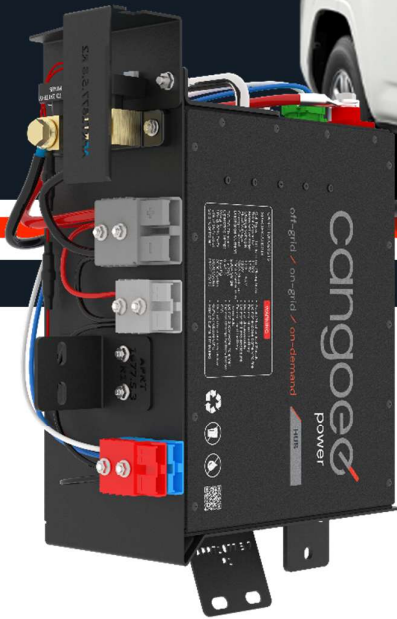


# 300 Series Toyota LandCruiser Installation Manual

INS0185



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

cangoe

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# Document Changelog

Revision	Date	Author/ Edit	Checked	Comments
R1	OCT-22	RJ	DK	This is the first revision
R2	MAR-24	SH		Updated format, information, and diagrams
R3	OCT-25	OR	OR	Page 17
R4	NOV-25	OR	OR	Page 17
R5	DEC-25	OR	OR	Page 11
R6	DEC-25	OR	OR	Page 4

## 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

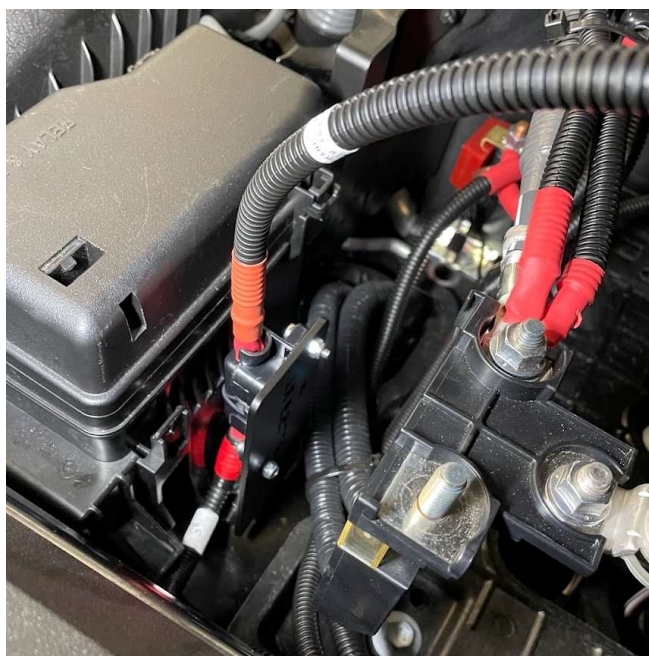
This document serves as a comprehensive guide for installing the Cangoee battery kit in the Toyota Land Cruiser 300 Series MY23. As this installation involves electrical equipment and live cables, it is crucial to ensure a competent, cautious individual performs the procedure. Please be aware that the jack and subwoofer (models that have the subwoofer installed) won't fit under the trim after installing the battery kit.

