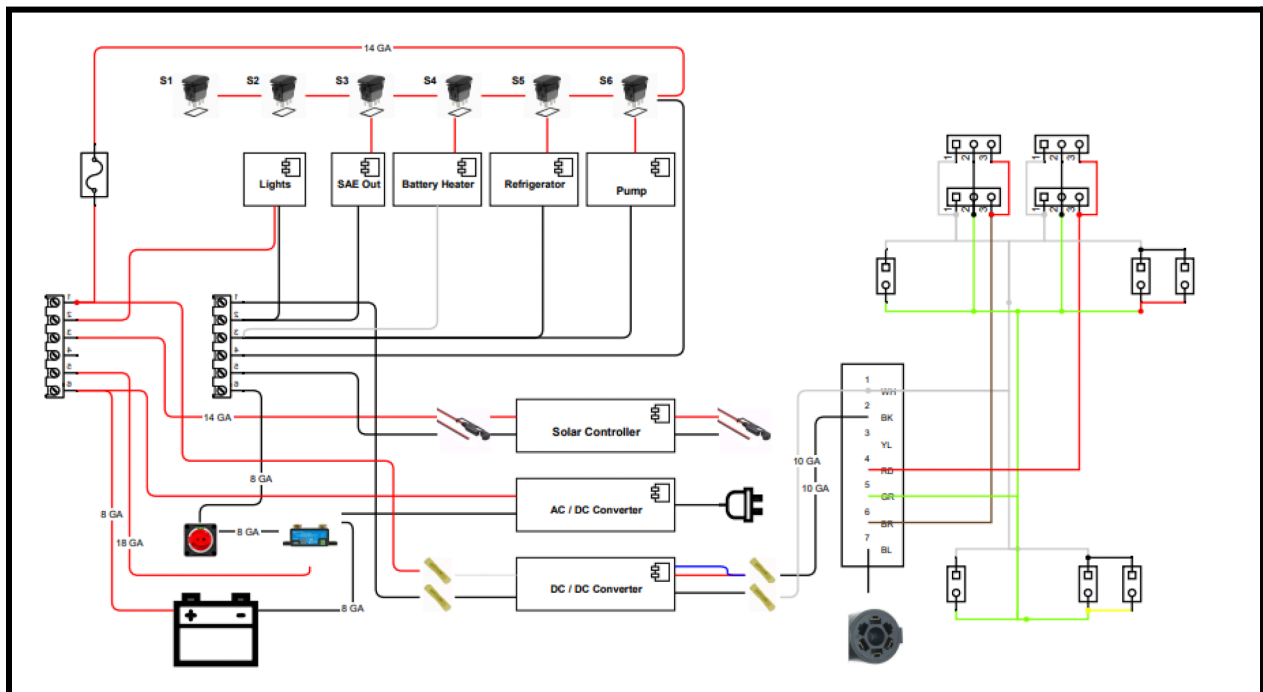
Once the tank is full, keep the hose running. The small vent hole should now be spitting out water.

With light force push the hose into the fill neck, and with your other hand place one finger over the vent hole to stop its flow of water.

This procedure will force water through the pump which will then prime it.

- **Awning (if equipped)**

- During windy or other weather conditions, use the legs on the awning, and stake tiedown cords from the awning into the ground for additional support. Use judgment to prevent damage to your awning if the weather becomes too harsh.
- **Interior and Exterior Lighting (if equipped)**
 - Located inside the back tailgate on the left hand side of the trailer are two control switches for the interior and exterior lights respectively. Dim and toggle your lights from this control. Note that your master power switch knob may need to be turned on for this feature to operate.
- **Electrical Circuitry (if equipped)**
 - Below is a schematic for your trailer's wiring.



5. Common Hazards

5.1 Jackknifing



NOTICE - Be careful not to allow the trailer to turn too much while steering, because it will hit the rear of the tow vehicle. This error is commonly called '**jackknifing**'. Straighten out by pulling forward, or turning in the opposite direction. Avoid tight spaces where **jackknifing** is prone to happen.

5.2 Loss of Control



Warning - Loss of control of the trailer or trailer/tow vehicle combination can result in death or serious injury. Common causes include:

Improper Sizing of the Trailer to the Tow Vehicle

- Trailers that are too heavy for the towing vehicle can cause stability problems and serious tow vehicle maintenance issues. Never exceed the **maximum towing capacity** of your tow vehicle, as specified in the Owner's Manual.

Driving Too Fast

- The maximum recommended speed for safely towing a trailer is 55 mph. Driving too fast increases the likelihood of trailer sway and tire blowouts.

Failure to Adjust Driving Behavior

- Towing a trailer affects acceleration, stopping distance, and turning radius. The handling of your vehicle will be more sensitive to steering inputs and affected by wind and passing vehicles. Keep these tips in mind:
 - Be alert for slippery conditions.
 - Anticipate trailer sway and respond by easing off the accelerator and making small steering adjustments.
 - Use lower gears on steep or long grades to avoid overheating brakes.
 - Be aware of your trailer's height, especially under bridges and trees.

Improper Loading

- Do not exceed the trailer's Gross Vehicle Weight Rating (GVWR) or the Gross Axle Weight Rating (GAWR). Distribute the load evenly to prevent instability.

Trailer Not Properly Coupled to the Hitch

- Ensure the trailer is securely coupled to the hitch, and safety chains are correctly attached.

Improper Use of Safety Chains

- Safety chains should be fastened to the frame of the tow vehicle or a dedicated chain loop that many vehicles have near the hitch area. When using hooks on the end of your chains, be sure to approach the vehicle from underneath it, so that the opening of the hooks face upward and towards the trailer. Cross the chains underneath the hitch and coupler so the chains hold up the tongue if the trailer comes loose. Have minimal slack to allow turning.

Worn Tires, Loose Wheels, and Lug Nuts

- Inspect trailer tires before each tow and ensure proper tire pressure as indicated on the Certification (VIN) label. Tighten lug nuts to the specified torque.

Weight and Load Distribution

- Distribute the load front to rear to provide proper tongue weight and evenly left to right to avoid tire overload. Keep the center of gravity low.

Shifting Cargo

- Secure your cargo to prevent shifting during transit.

Inappropriate Cargo

- Use the trailer only for intended cargo. Do not transport people, hazardous substances, or flammable materials.

Inoperable Lights or Mirrors

- Check that all trailer lights are functioning before towing. Use mirrors that provide adequate visibility for safe driving.

6. Maintenance



Warning - You must inspect, maintain, and service your trailer regularly to ensure safe and reliable operation. If you cannot or are unsure how to perform the items listed here, contact your dealer. Failing to Maintain your ADDAX Overland Trailer could result in injury or death.

6.1 Jacking for Maintenance

To perform many of the inspection and maintenance activities, you must jack up the trailer. Four Jacks come pre-installed on the ADDAX Overland Trailer, however, situations may arise where you opt to use an external Jack to lift your trailer. This may be because of weight or height constraints.

When jacking with external jacks, place them so as to clear suspension parts, cables, and non-structural supports (springs, torsion bars, thin flooring, etc.). Place jacks and jack stands under the outer frame rail to which the axles are attached.

6.2 Washing

Wash the trailer as needed with a power washer and a detergent solution. Note that some water intrusion is normal.

6.3 Inspecting Frame Members and Fasteners

Regularly inspect all fasteners and structural frame members for bending and other damage, cracks, or failure. Repair or replace any damaged fastener and repair the frame member. If you have any questions about the condition or method of repair of fasteners or frame members, get the recommendation of, or have the repair done by your dealer.

6.4 Inspecting Welds

All welds can crack or fail when subjected to heavy loads or movement of cargo that was not properly secured. Any time that you know or suspect that the trailer has been subjected to heavy loads or movement of cargo, immediately inspect the welds and fasteners for damage. To prevent severe damage to your trailer, inspect all of the welds for cracks or failure at least once a year. If a weld failure is detected, contact your dealer.

6.5 Maintaining the Hitch and Coupler

Each year or every 500 miles (whatever comes first) coat the moving components of the Hitch and Coupler with a thin layer of automotive bearing grease to reduce wear and ensure proper operation.

See the coupler manufacturer's manual for other inspection and maintenance procedures. All bent or broken coupler parts must be replaced before towing the trailer.

6.6 Maintaining the Jacks

If a grease fitting is present, use a grease gun to lubricate the jack mechanism. Grease the gears in the top of hand-cranked jacks once a year, by removing the top of the jack and pumping or hand packing grease into the gears. Use a quality hydraulic grease that is lithium-based.

6.7 Maintaining Lights and signals

Before each tow, check all trailer lights for proper operation. If any electrical connection issues arise, contact your dealer.

6.8 Maintaining Wheel Rims

If the trailer has been struck, or impacted, on or near the wheels, or if the trailer has struck a curb, inspect the rims for damage. Replace any damaged wheel. Inspect the wheels for damage every year, even if no obvious impact has occurred.

6.9 Maintaining Wheel Bearings

Service axle bearings once yearly or every 6k miles (whichever comes first).

To check your bearings, jack up the trailer and secure it on adequate capacity jack stands. Check wheels for side-to-side looseness. If the wheels are loose, or spin with a wobble, the bearings must be serviced or replaced.

6.10 Maintaining Lug nuts or bolts

Lug nuts or bolts are prone to loosen right after a wheel is mounted to a hub. When driving on a remounted wheel, check to see if the lug nuts or bolts are tight after the first 10, 25, and 50 miles of driving, and before each tow thereafter.

Tighten the lug nuts or bolts in three stages to the final torque for the axle size on your trailer, to prevent wheels from coming loose. Tighten each lug nut or bolt in the order shown in the following figure. Use a calibrated torque wrench to tighten the fasteners. Verify that wheel studs are free of contaminants such as paint or grease, which may result in inaccurate torque readings. Over-tightening will result in breaking the studs or permanently deforming the mounting stud holes in the wheels and will void the axle warranty.

Tighten nuts or bolts to:

100 ft-lbs

6.11 Maintaining Tires

Before each tow, check the tire pressure to make sure it is at the level indicated on the tire sidewall or VIN label. Tires can lose air over time. Tire pressure must be checked while the tire is cold. Do not check tire pressure immediately after towing the trailer. Allow at least three hours for the tires to cool, if the trailer has been towed for as much as one mile.

Replace the tire before towing the trailer if the tire treads have less than 1/16 inch depth or the telltale bands are visible.

A bubble, cut or bulge in a side-wall can result in a tire blowout. Inspect both side-walls of each tire for any bubble, cut or bulge; and replace a damaged tire before towing the trailer.

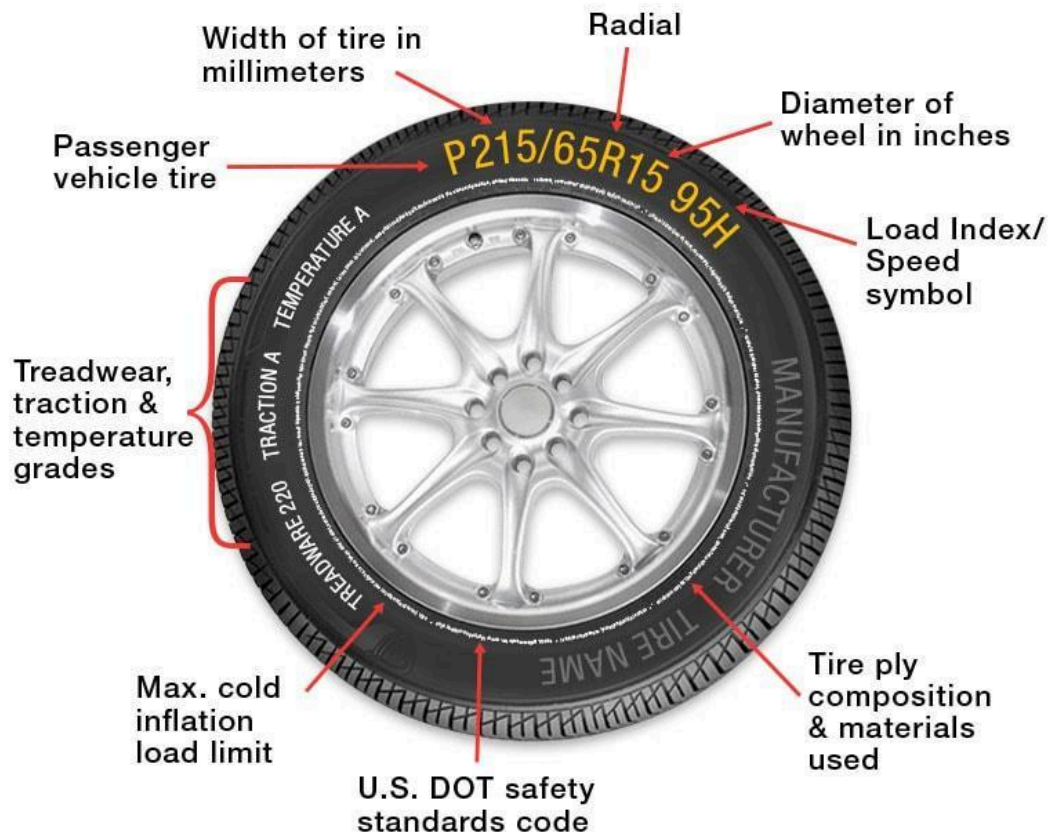
If you are storing your trailer for an extended period, make sure the tires are inflated to the maximum rated pressure indicated on the sidewall or VIN label and that you store them in a cool, dry place such as a garage. Use tire covers to protect the tires from the effects of the sun.

