cangoee power

Isuzu D-MAX Installation Manual

INS0175

off-grid / on-grid / on- demand.

Contents

Document Changelog

Revision	Date	Author/ Edit	Checked	Comments
R1	OCT-22	RJ	DK	This is the first revision
R2	MAR-24	SH	DK	Updated format, information, and diagrams
R3	JUL-24	SH		Updated information for MIDI Fuse Bracket

WARNINGS and SAFETY

SAFETY!

The battery contains Lithium Ferrous Phosphate (LiFePO4) cells, considered the safest of all lithium-ion chemistries. The battery contains a large amount of stored energy. Please follow these quick tips for safe use and operation:

- Ensure appropriate PPE gear is worn at all times during this install.
- Ensure the battery is secured safely before travel.
- Do not drill into the enclosure. Doing so may inadvertently puncture one of the internal cells.
- Do not short circuit the battery. Be careful not to drop a metallic object across the two exposed terminals. Always keep the terminal caps on the Positive (red) and Negative (black) posts during operation.
- Do not mount the battery upside down. The battery can also be mounted on its side if mounting upright is not an option.
- Do not connect multiple batteries in series to raise the voltage. The Battery Management System (BMS) is not designed to accommodate higher voltages.
- If the chemicals from a battery cell come into contact with your skin, immediately seek medical advice.

Please Note:

Cangoee strongly recommends that the installation of the battery kit be carried out by a competent, un-intoxicated individual. However, if installing at home or independently, strict adherence to the instructions and careful execution of each step is paramount to ensure proper installation and optimal functionality of your Cangoee battery system.

Please Ensure the consistent use of proper PPE, and, turn off the vehicle to minimize the risk of serious injuries or damage to the installer as well as the vehicle.

WARNINGS!

Please follow these warnings carefully and adhere to the 'safety' Guidelines when installing this battery system:

- Avoid mechanical shock.
- Avoid direct sunlight exposure.
- Do not store or mount batteries in incorrect orientations.
- Do not transport the battery unsecured.
- Do not expose the battery to water.
- Do not expose the battery to fire.
- Do not pierce the battery.
- Do not disassemble.
- Do not drill into the battery enclosure.
- Do not short battery terminals.
- Do not connect multiple batteries in a series configuration.
- Do not charge the battery outside the range of 0°C - 45°C.
- Do not store below -20°C or above 60°C.
- Risk of burns if misused.
- Always follow safe working practices.
- Installation of this device must only be carried out by appropriately qualified competent person(s).
- All connections must be fused at recommended fuse ratings to avoid damage to components.
- All minimum cable gauges and maximum lengths must be followed.
- Only use Lithium Battery Chargers to recharge batteries.

WARNING

This install works with live wires and electricity, ensure all safety guidelines are followed and proper equipment is used during this Install. Failing to follow these guidelines could result in incorrect installation of the Cangoee battery, malfunction, or severe injury.

Purpose

This document serves as a comprehensive guide for users to successfully install the Cangoee battery kit in the Isuzu D-Max MY21. As this installation involves electrical equipment and live cables, it is crucial to ensure that the procedure is performed by a competent and cautious individual.