## Completed Installation





### Battery Installation








### Engine Bay Connection



# Tools

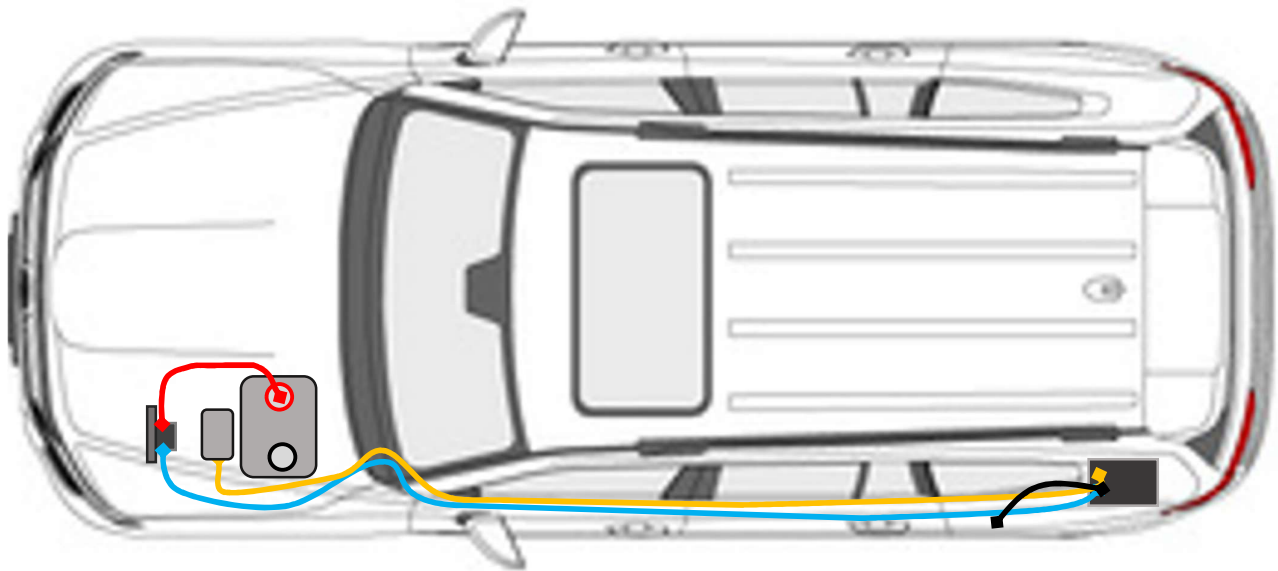
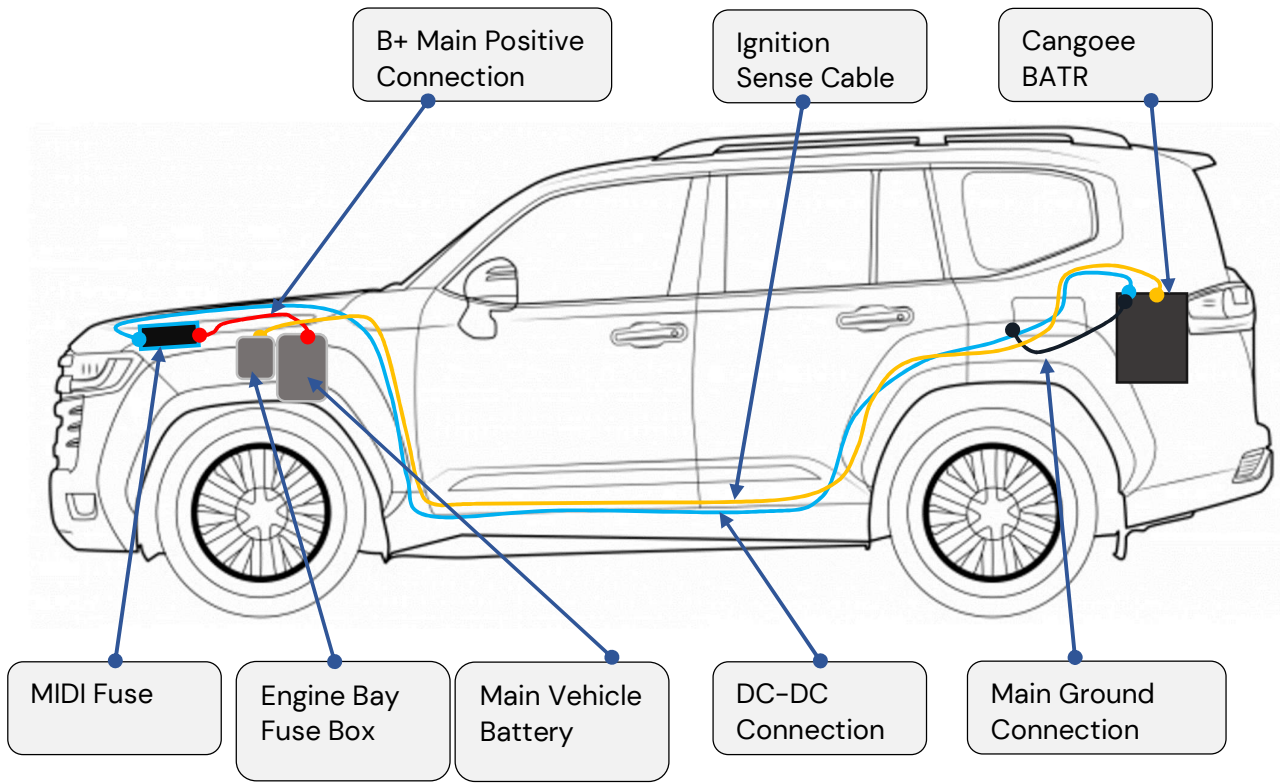
Tool	Description	Visual
13mm Socket	13mm Ratchet Socket to remove Hex Head Screws/ Bolts	
12mm Socket	12mm Ratchet Socket to remove Hex Head Screws/ Bolts	
10mm Socket	10mm Ratchet Socket to remove Hex Head Screws/ Bolts	
8mm Socket	8mm Ratchet Socket to remove Hex Head Screws/ Bolts	

## What's in The Kit

Tool	Description	Visual
CANGOEE LC300 Vehicle Battery Kit	The battery system for installation	
DC – DC Charge Cable	DC-DC long twin core cable with black outer insulation: Red and Black Connections	
Ignition Sense – Fuse Tap Cable	Used for the Ignition Sense function: Black braided with fuse clip on end	
Midi Fuse on Bracket	Midi Fuse attached to bolt-on bracket	
Main Positive Battery Connection (B+)	Cable connection for Midi Fuse	

Please ensure proper care when handling these parts, as no spares are included in this kit.

# Installation Overview



Top view of installation: with DCDC cable (**BLUE**), Ignition Sense Cable (**ORANGE**), Main B+ Cable (**RED**) and Ground Connection Cable (**BLACK**).

## Stage 1.1 – Remove Boot Space Panels



1. Fold back row seats back down to floor level
2. Remove side panels on plastic wall that are on Passenger side of vehicle.