7. Tire Safety Information

In accordance with 49 CFR 575.6, information about the trailer's tire and safety procedure is provided below:

7.1 Tire labeling

Federal law requires tire manufacturers to label standardized information on the sidewall of all tires. This information identifies and describes the fundamental characteristics of the tire and also provides a tire identification number for safety standard certification and in case of a recall.



- **Tire Type**
 - The letter "P" at the beginning of the "Tire Size" tells us the tire is a P-Metric tire, referring to tires made to certain standards within the United States, intended for Passenger vehicles.
- **Speed Rating**
 - Tells you the maximum speed capability of a tire. Often speed ratings are matched to the top speed capability of the vehicle. For example, a tire with an H-speed rating has a maximum speed capability of 130 mph or 210 km/h. Do not exceeding legally posted speed limits

- **Tire Width**
 - Is the width of the tire measured in millimeters from sidewall to sidewall. The first three-digit number in the tire size refers to the tire width. For instance, in a size P215/65 R15 tire, the width is 215 millimeters.
- **DOT Symbol**
 - The letters "DOT" on the sidewall indicate that the tire complies with all applicable Federal Motor Vehicle Safety Standards in the United States.
- **Aspect Ratio**
 - Is the ratio of the height of the tire's cross-section to its width. The two-digit number after the slash mark in a tire size is the aspect ratio. For example, in a size P215/65 R15 tire, the 65 means that the height is equal to 65% of the tire's width. The bigger the aspect ratio, the bigger the tire's sidewall will be.
- **Tire Identification Number**
 - The series of letters and numbers following the letters "DOT." The TIN consists of up to 12 numbers and letters to identify the factory location and the week and year the tire was manufactured. The DOT and TIN markings are on the sidewall of your tire.
- **Construction**
 - The letter "R" in a tire size stands for Radial, which means the layers run radially across the tire.
- **Treadwear, traction and temperature grades**
 - Provides information about the tire treadwear, traction and temperature capabilities.
- **Wheel diameter**
 - Is the size of the wheel measured from one end to the other. It tells us the size of the wheel that the tire is intended to fit. A size P215/65 R15 tire is made for a wheel with a 15" diameter.
- **Tire ply composition and materials used**
 - The number of plies indicates the number of layers of rubber-coated fabric in the tire. In general, the greater the number of plies, the more weight a tire can support. Tire manufacturers also must indicate the materials in the tire, which include steel, nylon, polyester, and others.
- **Load index**
 - Indicates the maximum load that the tire can support when properly inflated. You'll also find the maximum load on the tire sidewall, in both pounds and kilograms.
- **Maximum cold inflation load limit**
 - This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions.

7.2 Tire care



Properly maintained tires improve the steering, stopping, traction, and load-carrying capability of your vehicle and trailer. To avoid flat tires and other types of tire failure, you should maintain proper tire pressure, observe tire and vehicle load limits, avoid road hazards, and regularly inspect your tires.

Notice - It is important to check your vehicle and trailer's tire pressure at least once a month for the following reasons:

- Many tires naturally lose air over time.
- Tires lose air suddenly if you drive over a pothole or other object or strike the curb when parking.
- With radial tires, it is usually not possible to determine under inflation by visual inspection.

For convenience, purchase a tire pressure gauge to keep in your vehicle. Gauges can be purchased at tire dealerships, auto supply stores, and other retail outlets.

The recommended tire inflation pressure that vehicle manufacturers provide reflects the proper psi when a tire is cold. A cold tire is one that has not been driven on for at least three hours. When you drive, your tires get warmer, causing the air pressure within them to increase. To get an accurate tire pressure reading, you must measure tire pressure when the tires are cold.

7.3 Recommended tire inflation pressure

Your trailer is equipped with a tire label including the recommended cold tire inflation pressure, as the one below. It is located at the ride side of your trailer, by the wheel.

TIRE AND LOADING INFORMATION				
SEATING CAPACITY		TOTAL	FRONT	REAR
The combined weight of occupants and cargo should never exceed				Kg or Lbs.
TIRE	SIZE	COLD TIRE PRESSURE		SEE OWNER'S MANUAL FOR ADDITIONAL INFORMATION FD-327
FRONT				
REAR				
SPARE				

Underinflated tires



WARNING - Driving on tires that are underinflated is very dangerous, being one of the leading causes of tire failure. When tire pressure is low, its surface area touching the road increases. The increased footprint will increase friction, which can cause overheating, premature wear, tread separation, and, eventually, a blowout. Depending on the severity of the blowout, you could lose control of the vehicle, putting you and other drivers in harm's way.

Overinflated tires



CAUTION - In overinflated tires, the sidewalls and tread become harder than normal, and the tire's surface area touching the road decreases. This change in footprint can reduce traction and performance, giving you a bouncy ride and affecting the handling of the car. Over-inflation will also cause uneven wear, thereby decreasing the life of your tires.

Measuring and adjusting air pressure

Use a tire pressure gauge to determine if your tires are within an acceptable pressure range. If it is low, add air, and if it is high, release air. Most common tires have a valve stem with a Schrader valve. Putting pressure upon the central stem within the valve will allow air to escape.

7.4 Terminology

Accessory Weight: The combined weight (in excess of those standard items which may be replaced) of an automatic transmission, power steering, power brakes, power windows, power seats, radio, and heater, to the extent that these items are available as factory-installed equipment (whether installed or not).

Bead: Part of the tire that is made of steel wires, wrapped or reinforced by ply cords and shaped to fit the rim.

Bead Separation: This is the breakdown of the bond between components in the bead.

Bias Ply Tire: A pneumatic tire in which the ply cords that extend to the beads are laid at alternate angles substantially less than 90 degrees to the centerline of the tread.

Carcass: The tire structure, except tread and sidewall rubber which, when inflated, bears the load.

Chunking: The breaking away of pieces of the tread or sidewall.

Cold Inflation Pressure: The pressure in the tire before you drive.

Cord: The strands forming a ply in the tire.

Cord Separation: The parting of cords from adjacent rubber compounds.

Cracking: Any parting within the tread, sidewall, or inner liner of the tire extending to cord material.

CT: A pneumatic tire with an inverted flange tire and rim system in which the rim is designed with rim flanges pointed radially inward and the tire is designed to fit on the underside of the rim in a manner

that encloses the rim flanges inside the air cavity of the tire.

Curb Weight: The weight of a motor vehicle with standard equipment including the maximum capacity of fuel, oil, and coolant, air conditioning and additional engine components.

Extra Load Tire: A tire designed to operate at higher loads and at higher inflation pressures than the corresponding standard tire.

Groove: The space between two adjacent tread ribs.

Gross Axle Weight Rating: The maximum weight that any axle can support, as published on the Certification/VIN label on the front left side of the trailer. Actual weight determined by weighing each axle on a public scale, with the trailer attached to the towing vehicle.

Gross Vehicle Weight Rating: The maximum weight of the fully loaded trailer, as published on the Certification/VIN label. Actual weight determined by weighing trailers on a public scale, without being attached to the towing vehicle.

Innerliner: Layer(s) forming inside surface of a tubeless tire that contains the inflating medium within the tire.

Inner Liner Separation: The parting of the inner liner from cord material in the carcass.

Intended Outboard Sidewall: The sidewall that contains a white-wall, bears white lettering or bears manufacturer, brand, and/or model name molding that is higher or deeper than the same molding on the other sidewall of the tire or the outward

facing sidewall of an asymmetrical tire that has a particular side that must always face outward when mounted on a vehicle.

Light Truck (LT) Tire: A tire designated by its manufacturer as primarily intended for use on lightweight trucks or multipurpose passenger vehicles. May be used on trailers.

Load Rating: The maximum load that a tire is rated to carry for a given inflation pressure.

Maximum Load Rating: The load rating for a tire at the maximum permissible inflation pressure for that tire.

Maximum Permissible Inflation

Pressure: Maximum cold inflation pressure to which a tire may be inflated.

Maximum Loaded Vehicle Weight:

The sum of curb weight, accessory weight, vehicle capacity weight, and production options weight.

Measuring Rim: The rim on which a tire is fitted for physical dimension requirements.

Occupant Distribution: The distribution of occupants in a vehicle as specified in the third column of Table I of 49 CFR 571.110.

Open Splice: Any parting at any junction of tread, sidewall, or inner liner that extends to cord material.

Outer Diameter: The overall diameter of an inflated new tire.

Overall Width: The linear distance between the exteriors of the sidewalls of an inflated tire, including elevations due to labeling, decorations, or protective bands or ribs.

Ply: A layer of rubber-coated parallel cords. (plies, plural)

Ply Separation: A parting of rubber compound between adjacent plies.

Pneumatic Tire: A mechanical device made of rubber, chemicals, fabric and steel or other materials that, when mounted on

an automotive wheel provides traction and contains gas/fluid that sustains the load.

Production Options Weight: The combined weight of those installed regular production options weighing over 2.3 kilograms (5 lbs.) in excess of those standard items which they replace, not previously considered in curb weight or accessory weight, including heavy duty brakes, ride levelers, roof rack, heavy duty battery, and special trim.

Radial Ply Tire: A pneumatic tire in which the ply cords that extend to the beads are laid 90 degrees to the centerline of the tread.

Recommended Inflation Pressure:

This is the inflation pressure provided by the vehicle manufacturer on the Tire Information label and on the Certification/VIN tag.

Reinforced Tire: A tire designed to operate at higher loads and at higher inflation pressures than the corresponding standard tire.

Rim: A metal support for a tire or a tire and tube assembly upon which the tire beads are seated.

Rim Diameter: This means the nominal diameter of the bead seat.

Rim Size Designation: This means the rim diameter and width.

Rim Type Designation: This means the industry of manufacturer's designation for a rim by style or code.

Rim Width: This means the nominal distance between rim flanges.

Section Width: The linear distance between the exteriors of the sidewalls of an inflated tire, excluding elevations due to labeling, decoration, or protective bands.

Sidewall: That portion of a tire between the tread and bead.

Sidewall Separation: The parting of the rubber compound from the cord material in the sidewall.

Special Trailer (ST) Tire: The “ST” is an indication the tire is for trailer use only.

Test Rim: The rim which a tire is fitted for testing, may be any rim listed as appropriate for use with that tire.

Tongue weight: The downward force exerted on the hitch by the trailer coupler.

Tread: That portion of a tire that comes into contact with the road.

Tread Rib: A tread section running circumferentially around a tire.

Tread Separation: Pulling away of the tread from the tire carcass.

Treadwear Indicators (TWI): The projections within the principal grooves designed to give a visual indication of the degrees of wear of the tread.

Vehicle Capacity Weight: The rated cargo and luggage load plus 68 kilograms (150 lbs.) times the vehicle's designated seating capacity.

Vehicle Maximum Load On The

Tire: The load on an individual tire that is

determined by distributing to each axle its share of the maximum loaded vehicle weight and dividing by two.

Vehicle Normal Load On The Tire:

The load on an individual tire that is determined by distributing to each axle its share of the curb weight, accessory weight, and normal occupant weight (distributed in accordance with Table I of CRF 49 571.110) and dividing by 2.

Weather Side: The surface area of the rim not covered by the inflated tire.

Wheel Center Member: In the case of a non-pneumatic tire assembly incorporating a wheel, a mechanical device which attaches, either integrally or separably, to the non-pneumatic rim and provides the connection between the non pneumatic rim and the vehicle; or, in the case of a non-pneumatic tire assembly not incorporating a wheel, a mechanical device which attaches, either integrally or separably, to the non- pneumatic tire and provides the connection between tire and the vehicle.

Wheel-Holding Fixture: The fixture used to hold the wheel and tire assembly securely during testing

8. Vehicle Load Limits

Determining the load limit of a trailer includes more than understanding the load limit of the tires alone. On all trailers there is a Federal Certification/VIN label that is located on the forward half of the left (road) side of the unit. This Certification/VIN label will indicate the trailer's Gross Vehicle Weight Rating (GVWR). This is the most weight the fully loaded trailer can weigh. It will also provide the Gross Axle Weight Rating (GAWR). This is the most a particular axle can carry. If there are multiple axles, the GAWR of each axle will be provided.



Warning - Towing a trailer that exceeds its Gross Vehicle Weight Rating (GVWR) is likely to cause a loss of control, damage to the trailer, injury, or death.

8.1 Determining Your Trailer's Correct Load Limit

There is a placard located inside the front door of the ADDAX Overland Trailer. This placard provides tire and loading information. In addition, this placard will show a statement regarding maximum cargo capacity. Locate the statement, "The weight of cargo should never exceed XXX kg or XXX lbs.," on your vehicle's placard.