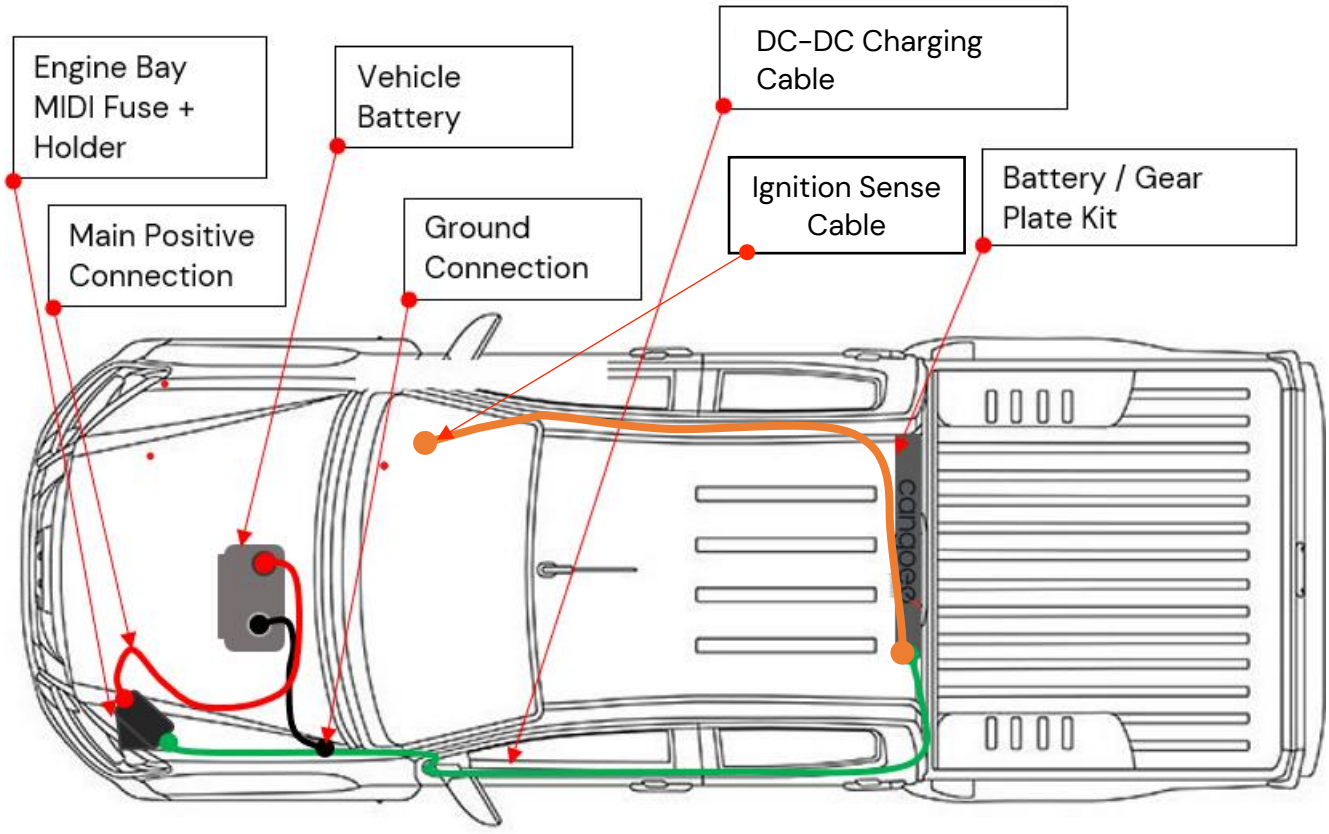
Completed Installation

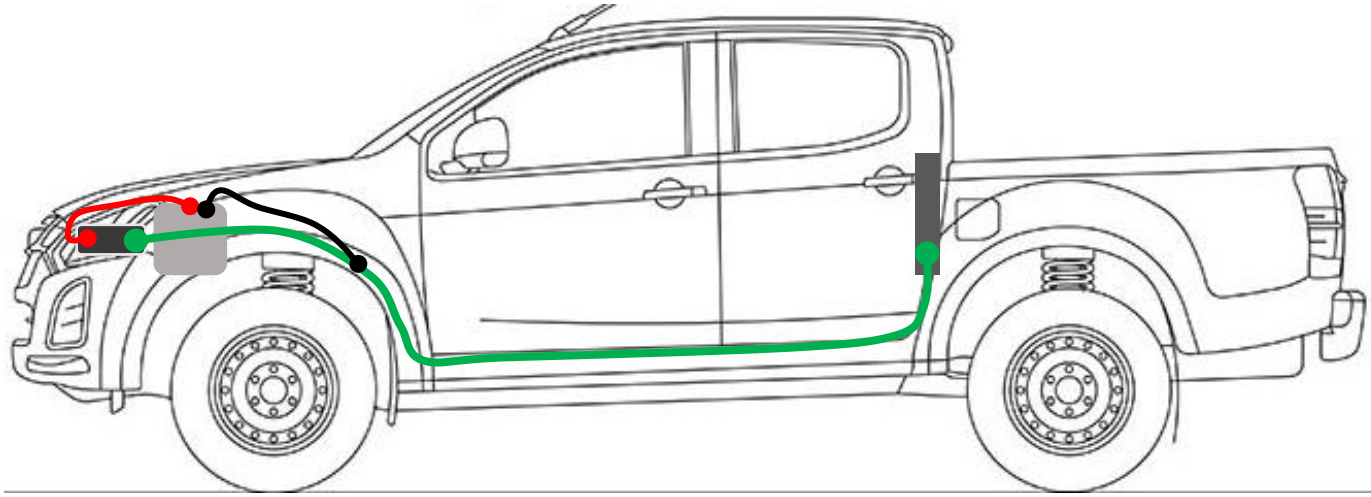
Battery Installation

Engine Bay Connection

Installation Overview

This is an overview of the installation kit and where each component fits.
Please carefully examine the below diagram and adhere to the guide, this will ensure the finished installation matches this diagram.





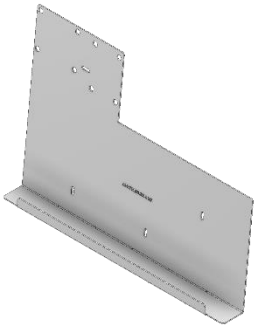
Side view of installation: with DCDC cable (Green) running through passenger side firewall and through engine bay grommet.

Items List

Vehicle Battery Kit

Item Image	Item Name	Part Number	Quantity
	Cangoee Isuzu D-Max MY21 Vehicle Kit	CANK RG01 D-MAX	1

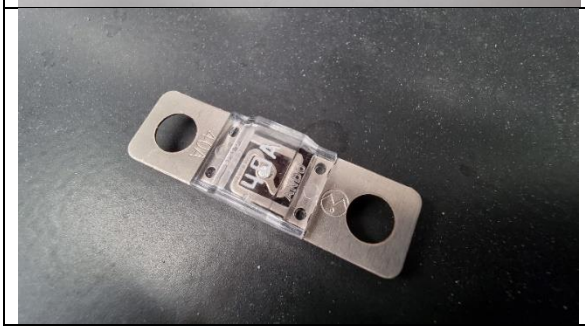
Brackets

Item Image	Item Name	Part Number	Quantity
	Cangoee Isuzu D-Max MY21 Back Plate	APRT1066.12.1 R2	1
	MIDI Fuse Holder	BKT10314.2 R2	1

Installation Looms

Item Image	Item Name	Part Number	Quantity
	Cangoee Isuzu D-Max MY21 MCP Loom	WIR10418.5	1
	Cangoee Isuzu D-Max MY21 DC-DC Charge Cable with Blue Anderson SB50 Plug + Battery Connect Cable	WIR10418.6	1
	Cangoee Isuzu D-Max MY21 Ignition Sense Cable	WIR10440	1

Modules

Item Image	Item Name	Part Number	Quantity
	Strip MIDI Fuse Holder	PEle SFH	1
	40A MIDI Fuse – Bolt On	CFus SWE-MID040	1

Fasteners

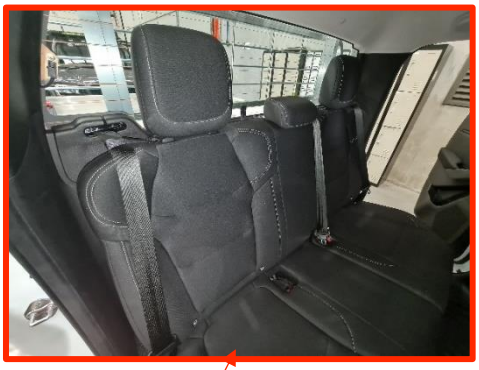
Item Image	Item Name	Part Number	Quantity
	M5 Stainless Steel Mudguard Washers Din Standard	XAM5X15X1.2MG304DINW	3
	M5x20mm Pan Head Phillips Screw	XAM 5x25MZPPCRMT	3
	M5x16mm Hex Head Zinc Plated Set Screw	XAM 5x16MZPSS	1

	M5 Stainless Steel Flat Washer	XAM 5MG304W	1
	M5 Stainless Steel Spring Washer	XAM 5MG304SW	1
	M5 Nutsert	XAM IN-YSF05-3.3	1
	M5 Clip Speed Nut U Type	XAM RAGF045	3