## Stage 1.2 – Remove Side False Floor Panels



1. Remove Passenger-side bottom panels on both sides by lifting the plastic clip and unscrewing Phillips head screw that is underneath it.
2. Remove rear plastic bumper by prying off carefully.
3. Fold over and remove rear false floor



## Stage 1.3 – Remove Rear Seat Plastic Covers



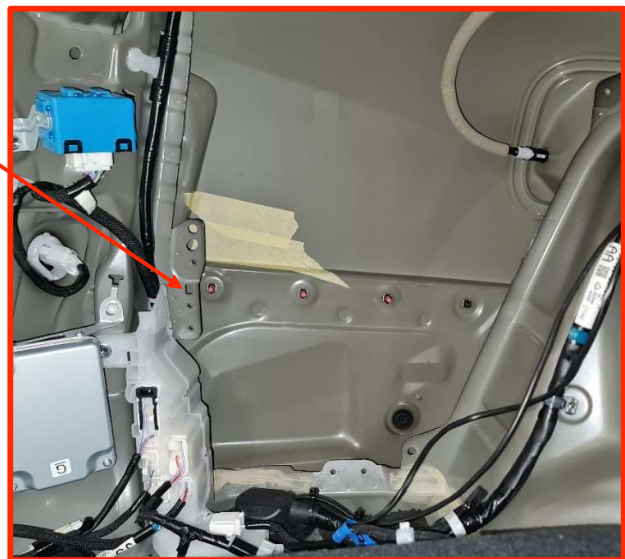
1. Take off plastic covering from rear folded seats, this panel can be pried off
2. Pry off rear cup holder on side plastic panel to make removal of side panel easier – ensure proper care is taken when removing panel as small clips may break if pulled too hard



## Stage 1.4 – Remove Boot Space Side Panel & OEM Jack



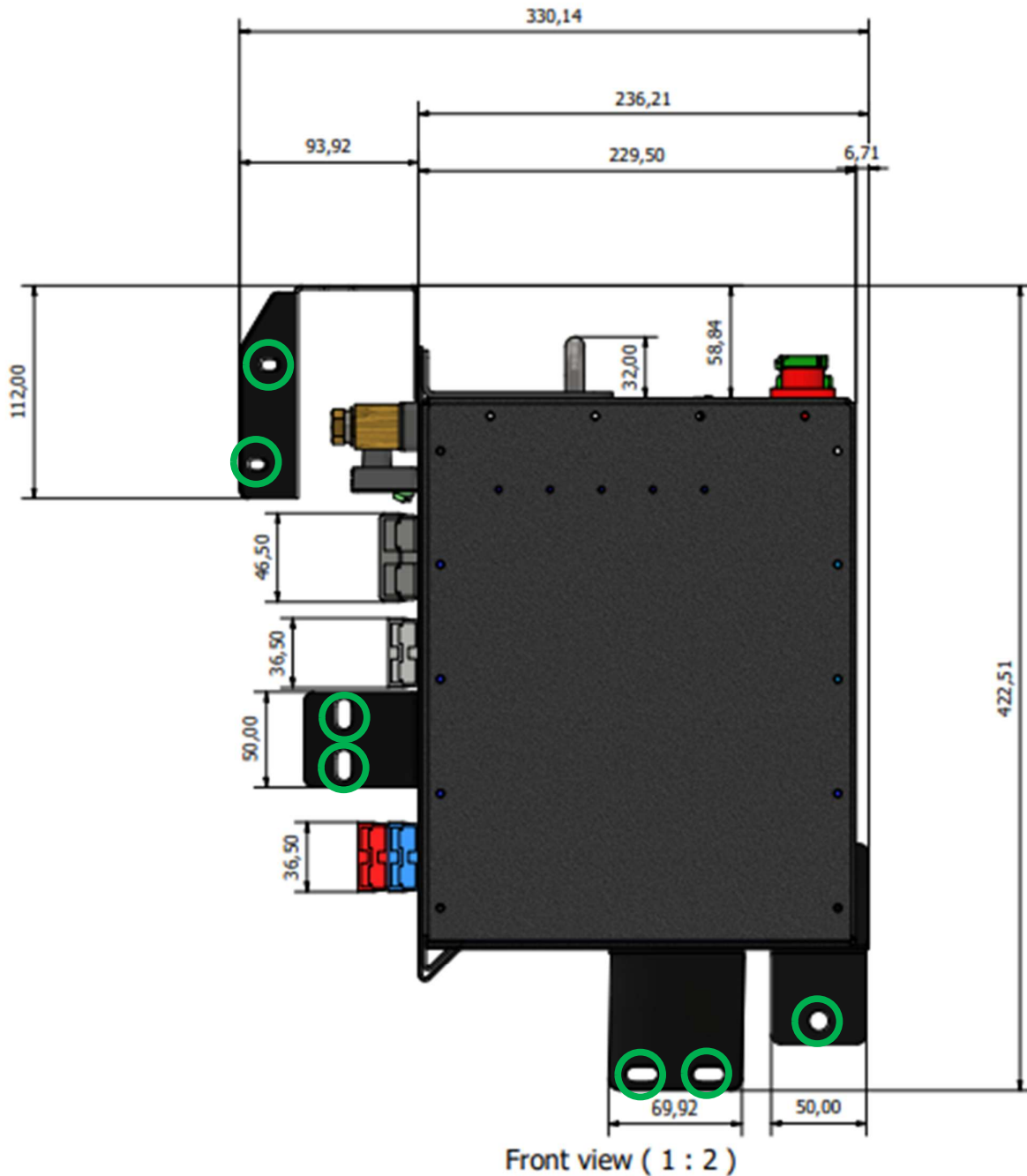
1. Carefully remove the side plastic panel – this can be done by releasing the clips internally and working slowly from left to right and top to bottom to pull away the panel. Ensure care is taken when removing the panel, as the clips may break if pulled with too much force
2. Unscrew the OEM jack and its storage mount. Please be aware that you will have to relocate these items, as there will be no room for them after the installation is completed