This figure equals the available amount of cargo and luggage load capacity.

Cargo can be added to the trailer, up to the maximum weight specified on the placard. The combined weight of the cargo is provided as a single number. In any case, remember: the total weight of a fully loaded trailer cannot exceed the stated GVWR. The Empty Weight of the trailer plus the maximum cargo weight is the Gross Vehicle Weight Rating (GVWR).

The best way to know the actual weight of the vehicle is to weigh it at a public scale. Talk to your dealer to discuss weighing methods needed to capture the various weights related to the trailer. This would include the weight empty or unloaded, weights per axle, wheel, hitch or king-pin, and total weight.

8.2 Distributing Weight in Your Trailer

When loading your cargo, be sure it is distributed evenly to prevent overloading front to back and side to side. Heavy items should be placed low and as close to the axle positions as reasonable. Too many items on one side may overload a tire. Towing stability also depends on keeping the center of gravity as low as possible. Load heavy items on the floor and over the axles. Always inspect your trailer for issues such as cracks before loading.



WARNING - Shifting cargo can result in the loss of control of the trailer, and can lead to death or serious injury. Tie down all loads with proper sized fasteners, chains, straps, etc.

The load distribution must be such that no component part of the trailer is loaded beyond its rating. You must consider the rating of the trailer body, tires, wheels and axle.



WARNING - Excessive loads, unbalanced loads, or under inflation cause tire overloading. As a result, abnormal tire flexing occurs. This situation can generate an excessive amount of heat within the tire. Excessive heat may lead to tire failure which can result in injury or death.

It is the air pressure that enables a tire to support the load so proper inflation is critical. See section 5.3.

8.3 Determining Your Tow Vehicle's Correct Load Limit

Locate the statement, "The combined weight of cargo should never exceed XXX lbs.," located on the front inside door panel.

9. Hitch and coupling setup



WARNING - Failure to comply with the following instructions on coupling your trailer to your tow vehicle can cause an accident that could lead to death or serious injury. Please ensure your tow vehicle, hitch, and trailer are within compliance of all posted ratings.

With the purchase of your trailer you have been provided with the removable trailer tongue, and the trailer side of a three axis CU Offroad coupling. You will need to provide the tow vehicle 'stinger' to attach the saddle of the CU Offroad hitch. This stinger holds the trailer at the correct height for your vehicle and can support the correct weight rating. More information can be found at <https://www.cuoffroad.com>.



WARNING - If the vehicle and hitch are not properly selected and matched to the Gross Vehicle Weight Rating (GVWR) of your trailer, you can cause an accident that could lead to death or serious injury.



CAUTION - If the vehicle and hitch are not properly selected to hold your loaded trailer level with the ground when towing, you risk damaging your trailer and tow vehicle. This will impact your clearance, and potentially result in injury. See 7.5 for more details.

Ask the dealer of your tow vehicle for advice on how to outfit the tow vehicle to obtain a correct towing height.

Vehicle manufacturers will provide you with the maximum towing capacities of their various models, as well as the GCWR. No amount of aftermarket reinforcement will increase a vehicle's horsepower or towing capacity.

9.1 Coupling Component Definitions

The following parts are involved in making a secure coupling between the trailer and tow vehicle:

- **Coupling:** The trailer's connecting mechanism by which the connection is actually made to the trailer. This is the trailer side of the CU Offroad hitch component that has been provided for you.
- **Coupler pin:** The large inch thick pin that runs through the end of the trailer's coupler, and also through the hitch when engaged.
- **Safety pin:** The small cotter pin that runs through the Coupler pin to prevent it from falling out when engaged.
- **Hitch:** The connecting mechanism that is attached to the towing vehicle, including bumpers intended to serve as hitches. This includes the vehicle stinger of the CU Offroad hitch that you will need to provide to match your vehicle's specifications. The stinger will support the saddle where the coupling takes place.
- **Safety chains:** Chains permanently attached to the trailer such that if the coupler connection comes loose, the safety chains can keep the trailer attached to the tow vehicle. With properly rigged safety chains, it is possible to keep the tongue of the trailer from digging into the road

pavement, even if the coupler-to-hitch connection comes apart. This is why chains must be crossed when engaged.

- Trailer electrical connector: A device that connects electrical power from the tow vehicle to the trailer.
- Jack: A device on the trailer that is used to raise, lower and level the trailer before or after coupling.

9.2 Coupling your trailer to the tow vehicle



WARNING - A secure coupling (or fastening) of the trailer to the tow vehicle is essential. A loss of coupling may result in death or serious injury. Therefore, you must understand and follow all of the instructions for coupling.



An image of a properly connected CU Offroad Hitch/coupling (trailer on right side)

Before you hitch your trailer:

- Ensure the tow vehicle side of the hitch is securely fastened to the tow vehicle.
- Wipe the inside and outside of the trailer side coupler clean and inspect it visually for cracks and deformations.
- Be sure the coupler is tight to the tongue of the trailer.
- Use the two front jacks affixed to the corners of the trailer to raise the bottom surface of the end of the coupler to be above the top of the hitch saddle.
- Lubricate the tow vehicle side of the hitch with a thin layer of automotive bearing grease.
- Lubricate the trailer side of the coupling with a thin layer of automotive bearing grease.

Steps to engage the hitch:

- Remove the safety pin from the coupler pin. Then remove the coupler pin from the coupling.
- Slowly back up the tow vehicle so that the coupling is near or aligned over the saddle.
- Lower the jacks so the coupler and hitch engage.
- Slide the coupler pin into the assembly, and then slide the safety pin into the coupler pin to secure its position.
- Be sure the coupler pin is all the way in the hitch and the safety clip is engaged. If the pin cannot be secured to the hitch, do not tow the trailer. Contact your dealer.
- Lower the trailer so that its entire tongue weight is held by the hitch, and continue retracting the jack to its fully retracted position.
- Connect safety chains
 - Visually inspect the safety chains and hooks for wear or damage. Replace worn or damaged safety chains and hooks before towing.
 - Safety chains must crisscross under the coupler so that if the trailer uncouples, the safety chains can hold the tongue up above the road.
 - Hook the chains to the loops provided in the hitch system of the tow vehicle. Do not attach them to an interchangeable part of the hitch assembly. Hook the chains from underneath, with the hook opening facing upwards and towards the trailer.
 - If the tow vehicle does not provide loops to hook the chains to, loop the chains around a frame member of the tow vehicle, attaching the hooks to their own chains such that the hook opening is facing upwards and towards the trailer.
 - Provide enough slack in chains to permit tight turns, but not be close to the road surface to drag.
- Connect the trailer lights to the tow vehicle's electrical system using trailer electrical cable.
- Check all trailer lights for proper operation. Repair or replace non-working lights/electrical connections before towing.



WARNING - Improper electrical connection between the tow vehicle and the trailer will result in inoperable lights, and can lead to collision. Before each tow, check that all lights and turn signals work.

The ADDAX Overland Trailer is set up to charge the battery from the tow vehicle. If the electrical system on your tow vehicle does not provide power to the battery, you must periodically charge the battery via a shore / solar power connector to keep the battery charged.



NOTICE - Some tow vehicles will continue to provide power to trailers via electrical and light connections after the engine is shut off. To prevent draining of your tow vehicle's battery, unplug your trailer when not towing.

9.3 Uncoupling your trailer from the tow vehicle

Steps to disengage the hitch:

- Park the trailer on a firm level surface and block the trailer tires.
- Disconnect the electrical connector.

- Disconnect safety chains from the tow vehicle.
- Make certain the ground surface below the jack pads will support the load of the trailer.
- Rotate the jack handle to extend the jack and transfer the weight of the trailer tongue to the jack.
- Once the weight of the trailer has been removed from the hitch, remove the cotter pin from the coupler pin, and remove the coupler pin from the hitch, disengaging the connection between the trailer and the tow vehicle.
- Raise the trailer coupler above the tow vehicle hitch.
- Drive the tow vehicle forward.

9.4 Achieving a Safe Tongue Weight



WARNING - Improper tongue weight can cause a loss of control of the trailer leading to serious injury or death. Always be sure to distribute the weight of the trailer to achieve the correct tongue weight.

It is critical to have a portion of the trailer load carried by the tow vehicle. That is, the trailer tongue must exert a downward force on the hitch. This is necessary for two reasons. First, the proper amount of tongue weight is necessary for the tow vehicle to be able to maintain control of the tow vehicle/trailer system. If, for example, the tongue exerts an upward pull on the hitch, instead of pushing down on it (because the trailer is overloaded behind its axle(s)), the rear wheel of the tow vehicle can lose traction or grip and cause loss of control. Also, even if there is some weight on the tongue, but not enough weight on the tongue, the trailer can become unstable at high speeds. Remember, the faster you go the more likely the trailer is to sway.

If there is too much tongue weight, the tow vehicle is prone to jack-knife. The front wheels of the tow vehicle can be too lightly loaded and cause loss of steering control and traction, if the front wheels are driving. In addition to tow vehicle control, tongue weight is necessary to insure that the trailer axle(s) do not exceed their Gross Axle Weight Rating (GAWR).

For the ADDAX Overland Trailer, the safe amount of tongue weight is:

15% - 20%

of the total weight including cargo.

To check the tongue weight, the tow vehicle and trailer must be on level ground, as they will be when the trailer is being towed.

Take the trailer to a truck stop or grain elevator where there is a “certified” scale. Place the tow vehicle only onto the scale and get the weight. This weight must be less than your tow vehicle’s GVWR.

Pull the trailer onto the scale and uncouple it from the tow vehicle, leaving just the trailer on the scale. Get a ticket, which lists the total trailer weight. Reconnect the trailer to your tow vehicle and then drive the tow vehicle wheels off the scale, just leaving the trailer axles on the scale. Get a “ticket”, which lists the trailer’s axle weight. Simply subtract the axle weight from the total weight to determine the tongue weight.

While you are at the scale, you should weigh the entire combination vehicle. This result should be less than the Gross Combined Weight Rating (GCWR) for your towing vehicle. Some scales allow you to get individual axle weights also. If this is possible, get the tow vehicles front and rear axle weights to make sure they are in the same proportion as the tow vehicle alone, and that the rear axle is not overloaded.

9.5 Adjusting The Hitch Height (If Equipped)



Warning - If the hitch does not hold your loaded trailer level with the ground when towing, you risk damaging your trailer and tow vehicle. This will impact your clearance, and potentially result in injury. See 7.5 for more details.

Many tow vehicle couplers provide hardware to adjust the height of your coupler. If yours does not, ensure you purchase a coupler that holds your trailer at the correct height.

If the trailer is not equipped with an adjustable hitch, an offset mount may be available from your hitch manufacturer.

The height of the hitch on the trailer must be adjusted so that the trailer, when loaded to rated capacity, is level while connected to the tow vehicle. Your dealer or a trailer service center can perform this adjustment, or you can use the following steps to adjust the hitch height yourself.

- Connect the trailer to the tow vehicle and load the trailer to rated capacity. See Loading And Unloading.
- Park the tow vehicle and trailer on a firm level surface.
- Stand away from the trailer and visually verify if the trailer is level front-to-rear. If the front of the trailer is higher than the rear, the hitch must be raised. If the front of the trailer is lower than the rear, the hitch must be lowered.
- Uncouple the trailer from the tow vehicle. See 7.2 and 7.3.
- Raise or lower the hitch as necessary.

10. Reporting Safety Defects / Issues

If you believe that your trailer has a defect that could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying: ADDAX Overland LLC c/o SKC Law Firm, 311 State Street, Ste. 250, Salt Lake City, UT 84111, steve@skclawfirm.com, 801.716.7016.

If NHTSA receives complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you and your dealer or ADDAX Overland LLC.

To contact NHTSA, you may call the Vehicle Safety Hotline toll-free at 1-888-327-4236 (TTY: 1-800-424-9153); or go to <http://www.safercar.gov>; or write to: Administrator, NHTSA 1200 New Jersey SE Washington, DC 20590. You can also obtain other information about motor vehicle safety from <http://www.safercar.gov>.

11. External Documentation

The ADDAX Overland Trailer comes with many components (If Equipped) from specialised vendors. The following pages will contain information these vendors provided on their components. If you have any questions, please contact your dealer.

We can't wait to hear about your adventures!

11.1 CU Offroad MAX Coupler



To set up your Max Coupler, choose a ball mount like our MC212, with a 1" mounting hole. A mount that allows the proper alignment between your tow vehicle and trailer combination. If you have already done this with a standard ball, then this part is done since our coupler was designed to directly replace it.

The tow vehicle side, or Yoke Assembly, has been pre-assembled to ease final installation. Remove the hex nut, flat and lock washer on the bottom and drop it onto the ball mount. Replace them and tighten the hex nut until the lock washer is compressed. This will require a 1-1/2" wrench or socket and a 3/4" hex drive socket. We have 3/4" slugs that fit into a standard 3/4" socket available.