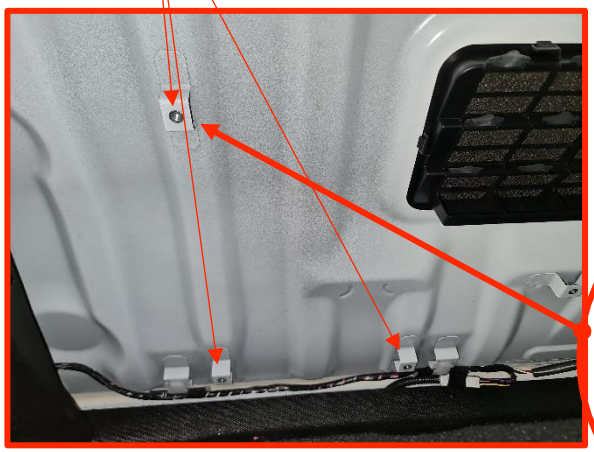
Install Guide: Step-By-Step

Vehicle Preparation

Stage 1: Remove Rear OEM Floor and Clear Space– Location: Rear Seats



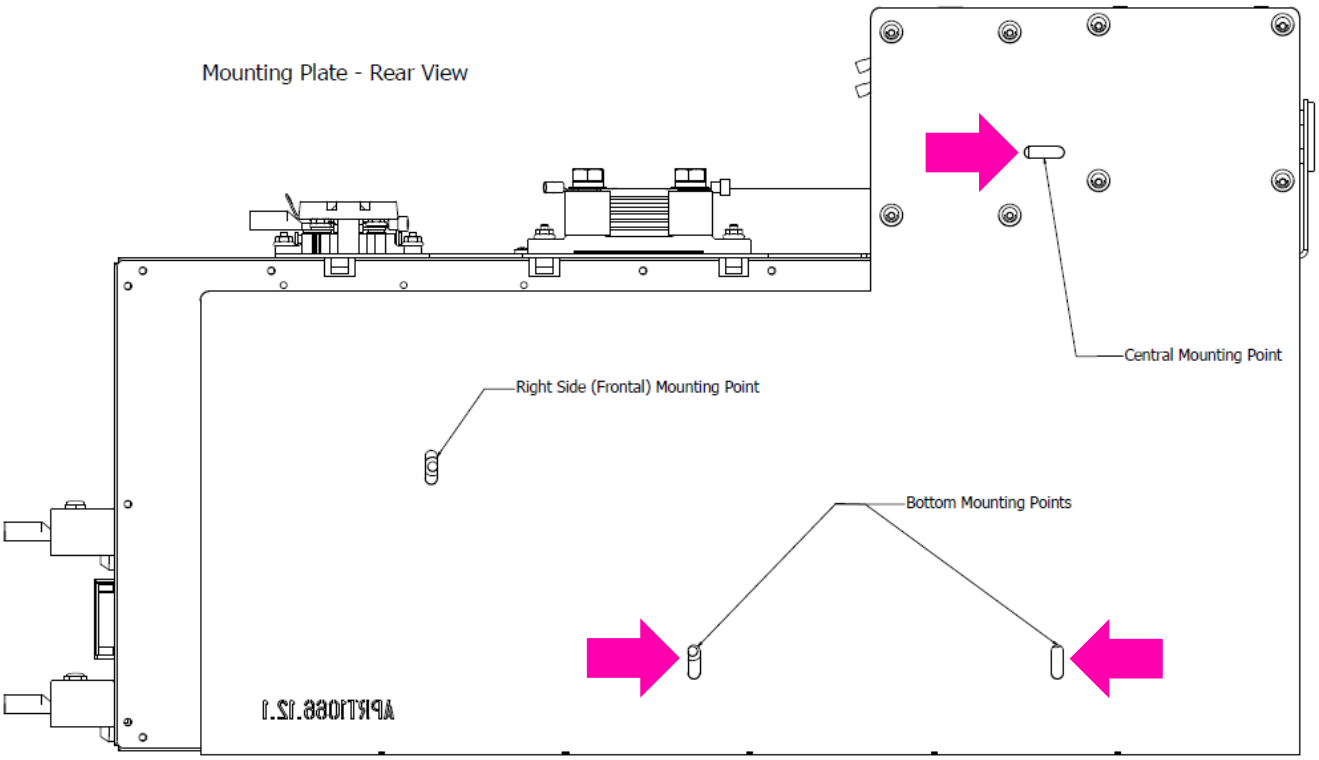
1. Locate second row seats and pull down with latch located on the top of the seat.
2. Remove the felt backing and black plastic cover to expose white vehicle chassis.
3. Insert and install M5 speed nut to the four protruding stand offs.



Stage 1 COMPLETE

Battery System Installation

Stage 2: Cangoee Isuzu D-Max Rear Mounting Plate Diagram



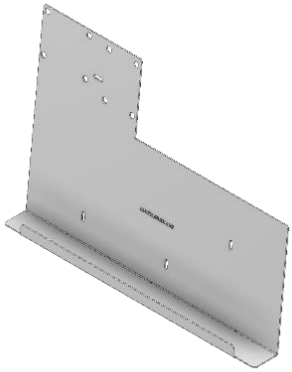
Stage 2.1: Placement of Battery – Location: Rear Seats

CAUTION REQUIRED

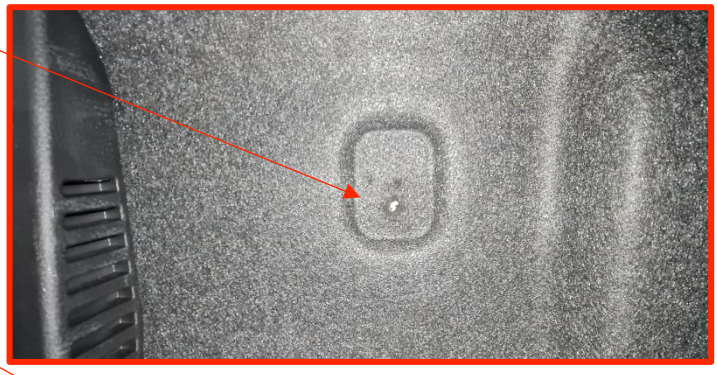
This installation works with live wires and electricity, ensure all safety guidelines are followed and proper equipment is used during this installation. Failing to follow these guidelines could result in incorrect installation of the Cangoee battery, malfunction, or severe injuries.