Stage 1  
Complete

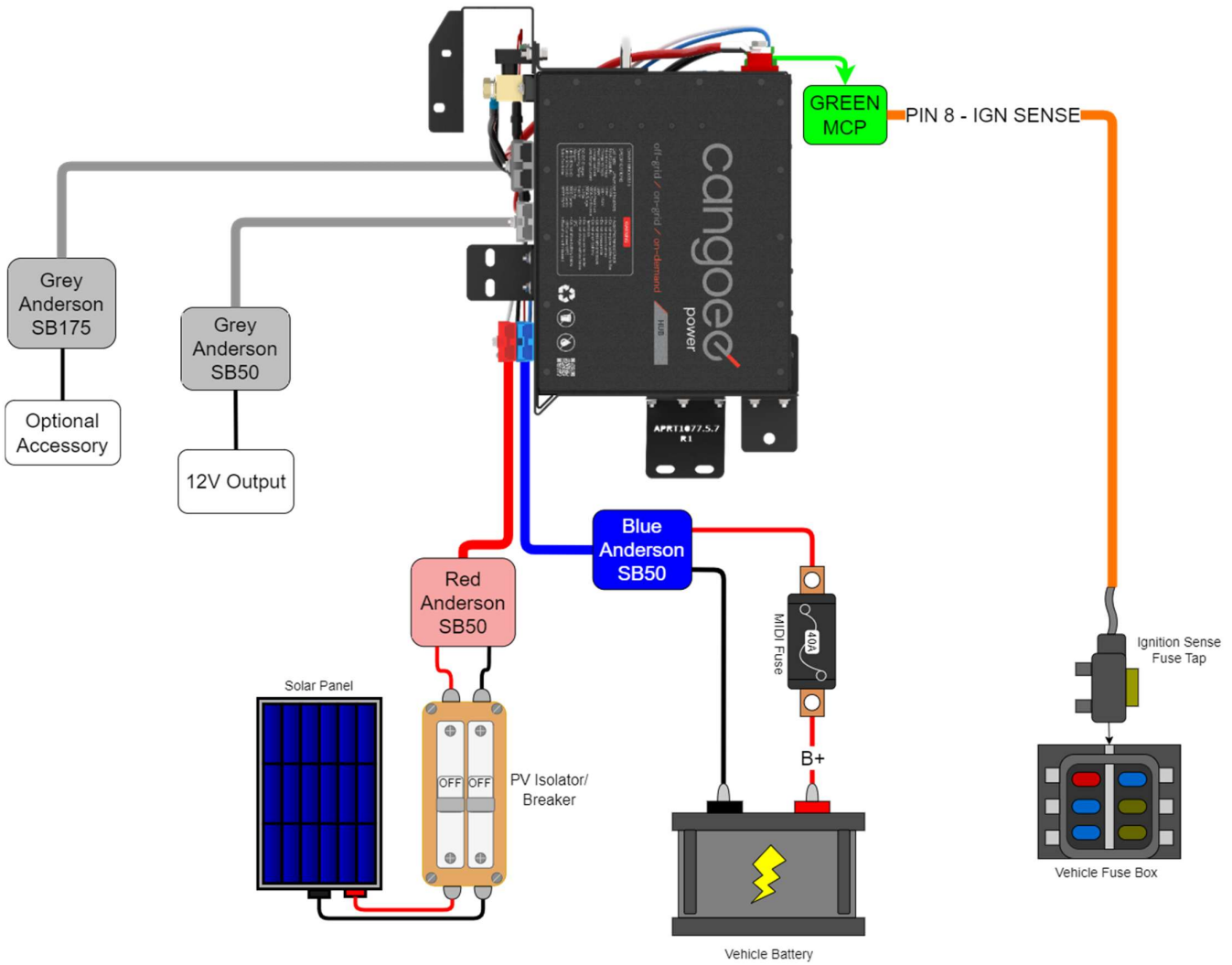
# Mounting Locations/ General Dimensions BATR – For stage 2

Please Carefully view the diagram for correct mounting points (Denoted in Green)