You will need to fill the coupler body with automotive grease before using. Find something to set the trailer side assembly onto to support the grease seal inside the rear end. Pump about 8-10 pumps of grease into the body, or until it is just oozing out uncontrollably. If you encounter water crossings or inclement weather on your adventure, we recommend removing the coupler body from the trailer, remove the grease seal from the open end, and stand the coupler on its end to allow any water to drain out. Replace grease as needed.

When towing a trailer, use caution when backing up! Be aware of jack-knifing the trailer and the damage it can cause. When you are finished off road, do a safety check of your vehicle and trailer before you hit the highway. Better safe than sorry! Always obey the posted speed limits.

The Max Coupler is covered for 2 years from the date of purchase for all defects.

Thank you for your purchase! Thank you for keeping America working!

Please support our troops! We do!

Any questions, email us at info@cuoffroad.com

11.2 EXPION Battery



USER MANUAL

EX-G24-60C

EX-G24-80C

EX-G24-95XDP

EX-G27-100C

EX-G27-120XDP

PLEASE KEEP THIS MANUAL FOR FUTURE REFERENCE

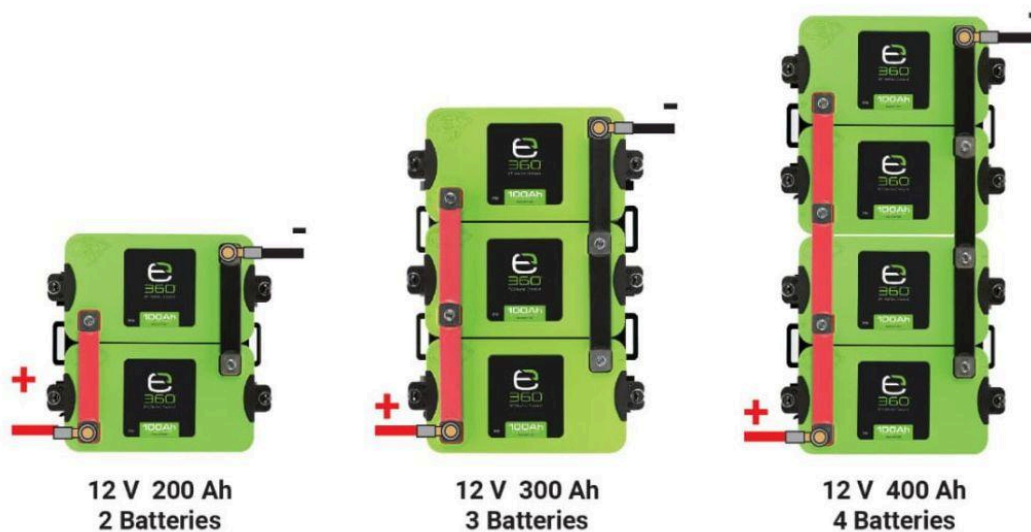
PLEASE READ EACH WARNING CAREFULLY TO PREVENT DAMAGE AND EXTEND BATTERY LIFE

WARNINGS:

- ⚠ DO NOT DROP THE BATTERY**
- ⚠ DO NOT OPEN THE BATTERY**
- ⚠ DO NOT SHORT-CIRCUIT THE BATTERY**
- ⚠ DO NOT SUBMERGE THE BATTERY IN WATER**
- ⚠ DO NOT USE THE BATTERY AS A STARTER BATTERY**
- ⚠ DO NOT USE BATTERIES OF DIFFERENT AGES AND CAPACITIES**
- ⚠ DO NOT CONNECT MORE THAN FOUR BATTERIES IN SERIES**
- ⚠ DO NOT CONNECT MORE THAN FOUR BATTERIES IN PARALLEL**
- ⚠ DO NOT ATTEMPT TO REPAIR THE BATTERY IF MALFUNCTIONING**
- ⚠ DO NOT CHARGE THE BATTERY ABOVE 14.6 VDC**
- ⚠ DO NOT CHARGE THE BATTERY AT OR BELOW 32°F OR 0°C**
- ⚠ DO NOT CHARGE THE BATTERY ABOVE ITS MAXIMUM CHARGE RATE**
- ⚠ DO NOT DISCHARGE THE BATTERY BELOW 10.5 VDC**
- ⚠ DO NOT DISCHARGE THE BATTERY AT OR BELOW -4°F OR -20°C**
- ⚠ DO NOT DISCHARGE THE BATTERY ABOVE ITS MAXIMUM DISCHARGE RATE**
- ⚠ DO NOT LEAVE THE BATTERY CONNECTED WHEN IN STORAGE**
- ⚠ DO NOT LEAVE THE BATTERY FULLY DISCHARGED LONGER THAN 1 WEEK**

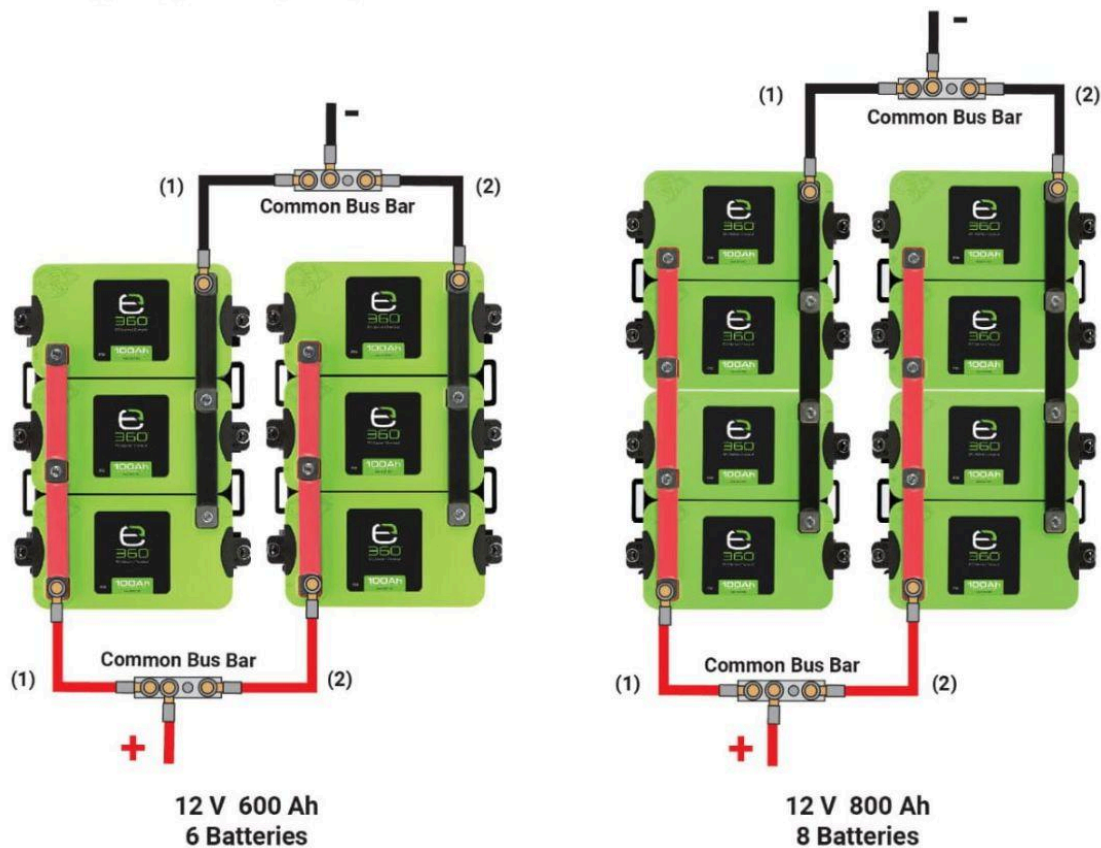
Battery Banks:

Parallel Connection Single String

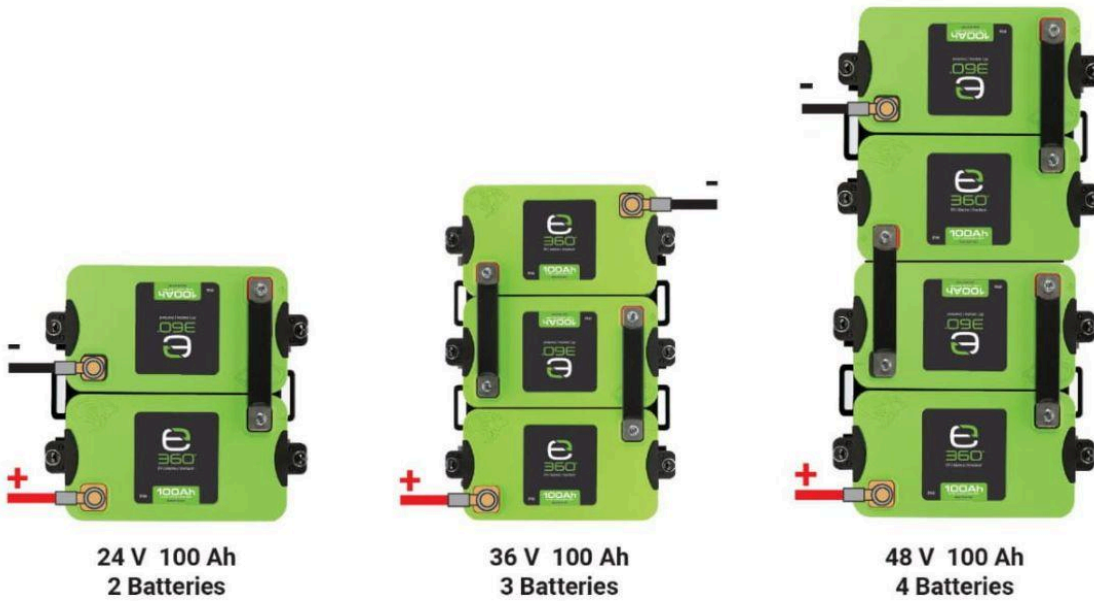


Parallel Connection Multi-string

* Cables (1) and (2) must be equal length to Common Bus Bar.

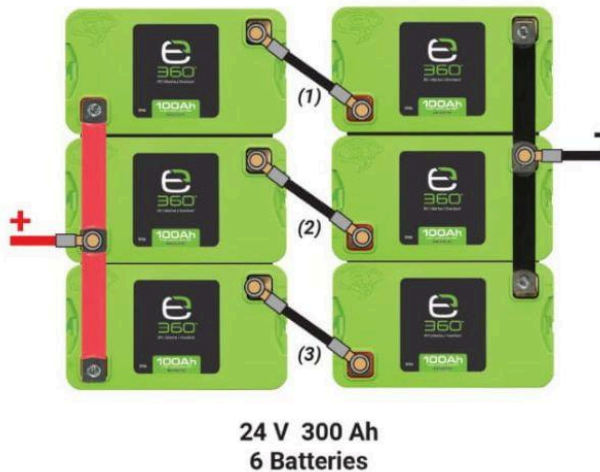


Series Connection Single String



Series Connection Multi-string

* Cables (1), (2), and (3) must be equal length on each string.



Please call technical support if your planned installation will be wired in a way not found in the provided wiring schematics.

2 Battery Management System (BMS)

See the [Battery Specifications](#) page for complete BMS protection settings.

Short Circuit Protection:

If a short circuit occurs, the BMS will disconnect to protect the battery. When the short circuit condition is corrected, the BMS will automatically reconnect. If the BMS does not reconnect, a charge is required to reset the BMS.

Overvoltage Protection:

If the charge voltage is higher than $14.6 \text{ Vdc} \pm 0.1 \text{ Vdc}$, the BMS will disconnect to protect the battery. When the battery voltage falls to $14.2 \text{ Vdc} \pm 0.2 \text{ Vdc}$, the BMS will automatically reconnect. If the BMS does not reconnect, a charge is required to reset the BMS. In some cases, it may take some time for the battery voltage to drop to 14.2 Vdc .

Undervoltage Protection:

If the battery reaches the minimum voltage of $9.5 \text{ Vdc} \pm 0.5 \text{ Vdc}$, the BMS will disconnect to protect the battery. *A charge is required within one week to prevent permanent damage and voiding the warranty of your battery.* When the battery voltage rises above $10.8 \text{ Vdc} \pm 0.4 \text{ Vdc}$, the BMS will reconnect. Some chargers will not charge if an open circuit is detected as the BMS has disconnected. We recommend using our DC-DC charger or AC-DC charger to avoid this open circuit problem and an Expion360 Battery Monitor to display voltage clearly.

Overcurrent Protection:

The BMS will monitor charge and discharge currents to protect the battery. If the charge or discharge current is too high, the BMS will disconnect to protect the battery. When a high current condition is corrected, the BMS will automatically reconnect. If the BMS does not reconnect, a charge is required to reset the BMS. See the specifications page for more details.

Thermal Protection:

If the temperature is too high or too low while charging or discharging the battery, the BMS will disconnect to protect the battery. When the temperature is within the acceptable range, the BMS will automatically reconnect.

Cell Balancing:

The BMS will monitor and prevent each of the four cell bricks from overcharging. If the individual cell brick voltages are outside the acceptable range, the BMS will automatically balance the cell bricks to bring them within range.