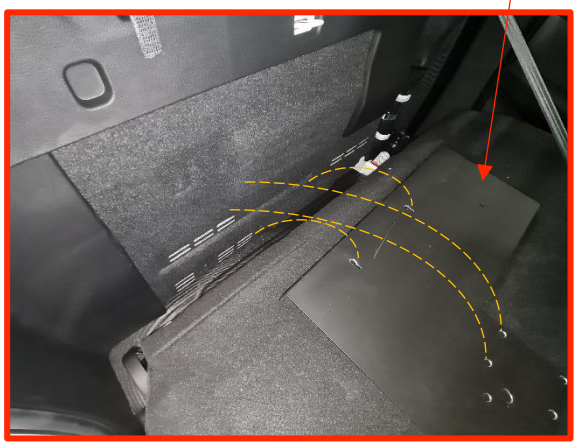
ATTENTION

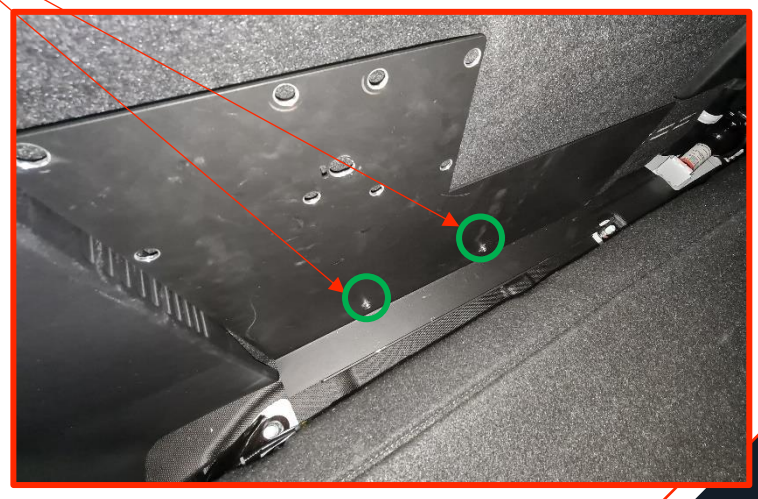
Please carefully view the different selection modes on page 21 as the switches are not easily accessible once installed.



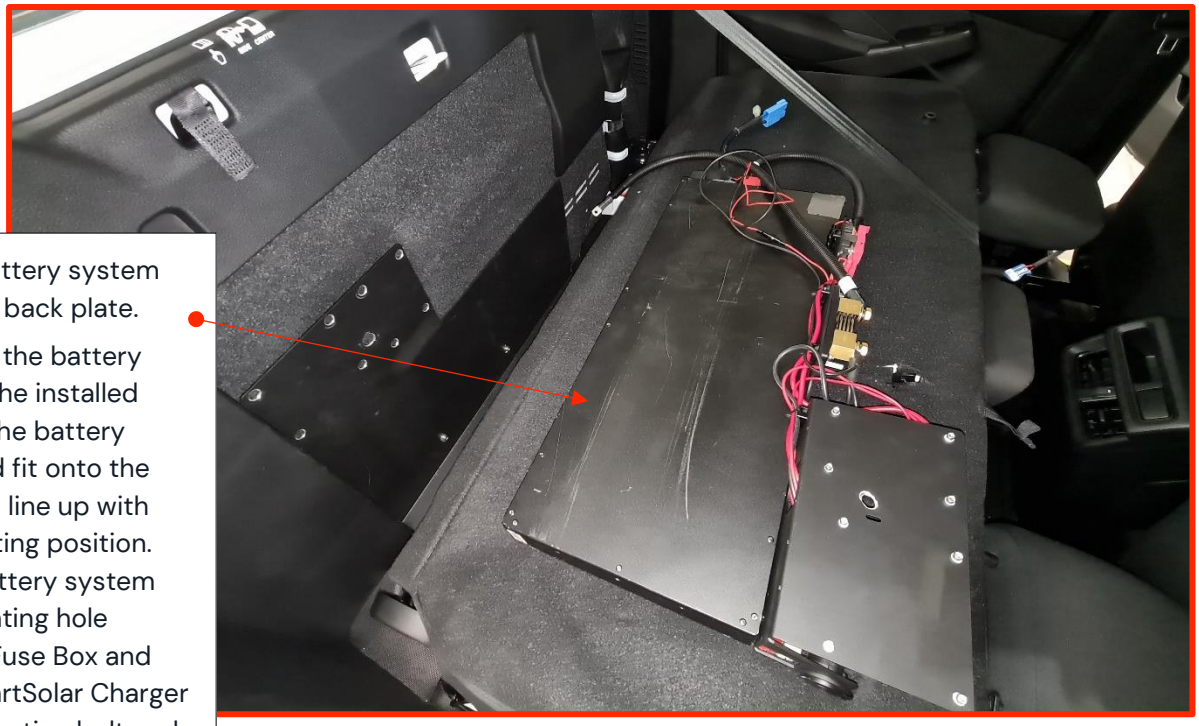
1. Reattach felt onto vehicle chassis and secure with glue.
2. Punch a small hole in felt on top mounting location to use as a guide for mounting vehicle kit back plate.
3. Line up back plate with the top mounting hole and use it to align with other mounting holes – bolt the back plate to the bottom two mounting points with the provided M5x25mm bolt and M5 washer.