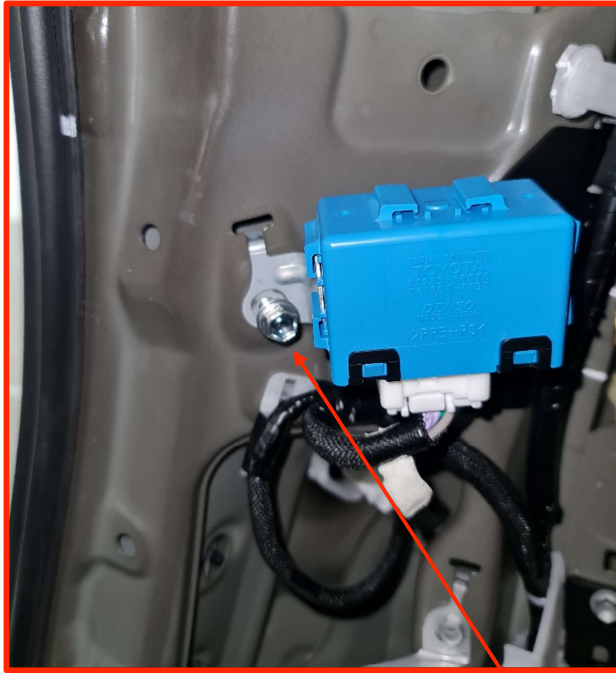


# General Wiring Diagram – For User Reference

**Please Note:** This is for illustration purposes only and is **NOT** intended to be used as a guide for installation.



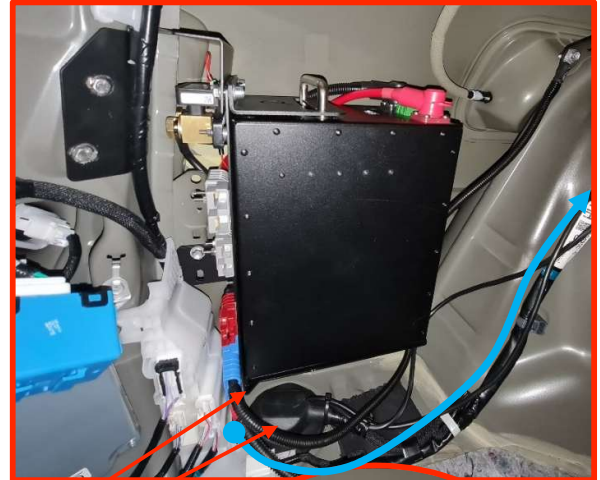
## Stage 2.1 – Installing Battery System- Rear Install



1. Disconnect the relay box from the side wall chassis – ensure that you do not damage or puncture any wires when removing as this could cause damage to your vehicle
2. Screw on mounting plates to side chassis on top and bottom top and bottom – please ensure these are tightened as the battery may come loose whilst the vehicle is in motion, which could cause severe damage to the CAN battery system
3. Bolt on battery and place wires to the side



## Stage 2.2 – Install Battery System Wiring DC-DC

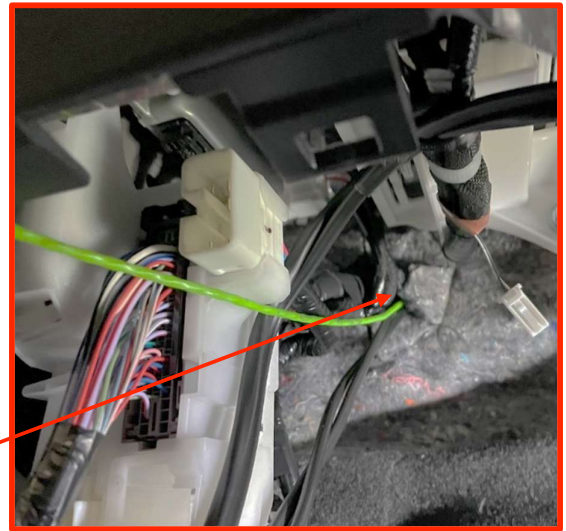


1. Connect DC-DC and Main Negative to blue Anderson plug, ensure that cables are zip tied or otherwise held in place
2. Connect main negative to chassis as shown and screw into place
3. Run ignition sense cable with DC-DC cable through the passenger-side firewall and over wheel arch
4. Replace rear vehicle passenger side trim.



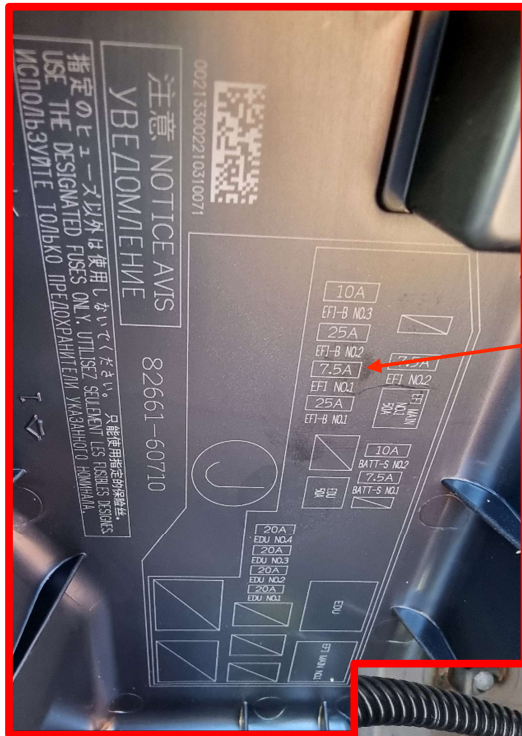
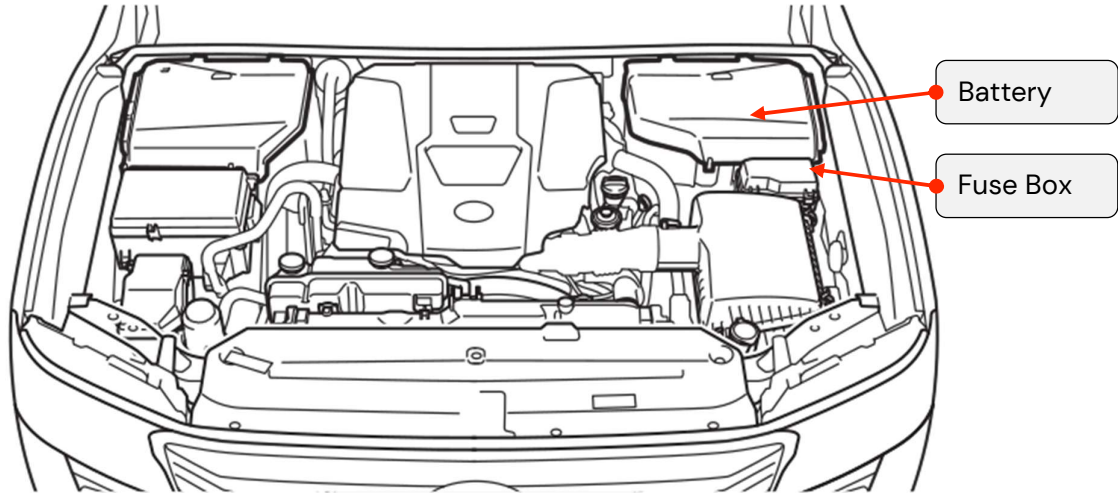
Stage 2  
Complete