3 Battery Monitoring

The charge/discharge characteristic curve of a LiFePO_4 battery has a much more gradual slope than lead-acid batteries. Determining the battery's state-of-charge (SoC) based on the voltage readings is not the best practice for LiFePO_4 batteries. To accurately calculate the SoC of a LiFePO_4 battery bank, the Expion360 Battery Monitor is recommended. The battery monitor calculates the SoC based on measuring the current that passes through a finely tuned shunt resistor, rather than voltage, to give a more accurate reading of the battery bank.

The Expion360 Battery Monitor is easy to program, simple to install, and is compatible with all other brands and battery chemistries. It shows the remaining capacity (Ah), SoC (%), battery bank voltage (V), charge/discharge current (A), and charge/discharge power (W). The battery monitor also shows the remaining discharge time until empty and the remaining charge time until full. Include this useful accessory for peace of mind, and to see your battery metrics at any time without manually probing your batteries.

Note that the voltage displayed on the Battery Monitor will read higher or lower than the actual value if the battery has been charged or discharged within an hour of measurement. Precision will increase with time until 12 hours have passed, after which the measured voltage will not change. This is not a design flaw, but an inherent characteristic of all batteries as they are charged and discharged. A greater difference in voltage will be measured when the battery is disconnected from high current sources/loads than low current sources/loads.

4 Charge

The optimal and maximum charge rates of a battery bank are equal to the rates of a single battery multiplied by the number of batteries connected in parallel. To prolong the useful life of your batteries, the optimal charge rate (0.2C) is recommended. The battery bank can be charged at the maximum charge rate (0.5C) for rapid power recovery if the temperature conditions listed in the [Battery Specifications](#) section are met. Never charge the battery bank above the maximum charge rate. See the [Battery Specifications](#) for each battery's optimal and maximum charge rates for different temperature conditions.

Example:

A battery bank has (4) 100 Ah batteries connected in parallel. The maximum charge rate of a single Expion360 battery is 50 A at 0.5C. The capacity of the battery bank is 400 Ah. The maximum charge rate of the battery bank is 200 A (0.5C). This method also applies to the optimal charge current.

If a battery or battery bank has been discharged to zero SoC, you must recharge the battery within a week to prevent battery damage and voiding warranty.

4.1 Charger Profile

Two-Stage CC-CV Charger:

Chargers using a constant current (CC) constant voltage (CV) profile are ideal to charge LiFePO₄ chemistry batteries. We recommend charging Expion360 batteries with a target voltage range from 14.2 Vdc to 14.6 Vdc, although 14.4 Vdc is preferred.

The CC (bulk or boost) stage charges the battery to 95% SoC at the charger's rated current until the battery reaches the charger's voltage setting. The charger then transitions to the CV (absorption or saturation) stage at the charger's given voltage setting and tapers the charge current down to zero as the battery reaches the charger's target voltage. The CV stage usually takes about 10 minutes, depending on the charger and the capacity of the battery.

The charger then enters standby mode and will charge the battery if a lower battery voltage is detected.

Single-Stage CC Charger:

A single CC stage charger can charge the battery to nearly 100% SoC. Single-stage CC chargers with target voltage settings from 14.2 Vdc to 14.6 Vdc (14.4 Vdc preferred) may also be used to charge Expion360 batteries, however, a CC-CV charger is advised.

Multi-Stage Charger:

A multi-stage (CC, CV, float, equalization) charger is primarily designed for flooded, AGM, and gel lead-acid batteries, and is not an ideal selection for LiFePO₄ batteries. The multi-stage charger slows down the charging process and may not fill the battery to 100% SoC. Expion360 batteries do not require a float stage because of their low self-discharge rates. LiFePO₄ batteries do not require an equalization stage because they do not experience damaging sulfation when left at states of charge lower than 100% for long periods. The charge voltage may also rise above 14.6 Vdc during the equalization stage, which would cause the BMS to disconnect due to overvoltage protection.

4.2 Charging Options

Shore Power Charging:

Expion360 batteries should be charged by a CC-CV two-stage charger with voltage settings from 14.2 Vdc to 14.6 Vdc. The rated charge current should never exceed the maximum charge rate of the battery bank. See [Battery Specifications](#) for individual charge currents for each model.

Our batteries may be configured as an uninterruptible power supply (UPS) with an inverter charger. Inverter chargers need to be programmed before a connection is made to shore power. On the inverter charger controller, under the "Battery Type" menu, choose the "CC-CV" setting in the setup, and set the charge voltage to 14.4 Vdc. The "Custom" setting on some inverter chargers is not recommended. The additional settings are determined by the design of the power system and different inverter chargers. Please refer to the inverter charger manual or contact Expion360 support for more information.

Solar Charging:

Expion360 batteries can be charged from solar power using a solar charge controller. A maximum power-point tracking (MPPT) charge controller is recommended as it has higher efficiency than a pulse-width modulation (PWM) charge controller.

Choose a solar charge controller that can be programmed for two-stage charging or one with a lithium battery setting. If using a programmable solar charge controller, set the charge voltage from 14.2 Vdc to 14.6 Vdc (14.4 Vdc preferred).

To prevent the solar charge controller from charging the battery bank below 32°F, install a disconnect switch between the solar panels and the solar charge controller. Make sure the switch is sized to handle the voltage and maximum current of the solar array. Some solar charge controllers have a temperature sensor and can be programmed to stop charging at a specific temperature. It is advised to set this temperature to 32°F. Please refer to the solar charge controller manual or contact the Expion360 support department for more assistance.

Alternator Charging:

The Expion360 battery can be charged from an alternator using any DC/DC charger equipped with settings for LiFePO₄ batteries. The Expion360 DC/DC charger is a CC-CV two-stage charger that is designed only to charge LiFePO₄ batteries with a 25 A output current. The Expion360 DC/DC charger is simple to install and compatible with any other LiFePO₄ battery. Within the limits of the battery bank and alternator specifications, up to two Expion360 DC/DC chargers can be used in parallel to achieve a higher charge rate.

Battery Balancer:

For series-connected battery banks of 24, 36, or 48 Vdc, an external battery balancer is recommended to maintain the balance of charge between all series-connected batteries.

5 Discharge

The Expion360 battery is designed for deep cycle use only. It should **NEVER** be used in a starting application. The maximum continuous discharge rate of the battery bank is equal to the maximum continuous discharge rate of a single battery multiplied by the number of batteries connected in parallel. Never discharge the battery bank above its maximum continuous discharge rate. See the Battery Specifications page ([Section 9](#)) for the optimal, maximum, and pulse discharge rates of each Expion360 battery.

For example, a battery bank has four 100 Ah Expion360 batteries connected in parallel. The maximum continuous discharge rate of a single Expion360 battery is 100 A (1C). The capacity of the battery bank is 400 Ah. The maximum continuous discharge rate of the battery bank is 400 A (1C). The same method applies to the recommended optimal discharge current and maximum pulse discharge current.

5.1 Inverter

The maximum continuous DC current must be considered carefully when pairing a battery bank with an inverter. The inverter cannot have a higher maximum DC input than the battery bank's maximum DC output. Otherwise, the BMS in the battery may shut off due to discharge overcurrent protection. An oversized inverter may irreversibly damage the battery bank in a worst-case scenario. The example below shows minimum battery bank capacities for various sizes of 12 Vdc inverters with estimated discharge times at full load.

Battery size (Ah)	60	80	95	100	120	360
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1000 Watt Inverter

1 Battery				1h 3m	1h 16m	2h 38m
2 Batteries	1h 16m	1h 41m	2h 0m	2h 6m	2h 31m	5h 15m
3 Batteries	1h 53m	2h 31m	3h 0m	3h 9m	3h 47m	7h 53m
4 Batteries	2h 31m	3h 22m	4h 0m	4h 12m	5h 2m	10h 30m

2000 Watt Inverter

1 Battery						1h 19m
2 Batteries				1h 3m	1h 16m	2h 38m
3 Batteries		1h 15m	1h 30m	1h 35m	1h 53m	3h 56m
4 Batteries	1h 15m	1h 40m	2h	2h 6m	2h 31m	5h 15m

3000 Watt Inverter

1 Battery						
2 Batteries						1h 45m
3 Batteries				1h 3m	1h 15m	2h 38m
4 Batteries		1h 7m	1h 20m	1h 24m	1h 40m	3h 30m

Properly size the battery bank's capacity to the inverter to prevent battery damage.

Match the battery bank's maximum pulse and continuous discharge current to the inverter's maximum surge and input current, respectively.

Use only inverters that have been certified to conform to UL 458.

For more information about pairing inverters and battery banks with capacities that are not listed above or further details about 24 Vdc, 36 Vdc, and 48 Vdc systems, please contact Expion360 technical support:

Support@expion360.com

+1 (541)797-6714

5.2 Circuit Protection

Properly sized circuit protection must consider the battery bank's maximum DC output, the inverter's maximum DC input, the size, length, and rating of the cables being used. The fuse or circuit breaker must be able to withstand the maximum continuous current that can be supplied by the battery bank and must be located as close to the battery bank as is safely possible. Use Blue Sea Systems fuses provided in the table below or an equivalent by an approved manufacturer.

Fuse Rating	Class T Fuse P/N	ANL Fuse P/N
60 A	N/A	5123
80 A	N/A	5124
100 A	N/A	5125
110 A	5112	N/A
125 A	5113	N/A
150 A	5114	5127
175 A	5115	5128
200 A	5116	5129
225 A	5117	N/A
250 A	5118	5131
300 A	5119	5133
350 A	5120	5135
400 A	5121	5136
500 A	N/A	5137
600 A	N/A	5161
750 A	N/A	5163

For Class T fuses between 110 to 200 A, use Blue Sea Systems fuse holder 5007100

For Class T fuses between 225 to 400 A, use Blue Sea Systems fuse holder 5502100

For ANL fuses between 60 to 200 A, use Blue Sea Systems fuse holder 5005

For ANL fuses between 225 to 750 A, use Blue Sea Systems fuse holder 5503

Class T fuses are recommended to protect the power system due to their lower voltage drop and higher efficiency. For the budget-conscious consumer and lower current applications, ANL fuses are sufficient (at the cost of reduced system efficiency). Use fuse and breakers from the following approved manufacturers to protect against overcurrent events and ensure the safety of your Expion360 battery system: Blue Sea Systems, Littlefuse, Eaton, or Bussman.

Single String Battery Bank:

For small battery banks that have fewer than four batteries or have a single string configuration, circuit protection (fuse or circuit breaker) should be installed close to the battery bank's positive terminal before connecting to the load. The fuse rating is based on the maximum continuous discharge rate of the battery bank. For example, if the maximum continuous discharge rate of a 400 Ah battery bank is 400 A, this battery bank should be paired with a 400 A DC fuse. In this example, any wires connecting the battery bank to the inverter must also be properly sized for a 400 A continuous current.

6 Battery Life

The battery is considered to reach the end-of-life (EoL) when the remaining available capacity is less than 80% of the original capacity. The cycle life of Expion360 batteries is tested at a charge/discharge rate of 0.2C/1C, 77°F, and 100% depth-of-discharge (DoD). Please note that many factors can affect battery cycle life. Using the recommended charge and discharge rates will offer longer life to your batteries.

DoD:

The cycle life of our G24 and G27 batteries is tested by discharging the batteries to a 100% DoD. The optimal window for operating LFP batteries is a DoD between 20% and 80%. To accommodate this, slightly over-size the capacity of the battery bank so that the DoD is about 80% for each cycle. This is beneficial to the batteries and will help to prolong the battery life. For example, in a 12 Vdc system, if 200 Ah is required for each cycle, the battery bank is recommended to have a 240 Ah capacity.

Operating Temperature Range:

Operating LFP batteries at extremely low or high temperatures will significantly decrease their cycle life. Please make sure the battery bank is well ventilated, or cooled during high temperatures and kept heated at low temperatures. Maximum battery life can be achieved when operating temperatures are as close to 77°F as possible. We advise installing our heating blankets ([Section 8](#)) with your batteries to protect them from extreme cold and to keep them close to ideal temperatures.

Charge/Discharge Rate:

Charging and discharging the battery at higher than recommended rates will generate more heat within the cells. Since temperature is the primary factor that affects the cycle life, consider the charge/discharge specifications with regards given to ambient temperature extremes when configuring your battery power system. The specifications page at the end of this manual considers both safety and the maximum life cycle when recommending optimal parameters for the battery system.

Storage Condition:

Most users will see their batteries in storage more often than active daily use. To prolong the battery life during periods of storage of one month or longer, please give careful consideration to the following instructions in [Section 7](#).

7 Storage

Properly storing the battery bank between 20% and 80% state-of-charge (SoC) will prolong the battery life and using a battery monitor to assist with tracking the SoC is highly recommended. If a battery monitor is not available, measure the battery voltage with a voltmeter (set to DC). If the battery is found to be less than 13.3 Vdc, charge it, and store the battery at 13.4 Vdc. Note that the battery voltage will read low or high if it has been discharged or charged within an hour of measurement. Precision will increase with time until 3 hours have passed, after which the voltage measurement will not change.