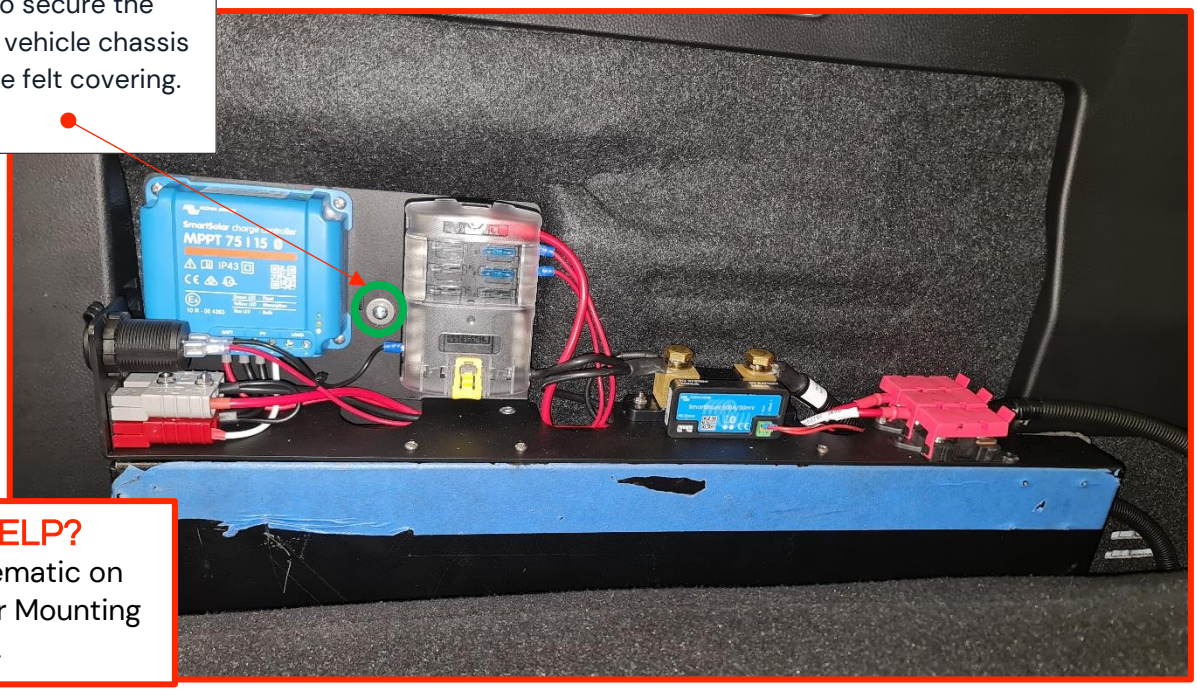




Stage 2.2: Fixing Battery in Place – Location: Rear Seats



4. Line up the battery system with mounted back plate.
5. Lift and insert the battery system onto the installed back plate – the battery system should fit onto the backplate and line up with the top mounting position. Secure the battery system with the mounting hole between the Fuse Box and the MPPT SmartSolar Charger – This M5 mounting bolt and washer will also secure the system to the vehicle chassis underneath the felt covering.

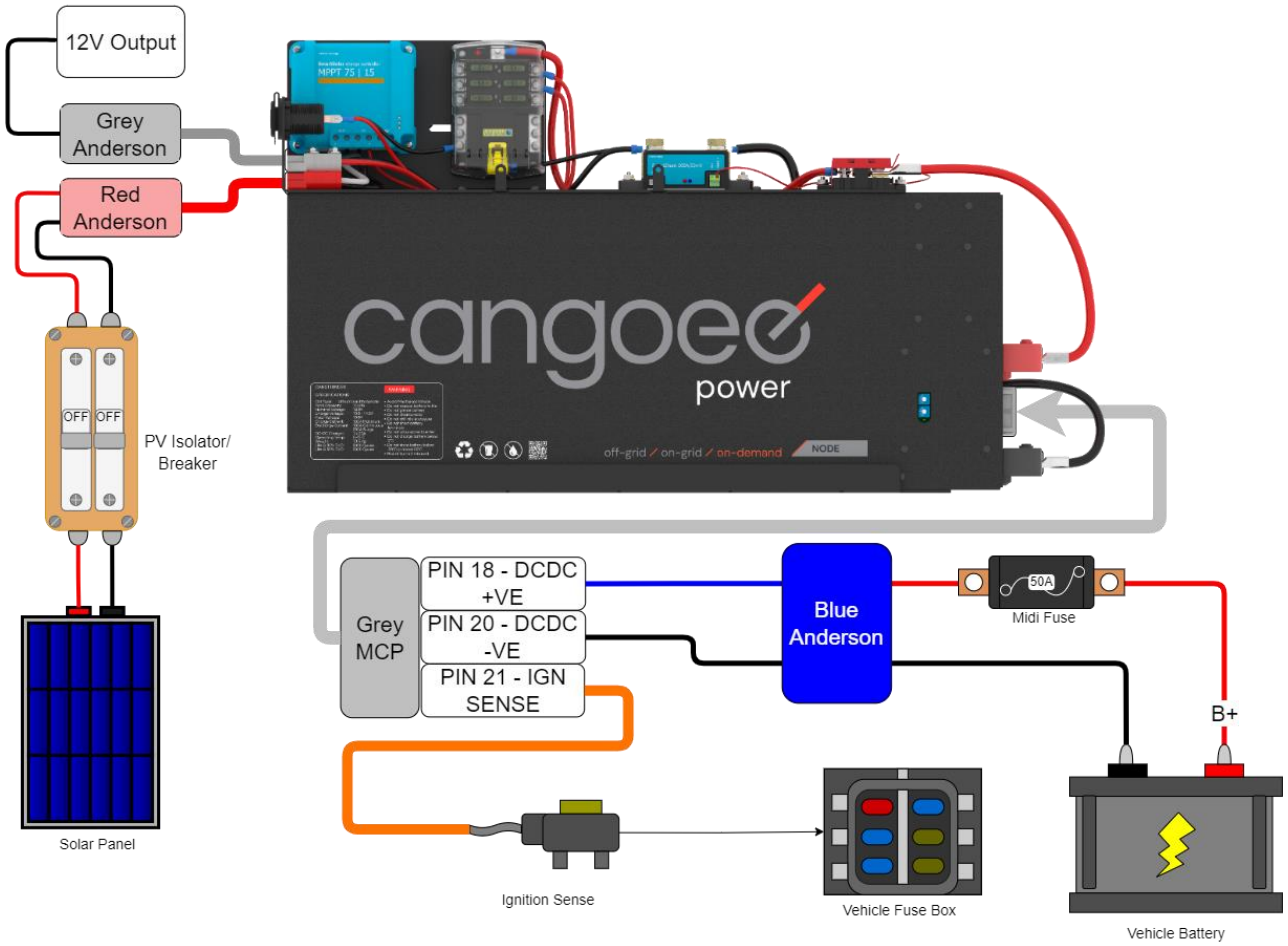


NEED HELP?
View Schematic on Page 11 For Mounting Locations.

Stage 2 COMPLETE

Engine Bay Cable Routing

Stage 3: General Wiring Diagrams – For User Reference



Stage 3.1: Main Cable Connections – Location: Rear to Front

1. Route DC-DC Cable from Blue Anderson behind the rear passenger seats along the door trims on the passenger side of the vehicle towards the vehicle firewall on the front passenger side.

Stage 3.2: Main Cable Connections – Location: Rear to Front

2. Route Cable through firewall grommet in engine bay
3. Route cable through engine bay around the right of the battery along the vehicle chassis (looking front on).

Stage 3 COMPLETE

Stage 4: Connections in the Engine Bay – Location: Engine Bay

CAUTION REQUIRED

This section details works involving the vehicle battery and electrical cabling, ensure all safety guidelines are followed and proper equipment is used during this procedure. Failing to follow these guidelines could result in incorrect installation of the Cangoee battery, malfunction, or severe injuries.