## Stage 3.1 – Routing DC-DC Charge Cable Installing Ignition Sense

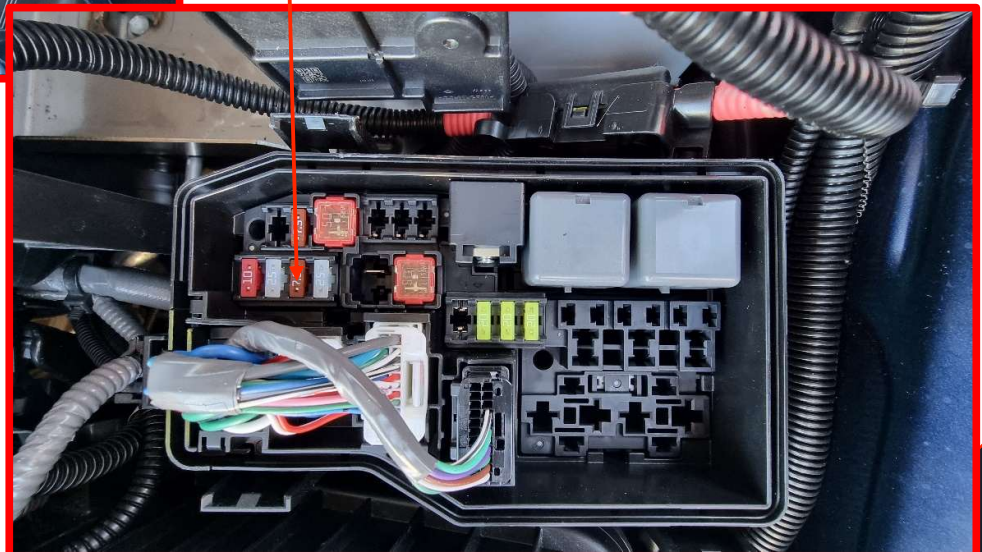


1. Route DC-DC and Ignition sense cable through passenger side firewall grommet – cable manage using existing cable channels along passenger side door trims.  
**\*\*Please note:** the vehicle battery may need to be removed before firewall grommet access is possible\*\*.