Before storing, the battery bank needs to be completely isolated from any loads (DC load, inverter, etc.) and charging sources (converter charger, solar charger, etc.). The Expion360 Battery Monitor can be left on the battery bank to check the status of the battery bank. Charge the battery bank to full capacity and recalibrate the battery monitor, before using the battery bank after the storage.

Please follow the guidelines below for lengths of storage time. Check the battery storage conditions in [Section 7](#) for more details.

1 month:	13.4 Vdc, -4°F to 113°F.
3 months:	13.4 Vdc, -4°F to 95°F.
6 months:	13.4 Vdc, -4°F to 77°F.

Completely discharge and charge the battery bank to 13.4 Vdc every 6 months.

Due to the inherent self-discharge of all batteries, it is advised to check the voltage displayed on the battery monitor periodically. If at any time the voltage is below 12 Vdc, check the battery bank and make sure it is completely disconnected from any load. Charge the battery bank to 13.4 Vdc and disconnect the charger. Isolating the batteries from the charger and load ensures that no parasitic draws may still be applied due to design flaws of third party accessories.

WHEN BATTERIES ARE PLACED IN STORAGE FOR LONGER THAN 2 to 4 WEEKS...

Charge the battery bank to 50% state-of-charge or an open circuit voltage of about 13.4 Vdc and disconnect all positive and negative cables from the battery terminals to prevent parasitic loads and irreversible battery damage.

IF BATTERIES ARE DISCHARGED TO 0% SoC...

Immediately charge the battery bank to 13.4 Vdc and confirm that all positive and negative cables have been disconnected from the battery terminals. All batteries using LiFePO₄ chemistry will be permanently damaged if discharged to 0% SoC and left for over **one week**. This is not a design flaw but is an inherent characteristic among all lithium iron phosphate batteries. The industry-leading 12-year Expion360 warranty excludes coverage for such damages due to neglect of the batteries by the end-user.

9 Battery Specifications

	Specifications	EX-G24-60C	EX-G24-80C	EX-G24-95XDP	EX-G27-100C	EX-G27-120XDP
Electrical	Battery Nominal Voltage	12.8 Vdc				
	Battery Rated Capacity (@ 0.2C, 77 °F)	60 Ah	80 Ah	95 Ah	100 Ah	120 Ah
	Battery Rated Energy (@ 0.2C, 77 °F)	768 Wh	1024 Wh	1216 Wh	1280 Wh	1536 Wh
	Battery Internal Impedance (@ 1kHz AC, 50 % SoC)	≤80 mΩ	≤60 mΩ	≤60 mΩ	≤50 mΩ	≤50 mΩ
	Battery Self-discharge Rate (@ 77 °F, 100 % SoC)	<2 – 3 % per month				
	Battery Cycle Life (@ 0.2C / 1C, 77 °F, 100 % DoD) (80 % Capacity retention)	>4000		>3500	>4000	>3500
	Max. Series Connection (per string)	4				
Mechanical	Battery Size	G24			G27	
	Battery Dimensions (Length x Width x Height)	10.24 in x 6.81 in x 8.59 in (260 mm x 173 mm x 218 mm)			11.93 in x 6.81 in x 8.59 in (303 mm x 173 mm x 218 mm)	
	Battery Weight	19 lbs. (8.7 kg)	24 lbs. (10.9 kg)	25 lbs. (11.4 kg)	29 lbs. (13.3 kg)	30 lbs. (14.0 kg)
	Case Material	Fiberglass Infused ABS				
	Terminal Material	Brass				
	Terminal Thread	M 8 x 1.25 (12 mm √)				
	Torque Spec	8 lb-ft (10 Nm)				
	Cell Type	Cylindrical LiFePO ₄				
Charge	Charge Method	CC-CV				
	Charge Voltage	14.2 Vdc to 14.6 Vdc				
	Optimal Charging Target Voltage	13.8 Vdc (about 80 % SoC)				
	Optimal Charge Current (0.2C)	12 A	16 A	19 A	20 A	24 A
	Quick Charge (32 °F to 50 °F (0 °C to 10 °C) (0.2C)					
	Current (50 °F to 140 °F (10 °C to 60 °C) (0.5C)	30 A	40 A	48 A	50 A	60 A
	Overcharge Disconnect	14.6 Vdc ± 0.1 Vdc				
	Overcharge Reconnect	14.2 Vdc ± 0.2 Vdc				
Discharge	Charge Temperature Range	32 °F ± 9 °F to 140 °F ± 9 °F (0 °C ± 5 °C to 60 °C ± 5 °C)				
	Optimal Discharge Current (0.5C)	30 A	40 A	48 A	50 A	60 A
	Max. Cont. Discharge Current (1C)	60 A	80 A	95 A	100 A	120 A
	Max. Pulse Discharge Current (3 s)	80 A	100 A	120 A	120 A	150 A
	Optimal Shut-off Voltage	12.4 Vdc (about 20 % SoC)				
	Overdischarge Disconnect	9.5 Vdc ± 0.5 Vdc				
	Overdischarge Reconnect	10.8 Vdc ± 0.4 Vdc				
	Discharge Temperature Range	-4 °F ± 9 °F to 140 °F ± 9 °F (-20 °C ± 5 °C to 60 °C ± 5 °C)				
Storage	Recommended Storage Voltage	13.4 Vdc (about 80 % SoC)				
	1 month	-4 °F to 113 °F (-20 °C to 45 °C)				
	3 months	-4 °F to 95 °F (-20 °C to 35 °C)				
	6 months	-4 °F to 77 °F (-20 °C to 25 °C) Discharge-Recharge Cycle every 6 months				

EXPION360

BATTERY MONITOR EX-BM350



USER MANUAL

Thank you for your purchase of the EXPION360 Battery Monitor

(1)Application

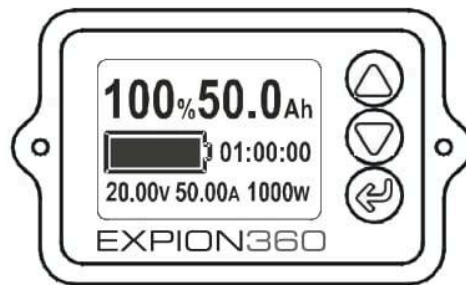
The Expion360 Battery Monitor is designed to measure a batteries state of charge (SOC). It measures voltage, watts, and capacity in real time. The monitor will show both power consumption as well as power replenishment. The monitor can be used with Lithium, Lithium Iron Phosphate, Lead Acid, AGM, Gel and Nickel Metal Hydride batteries with a voltage range of 8V to 80V. Please read all instructions prior to installing your new battery monitor to make the installation trouble free.

(2)Wiring Instructions

(2.1)Shunt: Attach the shunt B-terminal to the negative (black -) terminal on the battery(s). Attach all negative cables to the P- terminal on the shunt. The shunt can be mounted right side up or up side down for a better fit. It is very important to make sure all negative cables are attached to the P-terminal on the shunt so power can be calculated across the bridge of the shunt to accurately monitor the battery(s) SOC.

(2.2)Monitor Power: Attach the short red monitor power wire to either B+ terminal (Green terminal) on the shunt. Attach the other end with the ring terminal to the positive (red+) terminal on the battery. This connection provides power to the battery monitor screen.

(2.3)Monitor Data Line: Plug in one end of the battery monitor data line to the data inlet on the shunt and the other end to the display unit (screen). Your battery connections are now complete.



(3)Display Screen Functions

(3.1)% - Percentage: Upper Left Corner. This shows state of charge (SOC) as a percentage from 0% empty to 100% full.

(3.2)Ah - Amp Hour: Upper Right Corner. Abbreviated as Ah. This shows SOC in amp hours. The amp hour capacity of the battery(s) being monitored must be entered in when programing the monitor for the first time for this value to measure correctly.

(3.3)Battery Symbol: Middle Left. This shows SOC as a battery symbol. When the battery is being charged it will cycle to show it is filling. When the battery is full this symbol will be shaded and when it is empty it will not be shaded.

(3.4)Hour Counter: Middle Right. This will show run time remaining at the current rate of discharge until the battery is empty while under a load or time remaining until the battery is full when charging.

(3.5)V - Voltage: Bottom Left. This shows the voltage level the battery is at.

(3.6)A - Amperage: This shows the current (amperage) being used while discharging or supplied while charging.

(3.7)W - Watts: This shows the watts (power) being used while discharging or supplied while charging.

(3.8)Screen: The screen back-lighting will pulsate while charging or during a higher state of charging than discharging. The screen will remain solid during discharging or during a higher state of discharge than charge. The screen will be dark with no back-lighting when there is a balanced state of charge and discharge with no power being consumed or supplied.

(3.9)Display Screen Back-Lighting Modes:

Pulsating: Charge Mode
Solid: Discharge Mode
Dark: Balanced Inactive Mode

(4)Set Up Screen

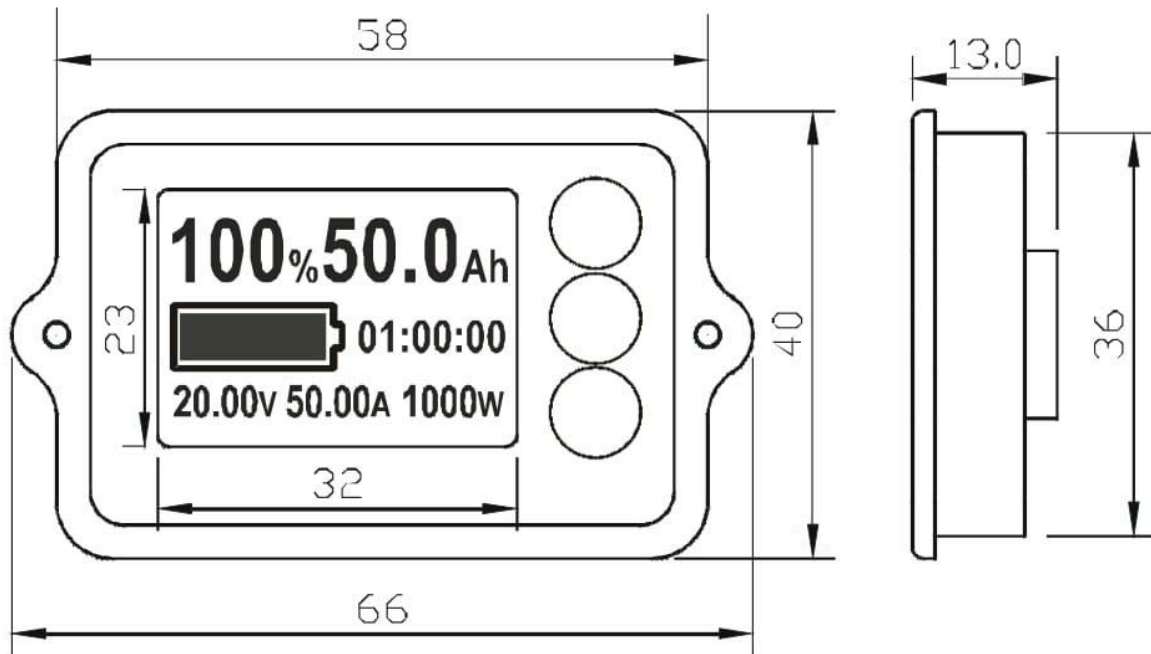
To access the set up screen to enter the battery(s) capacity, maximum charge voltage, and minimum discharge voltage for your monitor to operate correctly.

- ← (4.1) Press and hold the left arrow key on the faceplate until the set up screen appears. This will show the three values you need to enter.
- ◆ (4.2) Press the up or down arrow keys to move the cursor to the setting you would like to change.
- ← (4.3) Press and hold the left arrow key again to select that setting.
- ◆ (4.4) Press the up or down arrow keys again to select the number you need.
- ← (4.5) When you are done entering the information press and hold the left arrow key one last time to save your settings. Within 60 seconds the screen will automatically return to the home screen with your settings saved. Or simultaneously press the up and down arrow keys and hold to return to the main menu.