1. Attach Midi Fuse holder onto chassis with the provided M5 Bolt, M5 Flat Washer and M5 Spring Washer.
2. Connect DC-DC positive to 40A Midi Fuse in the fuse holder.
3. Run Main Positive B+ to the vehicle battery positive by rerouting back and around towards the rear of the vehicle battery.
4. Attach Negative/ Ground cable onto the battery negative

PLEASE NOTE – A M5 Nutsert will need to be installed in this location prior to securing the MIDI fuse bracket to the chassis.

Stage 4 COMPLETE

Ignition Sense Cable Connection

Stage 5: Ignition Sense Cable Connection to Battery System

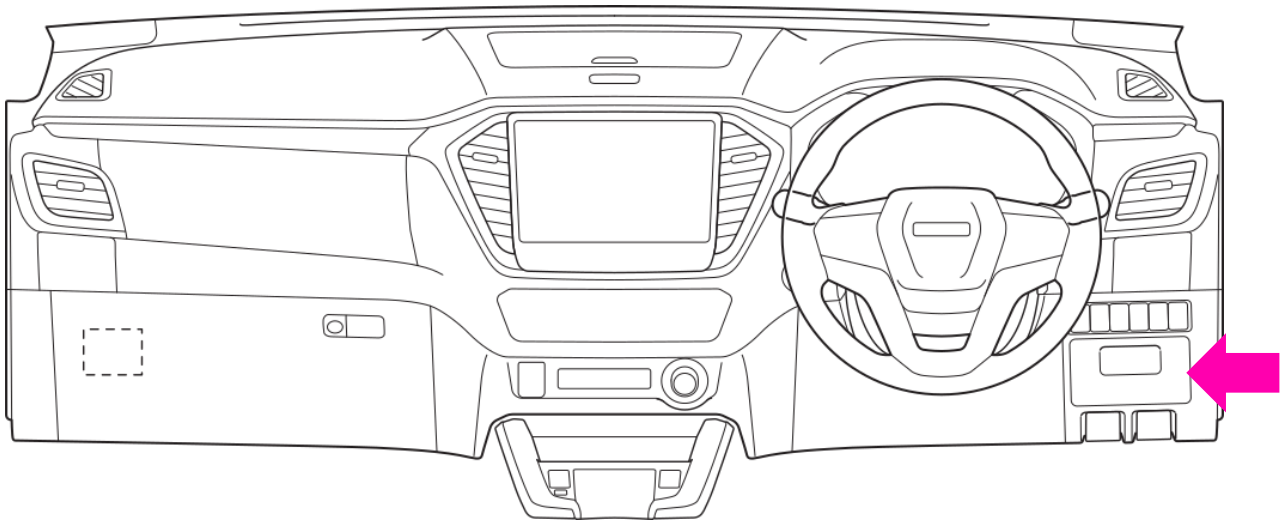
At the battery system – connect the Ignition Sense Cable Loom to the corresponding connector on the MCP Loom.

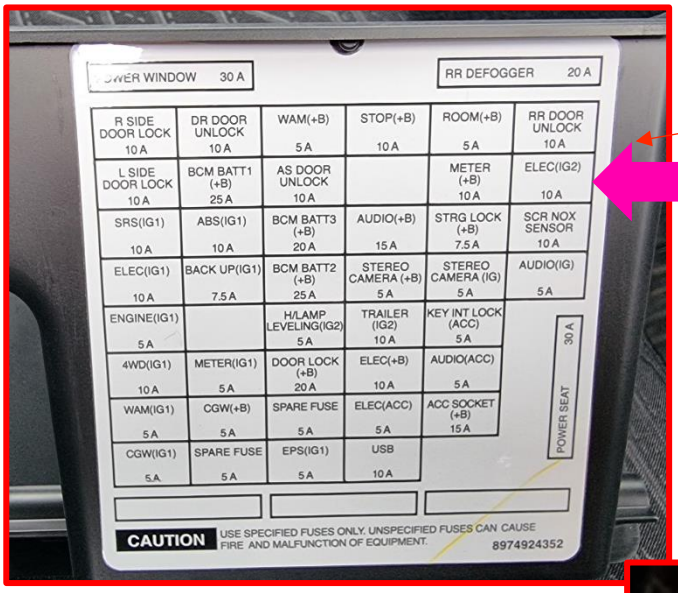
Cangoee Isuzu D-Max MY21 Ignition Sense Cable	Cangoee Isuzu D-Max MY21 MCP Loom
	

1. Route Ignition Sense Cable from behind the rear passenger seats along the driver side door trims towards the under-dash fuse box.

Stage 5.1: Ignition Sense Cable Connection to Under-Dash Fuse Box

The fuse box is located behind the Small Article Storage Pocket indicated below.





2. Once the storage pocket has been removed. The fuse box will be revealed. A diagram of the fuse box can be found labelled on the rear of the removed storage pocket.
3. Connect the Ignition sense cable to the slot labelled ELEC(IG2) indicated in the images.

Stage 5 COMPLETE

Completed Installation

Battery Installation

Engine Bay Connection

Congratulations on completing the installation of the Cangoee Battery Kit on an Isuzu D-Max MY21.

DC-DC Charger

The DC-DC charger in the Vehicle Kit allows the battery to charge from a vehicle engine/alternator/start battery. However, to prevent the depletion of the start battery, it is essential to limit charging to when the engine is actively running.

In some scenarios, determining when the engine is actively operating can be challenging. As a solution, the DC-DC charger uses a combination of inputs to decide when to initiate charging (turn ON) and when to cease charging (turn OFF). The primary goals of the charger are:

- Ensuring that charging occurs only when the engine is actively running, to maximise charging of the Vehicle Kit.
- Preventing charging when the engine is not running to avoid discharging the vehicle's start/cranking battery.

The logic for controlling when to activate or deactivate the DC-DC charger is executed through specialised software running on a microcontroller. This software allows for advanced control by considering several inputs including:

- Start battery voltage.
- Ignition signal voltage.
- Timing delays.
- Positions of 2 x 7-position (0-6) rotary switches: user-accessible from outside the battery.

Measured Voltage

The vehicle's start battery/alternator voltage will be measured with high precision, accurate to ±0.1V or better, and used as a reference for comparison with the ON and OFF levels.