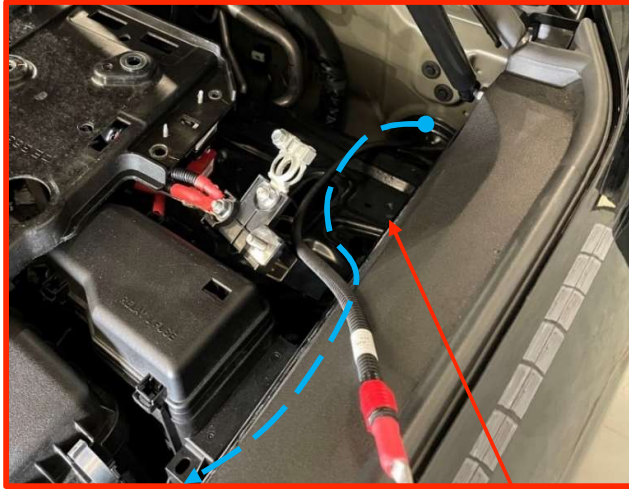




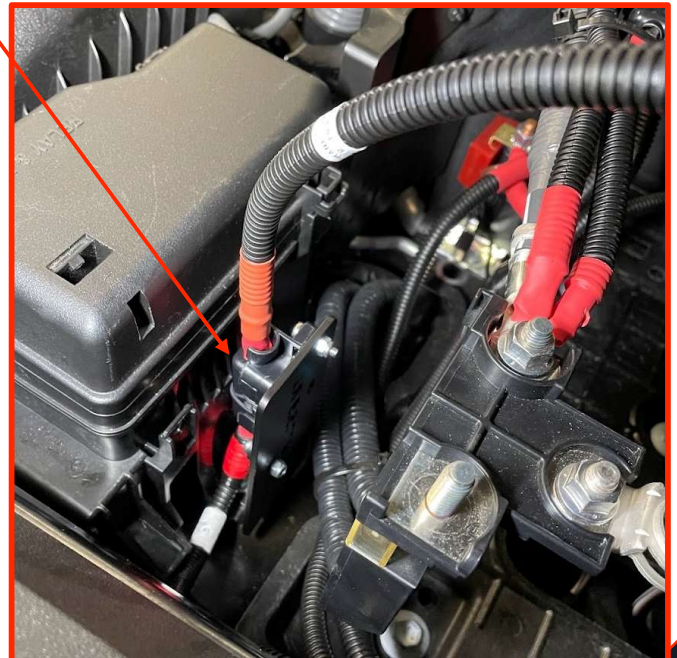
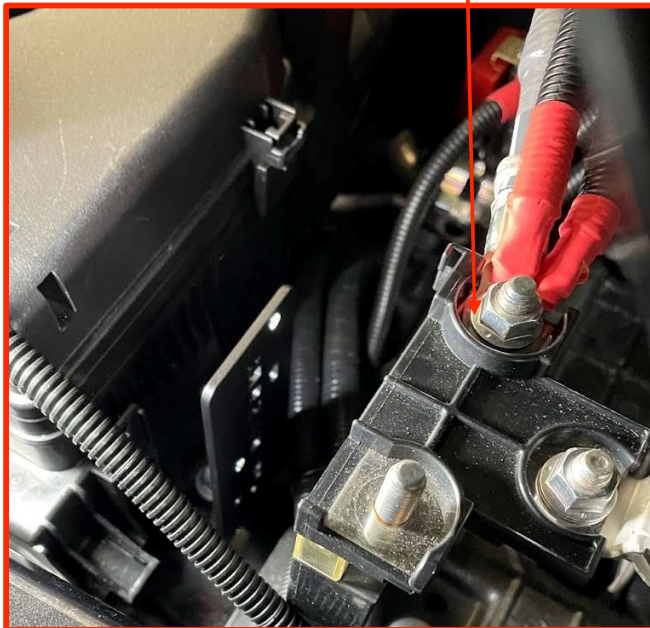
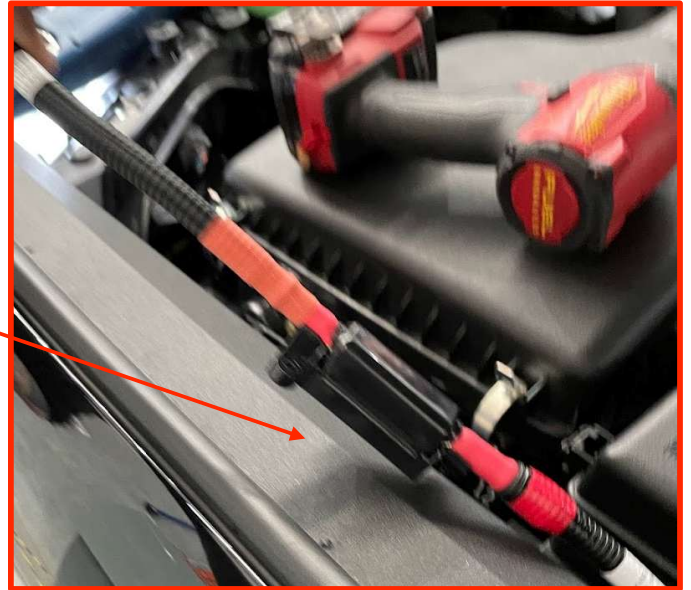
2. Route and connect the Ignition Fuse loom to the fuse box located in the engine compartment. The fuse box is located just in front of the vehicle battery.
3. Connect the Fuse tap to EFI NO.1 slot.



## Stage 3.2 – Installing Midi Fuse and Connect DC-DC Charge Cable to Vehicle Battery



1. Connect DC-DC Charge Cable to MIDI Fuse and attach Main B+ positive cable to adjacent end of MIDI Fuse
2. Secure MIDI Fuse bracket to side of relay box as shown
3. Run Main B+ Cable around to vehicle battery terminal.



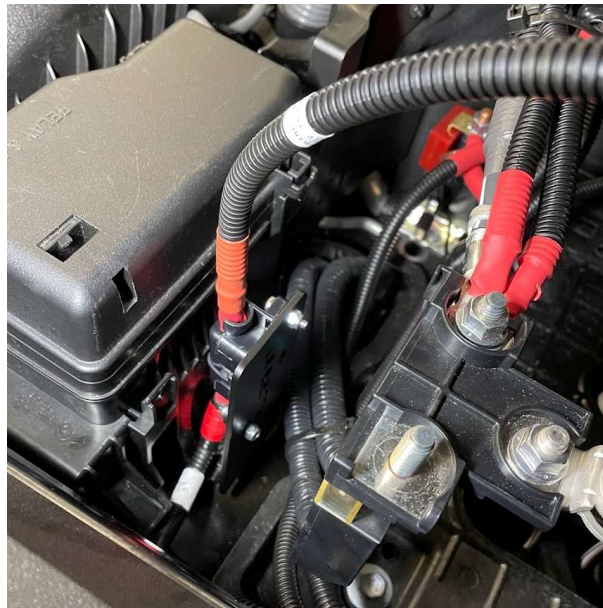
Stage 3  
Complete

# Completed Installation

## Battery Installation



## Engine Bay Connection



**Congratulations on completing the installation of the Cangoee Battery Kit on the Toyota LandCruiser 300 Series MY23.**

# 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  $\pm 0.1V$  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 <b>IMPORTANT</b> to consider <b>voltage drops</b> . It is recommended to measure the voltage at both the battery and at the end of the connected cabling.
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

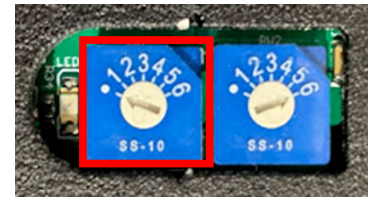


Figure 1 Left Rotary Switch for Measured Voltage Applications outlined in RED.