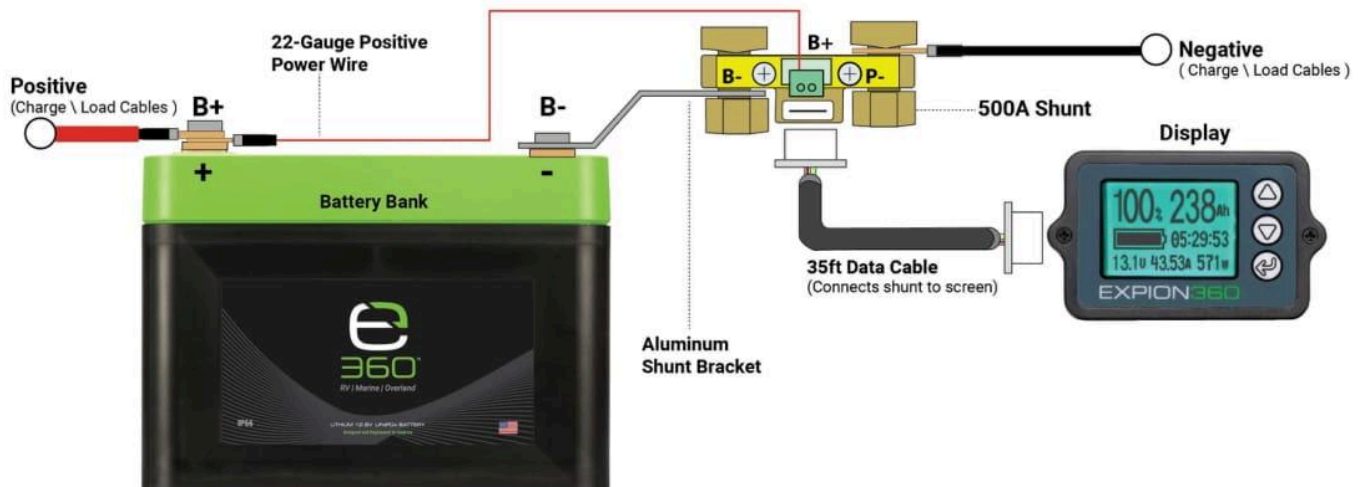
(5)Set Battery Capacity to Empty or Full

- ◆ The last step in the setup is to set the battery to its starting point at either empty or full capacity to start the monitoring process. We recommend starting at full unless you are unsure of the capacity of the battery being monitored. If unsure of the battery capacity start with the battery fully depleted (Empty) and set the monitor to its highest capacity, then charge the battery fully and record the capacity when charging is complete. Enter that Ah reading for capacity. From the home screen press the up arrow to set to full as your starting point after the battery has been fully charged (recommended). From the home screen press the Down arrow to set to empty as your starting point after the battery has been fully discharged.

(6)Screen Measurements



(6.1)Wiring Diagram



The Importance of Peukerts Law

(7)Peukerts Law:

To explain this law in simple terms: lead acid (flooded, SLA, AGM and Gel) batteries have a variable rather than fixed capacity based on the batteries discharge rate. The higher the discharge rate, the lower the usable amp hours the battery has or, the lower the discharge rate, the higher the usable amp hours the battery will have. This is much like the fuel in your vehicle when you travel at a higher rate of speed gas mileage is lower than if you are moving at a lower rate of speed. A lead acid battery will show its capacity as an amp hour rating followed by an hour rating (discharge time), usually listed as a 20HR rate and sometimes also listed as a 5HR rate to show amp hour capacity with low power usage and higher power usage. The amp hour and hour rate will be listed on the battery. If you have a battery that shows its rating at 100Ah @ 20Hr, that means that in 20 hours the battery will be discharged at a 5A load. The following formula is how you determine the load $100/20 = 5$.

Due to this law, it is hard to get a highly accurate Ah capacity, percentage, and time remaining readings on the Expion360 Battery Monitor, however, we can increase accuracy by setting the starting capacity (CAP) in the setup menu to a more accurate figure based on estimated power usage. This will help to provide a more accurate reading due to variable capacity (Peukerts Law). We have provided an amperage chart for RV appliances to help determine power usage. Most appliances run for short periods of time and amperages are based on 1 hour, so if appliances are only running for a few minutes, the amperage would be a fraction of the listed amount. For example, an appliance that is rated at 1.0A running for $\frac{1}{2}$ an hour will only draw .50A. Figuring power usage can be difficult and is not an exact science if unsure of your usage, start with setting "CAP" at the 20HR rate to establish a starting point and then customize that setting based on tracking the average power consumption over time.

(8)Setup for a New Flooded, SLA, and AGM Battery:

First, determine the batteries capacity at its 20-hour rate, this amount should be listed on the battery and shown like 100Ah@20Hr. To determine how many amps are available from the figure you divide $100/20=5$ or 5A per hour. We recommend setting "CAP" at the batteries 20Hr. rate to start then estimate actual power use over time and adjust "CAP" most likely to a lower amount if power use is higher according to Peukert's Law.

Some battery manufacturers will also list a 5Hr. rate that can be helpful in determining true capacity based on actual power use. If Parallel connecting two or more batteries the Ah capacity will need to be increased by the amount of each battery, and that will be the new figure to enter into the formula to establish a starting point for capacity.

(9)Voltage, Amperage, and Wattage Readings:

The voltage, amperage, and wattage readings on the battery monitor will be accurate within the amount listed on the specification sheet and are not affected by discharge rate (Peukerts Law). To see if your amp hour settings are correct according to your power use you can watch amperage being used at different times of the day and determine an average usage and apply it to the above settings chart to help determine your amp hour capacity. You can also assess your battery state of charge by the voltage reading on the monitor. The "Battery State of Charge at Different Voltage Readings" chart provided shows average voltage readings and state of charge for a new AGM battery. Readings will be somewhat different for different battery manufacturers, different battery chemistries and battery age.

(10)Settings for 12V Lithium Iron Phosphate (LiFePo4) and other Lithium Battery Chemistries:

Setting the battery monitor for lithium battery use is simple because lithium is nearly 100% efficient when discharging so Peukerts law, for the most part, does not apply here. You will get almost the batteries full rated capacity at any discharge rate.

(10.1)SETUP FOR LITHIUM:

CAP: 100% of the batteries rated amp hour (Ah) capacity.

Should be listed on the battery.

FULL: 14.4V to 14.6V Charge voltage.

See battery manufacturer specifications for full voltage.

ZERO: 10.5V to 11.5V. Lowest voltage the battery is considered empty at.

See battery manufacturer specifications for empty voltage.

(10.2)SETUP FOR EXPION360 LITHIUM VIPER POWER CELL:

CAP: 100% of the amp hour (Ah) capacity. 120Ah per battery.

FULL: 14.6V. Charge voltage.

ZERO: 10.5V. You may also set zero voltage higher if you want your battery to read empty sooner. 11.2V is recommended.

(11)Battery Aging and Battery Monitoring:

Many factors can determine a batteries lifespan. For Lead Acid, AGM, and Gel chemistries: life cycles are affected by undercharging, overcharging, depth of discharge (especially below 50% capacity), higher than the recommended charge current or discharge current, and operating at extremely high and low ambient temperatures. For lithium chemistries, life cycles are affected by the depth of discharge (especially to a full 100%), Higher than recommended charge or discharge current and operating at extremely high and low ambient temperatures. When a battery ages its capacity lowers, and because all batteries will age differently depending on how well they were operated and cared for in the past it will be challenging to determine its true capacity especially for Lead Acid, AGM and Gel. For old Lead Acid, AGM and Gel set the monitor to the lower amp hour capacity rate and test to determine how accurate the setting is by reading voltages and state of charge estimates at those voltages. You can also check voltage at the battery using a voltage meter. Then adjust accordingly, most likely lowering the amp hour capacity setting. For lithium set the amp hour capacity to 95% of its listed capacity and perform the same test and then adjust accordingly. Lithium capacity will not change due to aging as quickly as other battery chemistries.

(12) 12VDC APPLIANCES	
DIRECT BATTERY POWER	AMPERAGE
APPLIANCE	12VDC
LED LIGHT	.10A - .20A
STANDARD LIGHT	.50A - 1.5A
FLUORESCENT LIGHT	1.0A - 2.0A
CO DETECTOR	.50A - 1.0A
LP LEAK DETECTOR	.50A - 1.0A
POWER ROOF VENT	1.0A - 2.0A
RANGE HOOD FAN	1.5A - 2.5A
WATER PUMP	2.0A - 6.0A
RADIO	3.0A - 5.0A
VENT FAN	1.0A - 5.0A
TV	3.0A - 4.0A
DVD	2.0A - 3.0A
TV ANTENNA BOOSTER	1.0A - 2.0A
POWER JACK	8.0A - 10A
ELECTRIC POWER SLIDE	8.0A - 10A
LP FURNACE BLOWER	10A - 12A
LP REFRIGERATOR	1.0A - 2.0A
LP HOT WATER HEATER	1.0A - 2.0A

120VAC (13) APPLIANCES	
INVERTER BATTERY POWER	AMPERAGE
APPLIANCE	12VDC
AIR CONDITIONING	120A - 160A
MICROWAVE	80A - 130A
COFFEE MAKER	50A - 80A
BLENDER	50A - 60A
HAIR DRYER	50A - 120A
CURLING IRON	10A - 12A
COMPACT DISC PLAYER	10A - 12A
LAPTOP COMPUTER	20A - 30A
CROCK POT	10A - 20A
ELECTRIC BLANKET	5A - 15A
ELECTRIC FAN	10A - 20A
ELECTRIC SKILLET	60A - 120A
TOASTER	70A - 100A
VACUUM	10A - 20A
IRON	50A - 100A
ELECTRIC TOOLS	20A - 60A
SPACE HEATER	80A - 130A
ELECTRIC LIGHT	5A - 10A

(14)

TECHNICAL SPECIFICATIONS	
CATEGORY	FIGURE
VOLTAGE RANGE	8VDC - 80VDC
WORKING POWER CONSUMPTION	10mA ± 1mA
STANDBY POWER CONSUMPTION	0.6mA ± 0.2mA
DISPLAY BACKLIGHT ON CURRENT DRAW	45mA ± 5mA
DISPLAY BACKLIGHT OFF CURRENT DRAW	35mA ± 5mA
OPERATING TEMPERATURE RANGE	32°F - 120°F
SHUNT CURRENT RANGE	0A - 500A
AMP HOUR SETTING RANGE	1Ah - 999Ah
AMP HOUR MONITORING RANGE	1Ah - 999Ah
CURRENT MONITORING RANGE	1mA - 999.999A
WATTAGE MONITORING RANGE	0W - 999W
PERCENTAGE MONITORING RANGE	0% - 100%
DISPLAY BACKLIGHT ON SECONDS	3sec ± 1sec
DISPLAY BACKLIGHT OFF SECONDS	15secs ± 5sec
VOLTAGE ACCURACY	±1%
CURRENT ACCURACY	±1%
MONITOR SCREEN WATER RESISTANCE	NONE
MONITOR SCREEN UV PROTECTION	NONE
DISPLAY BACKLIGHT PULSE	CHARGE MODE
DISPLAY BACKLIGHT SOLID	DISCHARGE MODE
DISPLAY BATTERY SYMBOL CYCLING	CHARGE MODE
DISPLAY BATTERY SYMBOL SOLID	DISCHARGE MODE

(15)

FLOODED, SLA, AGM AND GEL BATTERY SOC VOLTAGE	
BATTERY STATE OF CHARGE (SOC)	VOLTAGE
100%	12.80V - 13.00V
90%	12.70V - 12.80V
80%	12.40V - 12.50V
70%	12.20V - 12.30V
60%	12.10V - 12.15V
50%	12.00V - 12.05V
40%	11.90V - 11.95V
30%	11.80V - 11.85V
20%	11.65V - 11.70V
10%	11.50V - 11.55V
0%	10.50V - 11.00V

**FOR OPTIMUM LIFE CYCLES DO NOT DISCHARGE FLOODED, SLA, AGM
OR GEL BATTERIES BELOW 50% SOC AND TO PREVENT SULFATION
DO NOT DISCHARGE BELOW 80% SOC.**

EXPION360

QUESTIONS:

SUPPORT@EXPION360.COM

(541) 797-6714

CE



USER MANUAL

MODEL EX-25DC

EXPION360

MOBILE CHARGER MODEL EX-25C

DESCRIPTION

The Expion360 DC to DC mobile charger is designed to charge Lithium Iron Phosphate (LiFePO₄/LFP) chemistry deep cycle house batteries from the vehicle alternator through the chassis battery. The mobile charger is unique in that it uses a 2-stage constant current (CC) constant voltage (CV) charge profile at 14.6V / 25A. The charger is compact, easy to install, and simple to use. The mobile charger is specifically designed to charge the Expion360 VPR 4Ever Classic and Platinum batteries. It can also be used with other LFP chemistry batteries that recommend the same charge profile.

INSTALLATION

The Expion360 mobile charger needs to be installed in a location with some air movement. It is convection air-cooled using a heat sink. The charger is IP68 rated and can be installed on an outside location such as a vehicle frame rail. Make sure to secure the charger to its mounting location to prevent its movement. If the charger is installed on an outside location, make sure it stays clean and free of debris to prevent overheating. Do not install in the engine compartment to prevent overheating. Install the charger with the LED green and red indicator lights visible by the user for troubleshooting purposes if needed. Please make sure to follow all wiring diagram instructions provided in this manual.

MULTIPLE CHARGER CONNECTION

You can parallel connect up to two Expion360 mobile chargers. By parallel connecting the chargers, the charge rate will increase from 25A to 50A while maintaining 14.6V. For the charger to boost the voltage to 14.6V it requires additional current from the alternator and may draw up to 35A on the input circuit to achieve this. Because of the input load requirement, we do not recommend parallel connecting more than two chargers as two can draw up to 70A. Combining more than two chargers can exceed the vehicle alternator's surplus output capability especially when at idle with high load items running such as air conditioning.