The DC-DC Charger will be activated (start charging) when the **Measured Voltage** goes ABOVE the **ON Level**. Thereafter it will deactivate after the **Measured Voltage** goes BELOW the **OFF Level.**

The OFF level is lower than the ON Level by 1.0V; this forms a "dead-band" where the charger will simply remain in the same state (i.e., remain ON if already ON, and remain OFF if already OFF).

ON and OFF Levels can be selected by the user/installer by choosing the corresponding position on the **Voltage Switch**, which is the left rotary switch accessible from the outside of the battery indicated by the image below:

Voltage Switch Position	ON Level	OFF Level	Application
0	11.0	10.0	Always on: Ignition Relay/ Signal
1	12.0	11.0	When dealing with extended lengths of thin cable, it is **IMPORTANT** to consider **voltage drops**. It is recommended to measure the voltage at both the battery and at the end of the connected cabling. Please see the table on page 11 for recommended cable gauges
2	13.0	12.0	
3	13.3	12.3	
4	13.5	12.5	
5	13.7	12.7	
6	14.0	13.0	

Table 1 Measured Voltage Switch Position Table

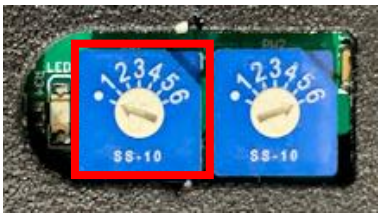


Figure 1 Left Rotary Switch for Measured Voltage Applications outlined in RED.

Delay Switch

Delay times can be selected by the user/installer by choosing the corresponding position on the **Delay Switch**, which is the right rotary switch accessible from the outside of the battery indicated in the image below:

Delay Switch Position	Delay OFF Time	Application
0	0 sec	Traditional Alternator, or Ignition Relay
1	30 sec	Vehicles with Smart Alternators
2	1 min	
3	1.5 min	
4	3 min	
5	5 min	
6*	***0 sec***	***Ignition signal control***

Table 2 Off Delay Switch Position Table

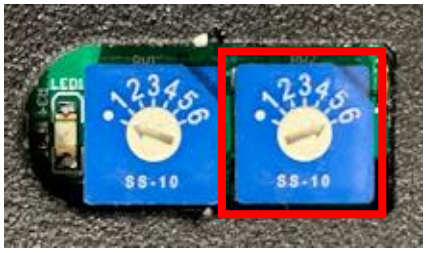


Figure 2 Right Rotary Switch for Off Delay Applications outlined in RED.

Off-Delay

After the measured voltage falls BELOW the OFF level, the DC-DC charger will incorporate a delay before turning off (ceasing to charge). This delay is implemented to accommodate smart alternators, which may lower the voltage for brief periods of time (duration may vary based on the drive cycle, vehicle model, and other factors).

During this delay period where the voltage has gone BELOW the OFF level and the DC-DC charger is "waiting" to turn OFF, the status LED will flash to indicate that it will turn off soon.

If the voltage rises ABOVE the ON level within this delay period, the timer will reset, and the DC-DC charger will stay on.

On-Delay

If the Ignition Signal is selected (position **6** on the **Delay Switch**) the DC-DC charger will wait **15 seconds** before turning ON. This delay prevents placing extra load on the start battery before and straight after the engine turns on. There is no On-Delay for other positions as the DC-DC Charger will monitor the vehicle start battery/alternator voltage to operate.

Ignition Signal

If **Position 6** on the **Delay Switch** is selected then the ignition signal (via a separate connection point) will serve as a binary reference (ON or OFF), and there will be no delay when turning off. This has two benefits:

- The ignition signal is (usually) a reliable indicator that the engine is running.
- Voltage drop considerations along the positive DC-DC charging cable are not required.

The default setting for most applications is 0 on the voltage switch and 6 on the delay switch, this enables DC-DC charging operation to be ON 15 seconds after the Ignition is on.

Note that even if the ignition signal is used for the measured voltage, there will still be a voltage drop along the negative path of the DC-DC charging cable to the start battery. Voltage drop is likely to be negligible along vehicle chassis, however, if the negative path is via a long and/or thin cable, then voltage drop may still be a factor and needs to be considered.

Victron Connect App

Download the Victron Connect application onto your smart device to access and manage the Power Hub's Victron Energy Components.

Victron Connect info:

Download on the App Store | Get it on Google Play | Available on the Mac app | Download for Windows

Victron Energy SmartSolar MPPT 75/15

Victron Energy SmartSolar MPPT 75/15	
Manual	Datasheet

The Victron Energy SmartSolar MPPT 75/15 model is a compact and highly efficient solar charge controller, ideal for optimizing solar power systems. It offers advanced Maximum Power Point Tracking (MPPT) technology to maximize the energy harvested from your solar panels.

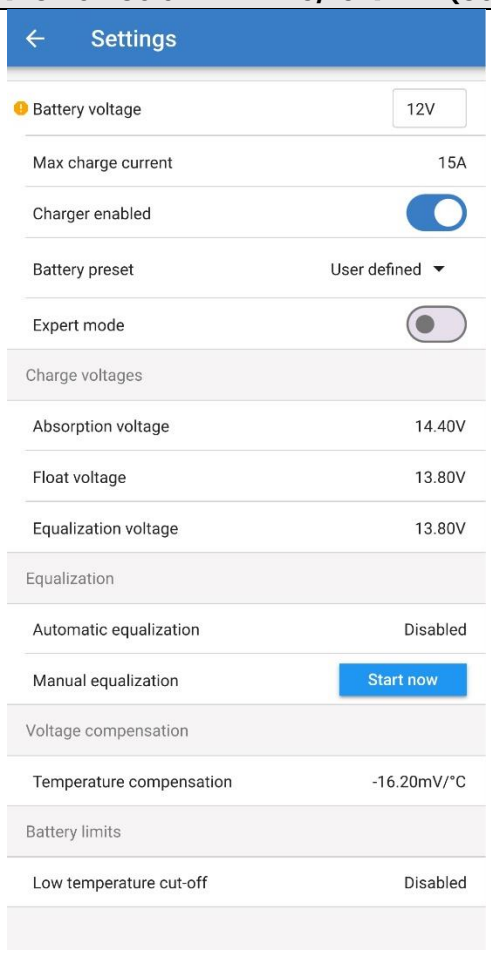
Solar Panel Array Input Limitations

MAX OPEN CIRCUIT VOLTAGE (Voc): 75 V

It is recommended to stay at least 10% below the rated maximum open circuit voltage (Voc)