## 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	
<b>6*</b>	<b>0 sec</b>	<b>Ignition signal control</b>

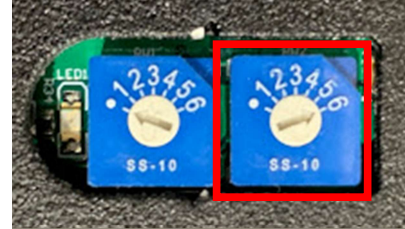


Figure 2 Right Rotary Switch for Off Delay Applications outlined in RED.

Table 2 Off Delay Switch Position Table

## 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.

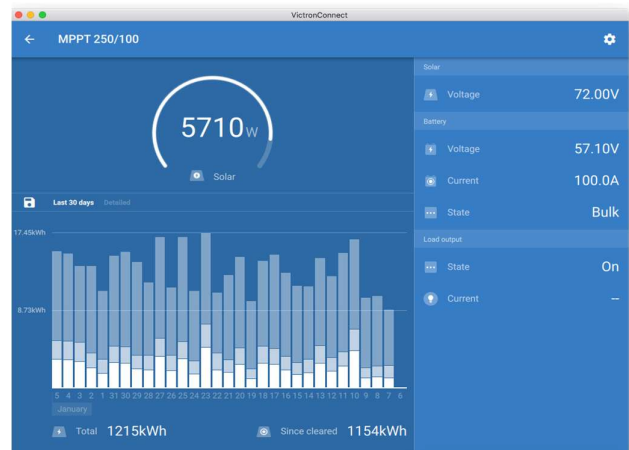
The default setting for most applications is 0 on the voltage switch and 6 on the delay switch, this enables DC-DC charging operation to be ON 15 seconds after the Ignition is on.

Note that even if the ignition signal is used for the measured voltage, there will still be a voltage drop along the positive 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:



# 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. This is the model that is directly integrated within the vehicle kit's battery.

## Solar Panel Array Input Limitations

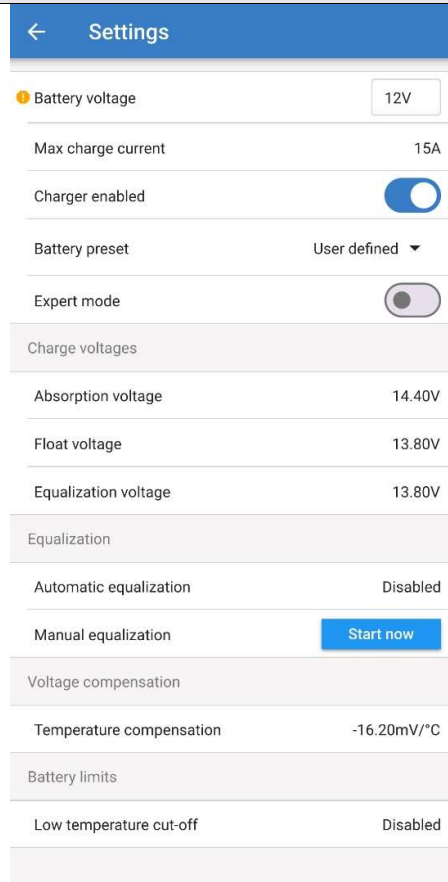
**MAX OPEN CIRCUIT VOLTAGE (Voc): 75 V**

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 settings	
Battery capacity	110Ah
Charged voltage	14.0V
Discharge floor	20%
Tail current	1.00%
Charged detection time	3m
Peukert exponent	1.05
Charge efficiency factor	99%
Current threshold	0.10A
Time-to-go averaging period	3m
Battery SOC on reset	Keep SOC
State-of-Charge <small>Manually set the current state-of-charge</small>	85.0%
Synchronize SOC to 100%	<b>Synchronize</b>
Zero current calibration	<b>Calibrate</b>

# Battery Management System

The Vehicle Kit's battery 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.

## BMS Off Functionality

The BMS is equipped with a remote load disconnecter which can cut off power/ voltage from the main positive and negative terminals. This functionality is intended for isolating remote loads and should only be utilised as a substitute for a dedicated isolator. It can be activated by supplying 12V to PIN 12 of the MCP Connector which will internally disconnect all loads from the battery terminals.

**Please Note:** The activation of this functionality will also disable the battery's ability to charge.

- ❑ For single or multiple batteries in a switched circuit setup, it is considered best practice to fuse PIN 12 to the main positive with a fuse rated for 1 to 2 Amps. **DO NOT** connect PIN 5

## 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 is frozen it is essential to allow the battery to thaw and wait for an appropriate room 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.
- ❑ Update firmware for Victron components whenever available.

## 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 draw.
- ❑ 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.