CHARGE PROFILE

The Expion360 mobile charger uses the CC/CV (bulk/absorption) 2-stage charge profile with no float or equalization stages. LFP batteries have a very low self-discharge rate and do not sulfate by being left at a partial state of charge, so a maintenance float stage and desulfation equalization stage are not required.

Constant Current Stage (Bulk): During this stage, the charger will provide the full rated current at 25A (1 charger) or 50A (2 chargers) until the maximum charge voltage has been achieved at 14.6V. The battery is approximately 97% full and will now transition to the constant voltage stage. The red LED indicator light will be lite when in the constant current stage (bulk).

Constant Voltage Stage (Absorption): During this stage, the charger will hold the full charge voltage while gradually decreasing the current to zero or near zero. This stage will take 15-20Min on average, depending on how many batteries are being charged. During this stage, the final cell balancing is completed. The charger will then enter a standby mode waiting for the batteries voltage to drop to provide another charge cycle. The red and green indicator lights will be lite simultaneously during the constant current – absorption stage. The green light will be lite when fully charged and in standby mode.

MODEL EX-25DC TECHNICAL SPECIFICATIONS

MECHANICAL PARAMETERS

DIMENSIONS (L X W X H)	7.08 X 4.72 X 1.57
WEIGHT	2.5Lbs
CHARGER WIRE SIZE	10Ga
CASE TYPE	DIE-CAST ALUMINUM
CASE PROTECTION	IP68
INTERNAL ELECTRONIC PROTECTION	EPOXY POTTING
COOLING	HEAT SINK CONVECTION
BATTERY ISOLATION	YES
SAFETY	RoHS / CE

INPUT PARAMETERS

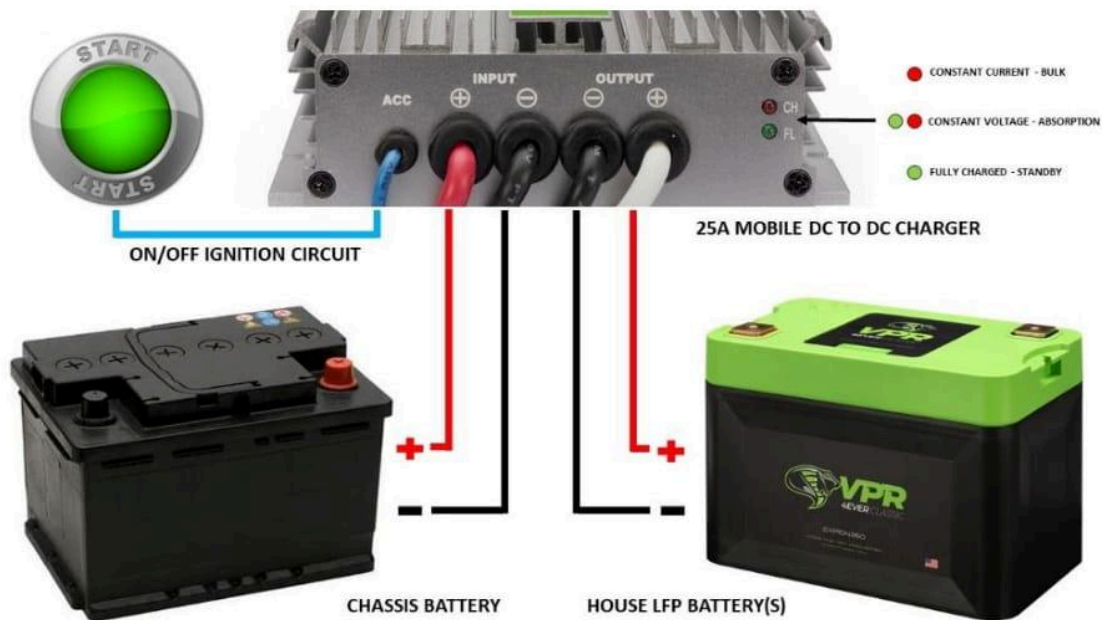
NOMINAL VOLTAGE	12.8V
MINIMUM VOLTAGE	10.0V
MAXIMUM VOLTAGE	16.0V
MAXIMUM CURRENT	35A
FUSE SIZE REQUIRED	45A
EFFICIENCY	91%

OUTPUT PARAMETERS

CHARGE PROFILE	CC/CV 2-STAGE LFP
VOLTAGE	14.6±0.1V
OVERVOLTAGE PROTECTION	YES
MAXIMUM CURRENT	25A
FUSE SIZE REQUIRED	35A
POWER	365W
PARALLEL CONNECTION	2 CHARGERS / 50A
NO LOAD CURRENT	60mA

TEMPERATURE PARAMETERS

OPERATING TEMPERATURE	-4 TO 132°F
HIGH TEMPERATURE PROTECTION	YES
STORAGE TEMPERATURE	-20 TO 150°F
OPERATING HUMIDITY	0-100%RH



NOTICE

TO PREVENT DAMAGE AND EXTEND THE LIFE OF THE CHARGER PLEASE FOLLOW THESE PRECAUTIONS

- ⚠ DO NOT DROP THE CHARGER
- ⚠ DO NOT OPEN THE CHARGER
- ⚠ DO NOT SHORT CIRCUIT THE CHARGER
- ⚠ DO NOT SUBMERGE THE CHARGER IN WATER
- ⚠ DO NOT CONNECT MORE THAN 2 CHARGERS IN PARALLEL
- ⚠ DO NOT ATTEMPT TO REPAIR THE CHARGER IF MALFUNCTIONING
- ⚠ DO NOT USE THE CHARGER TO CHARGE OTHER BATTERY CHEMISTRIES
- ⚠ DO NOT USE THE CHARGER AS A 12VDC POWER SUPPLY ONLY USE TO CHARGE



MPPT SOLAR CHARGE CONTROLLER USER MANUAL

EX-10ASC

DISCLAIMER

While every precaution has been taken to ensure the accuracy of the contents of this guide, Expion360 assumes no responsibility for errors or omissions. Note as well that specifications and product functionalities may change without notice.

IMPORTANT

Please be sure to read the manual in its entirety before using the products. Misuse may result in damaging the products, causing harm, or incurring serious injury. This manual will update periodically without notice. Instead of saving this manual, view it on the Expion360 website for future updates and reference.

<https://expion360.com/pages/customer-support>

ABOUT US

- **Safety**

Expion360 lithium batteries use lithium iron phosphate (LiFePO₄/LFP) chemistry, which is the best choice for RV, marine, and off-grid power storage applications, because of its high degree of safety and long cycle life.

- **Quality**

With all the Li-ion manufacturers in the market, Expion360 strives to ensure that our products meet the highest quality standards to maintain our advantage over the competition. Expion360 battery uses cylindrical 26650, stainless steel encased LiFePO₄ cells. The cells are UL 1642 recognized (File No. MH64383). They are certified to the highest standard in safety and performance. Instead of soldering, all internal connections are mechanically fastened to reduce resistance and ensure long-term durability.

The Expion360 proprietary case contains internal structural support to protect the battery pack and BMS inside from the effects of vibration and movement. The innovative oversized terminals and bus bars provide substantial electrical connections to accommodate high ampacity cables.

- **Service**

The Expion360 technical support department has industry experts on standby to assist you, our valued customers, in every way we can. If for any reason you require assistance with our products, contact us by phone or email any weekday during business hours and receive help from the best technical support in the industry.

support@expion360.com

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Monday to Friday except for holidays

8 am - 4 pm PST

1. Safety Information

Read all instructions in this manual before installation!

- The controller will be damaged if the solar input is above 10 A.
- DO NOT disassemble or attempt to repair the controller.
- Always disconnect the solar module before disconnecting the battery.
- Power connections must remain tight to avoid excessive heating from a loose connection.
- Charge only LiFePO4 batteries with this charge controller.
- Battery connection may be wired to one battery or a bank of batteries.
- Risk of electric shock. Please use caution.

2. Overview

The MPPT charge controller uses an advanced algorithm to optimize solar power conversion to electricity as efficiently as possible. The charge controller has the following benefits:

- Quality internal components for a long lifespan.
- Wide window of operating temperatures.
- Lithium battery compatible and preset for Expion360 batteries.
- Maximum conversion efficiency of 98%.
- PV power limitation function.
- Aluminum housing with heat sink for cooling.
- IP67 rated.

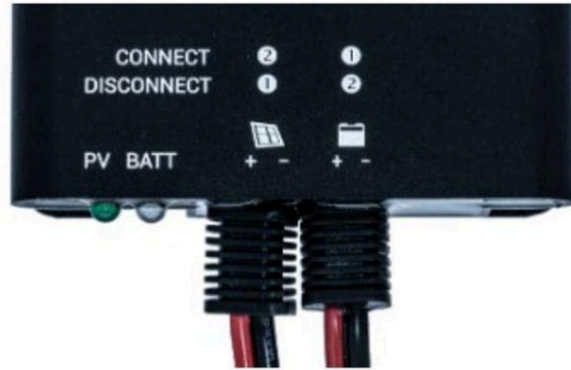
3. Product features

1	Solar PV LED (Green) (off or on)
2	Battery LED (Green, Orange, or Red)
3	Solar PV SAE input connection
4	Battery SAE output connection



4. Wiring

Please note that extra care must be given to the polarity of cables when using SAE connectors. Most SAE connectors will have the red positive wire terminated at a shrouded female terminal. When a cable assembly with this orientation of connector and cable connects with the SAE connectors of the solar charger, the red wire becomes negative, and the black wire becomes positive. This is a potential source of confusion when wiring and may cause damage to the unit. To reduce confusion, please use the accessory cable (available on the website) to extend your SAE connections and remember to always consider polarity when making connections to your battery and your solar panel(s).



Connection Order

- 1) Connect the battery to the solar charge controller. After connecting the battery, verify the battery LED is green. If it is not green, refer to the troubleshooting section.
- 2) Connect the solar panel.
Pay close attention to the polarity of the wires.

Disconnect Order

- 1) Disconnect the solar panel.
- 2) Disconnect the battery.

5. LED Indicators

Indicator	Color	LED Indication	Status
PV LED	Green	On, Solid	PV connection normal but low voltage from PV. No charging.
	Green	OFF	No PV voltage at the input. No charging.
	Green	Slowly Flashing (1x per second)	Charging.
	Green	Fast Flashing (4x per second)	PV over voltage. No charging.
BATT LED	Green	On, Solid	Normal.
	Green	Slowly Flashing (1x per second)	Full.
	Green	Fast Flashing (4x per second)	Over-voltage.
	Orange	On, Solid	Under-voltage.
	Red	On, Solid	Over-voltage.
	Red	Fast Flashing (4x per second)	Overheating or low temperature.
If PV LED is green and the battery LED is orange:			System voltage error.

6. Protection

Warning! The controller will be damaged if the solar input is above 10 A!

PV Over Current – The controller will limit battery charging current to 10 A. Adding additional extra solar panels will not increase the charging speed of the solar charge controller and can damage the charge controller.

Battery Over Voltage – When the battery voltage reaches the set point of 14.4 Vdc, the controller will stop charging the battery.

PV Short Circuit – The controller will stop charging if the solar panel connection is in a short circuit condition. Clear the short to resume normal operation.

PV Reverse Polarity – Solar can be connected in reverse polarity without damaging the charge controller **only** when:

- The battery is not connected.
- The battery is properly connected, and the open circuit voltage of the PV is lower than 85 V.

Reverse Battery Polarity – When the PV is not connected or the PV connection is reversed, the charge controller is fully protected against reverse battery polarity connection.

Warning! The controller will be damaged if the solar connection is correct, and the battery polarity is reversed!

7. Technical Specifications

Device	EX-10ASC
Nominal system voltage	12.8 Vdc
Rated charge current	10 A
Rated charge power	130 W (12.8 Vdc)
Max PV open circuit voltage	60 V
Maximum power point voltage range	Battery voltage + 2 V to 36 Vdc
Boost charging voltage	14.5 Vdc
Self-consumption	<13 mA
Working environment	-40 °F to 140 °F
Enclosure rating	IP67
Overall dimension	124 mm x 89 mm x 30 mm
Mounting hole size	3.5 mm
Mounting dimension	88 mm x 76 mm
Wire gauge	14 AWG
Connector	SAE
Weight	1.2 lb

8. Troubleshooting

Fault	Possible Cause	Solution
The solar PV LED is off despite the PV modules receiving sun exposure.	Solar PV is disconnected.	Check all wiring and connections.
No battery LED indicator.	Battery voltage may be less than 8.5 Vdc or disconnected.	Use a multimeter to check the battery voltage and check all connections.
The battery LED is blinking fast (green).	Battery over voltage.	Using a multimeter, measure the battery voltage and confirm it is less than 14.6 Vdc.

9. Warranty

This warranty does not apply under the following conditions:

- The product has incurred damage from improper use in an unsuitable environment.
- Visible dent marks or signs of abuse.
- Connected PV current, voltage, or power exceeding the rated value of the controller.
- The charge controller is used outside the working temperature window.
- Any attempt to disassemble the product by the user.