MAX SHORT CIRCUIT CURRENT (Isc): 15A

Pre-set and suggested programming settings in the Victron Connect Application
Victron Connect → SmartSolar MPPT 75/15 → ⚙ (Settings) → Battery



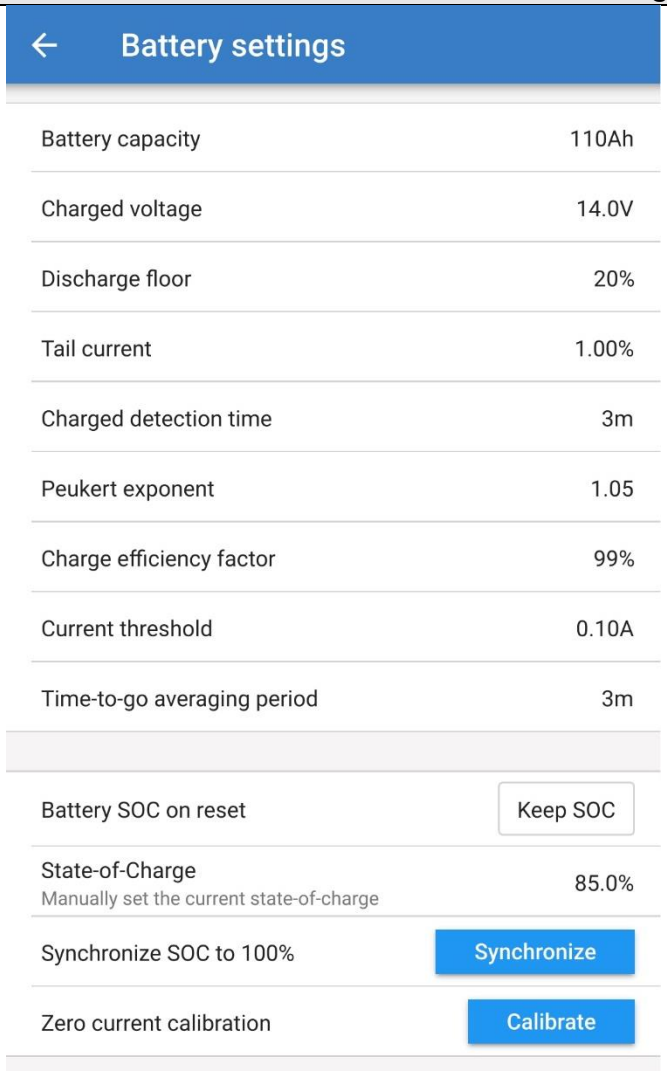
Victron Energy SmartShunt 500A/ 50mV

Victron Energy SmartShunt 500A/ 50mV	
Manual	Datasheet

The Victron Energy SmartShunt is an all in one battery monitor, only without a display. A smartphone can be utilised as a display. The SmartShunt connects via Bluetooth to the VictronConnect app on the smart device and conveniently displays all monitored battery parameters.

Pre-set and suggested programming settings in the Victron Connect Application

Victron Connect → SmartShunt 500A/ 50mV → (Settings) → Battery



Battery Management System

The Vehicle Kit is equipped internally with a Battery Management System (BMS), which is an electronic solid-state circuit board that serves multiple important functions:

- Battery Cell Management: The BMS manages and maintains the cells within the battery.
- Safety Measures: The BMS provides safeguards that protect against overcharging and over-discharging as well as activating in response to situations where the battery is producing low voltage (less than 10.5V), overcurrent (more than 100A), or short-circuit situations.
- Cell Balancing: The BMS ensures that the Power Bank cells are equalised throughout its operation to promote overall efficiency and longevity.
- Cell Temperature Sensing. If the BMS detects the temperature of the cells to be above 45˚C, it will automatically stop charging and discharging until the temperature has returned within the range of 0˚C - 45˚C.

Unlike lead-acid batteries, overcharging or over-discharging a lithium battery may lead to a hazardous scenario, therefore, the BMS is essential to the lithium battery.

Safety Tips

The battery contains Lithium Ferrous Phosphate (LiFePO4) cells, considered to be the safest of all lithium-ion chemistries. The battery consists of a large amount of stored energy. Please follow these safety tips for use and operation:

- Ensure the battery is secured safely before travel.
- Do not drill into the enclosure. Doing so may inadvertently puncture one of the internal cells.
- Do not short-circuit the battery. Be careful not to drop a metallic object across the two exposed terminals. Always keep the terminal caps on the Positive (red) and Negative (black) posts during operation.
- Do not mount the battery upside down. The battery can also be mounted on its side if mounting upright is not an option.
- Do not connect multiple batteries in series to raise the voltage. The BMS is not designed to accommodate higher voltages.

Longevity Tips

Factors that mainly affect the lifespan of the battery are depth of discharge and operating temperature. To ensure longevity and use of the battery:

- Do not fully discharge the battery to zero. Each time the battery is discharged to zero, either intentionally or unintentionally, it reduces the lifespan of the battery.
- Do not discharge the battery below 80% depth of discharge (i.e., 20% full).
- Do not charge the battery outside the range 0˚C - 45˚C to maximize the life of the battery and avoid damage to the cells.
- Avoid exposing the battery to direct sunlight, mount the battery in a compartment or undercover.

The cells are designed to last 2,000 cycles at 80% DOD (Depth of Discharge) and 5,000 cycles at 50% DOD.

Tips for Use

- Batteries of the same voltage may be placed in parallel to increase storage capacity. However, each battery should be independently fused, and the battery must be from **CANGOEE**.
- If the battery temperature is potentially less than 0˚C it is essential to allow the battery to warm to ambient temperature before connecting power to it.
- The battery is splash-proof and water resistant but not waterproof, **DO NOT** directly submerge the battery in water.
- The battery is designed to be housed in a dry, enclosed compartment, not in direct sunlight or exposed to outside weather conditions for an extended period.
- Only use Lithium Battery Chargers to recharge the battery.

Maintenance Tips

If not using the battery for a prolonged period (months at a time), then store the battery as follows:

- Disconnect all loads from the battery so that there is no external current drawn.
- Ensure the battery is close to full capacity as the battery will slowly self-discharge over time.
- Do not keep the battery on trickle charge as this may harm the internal battery cells.

Within every two months, give the battery a quick recharge to ensure battery longevity.