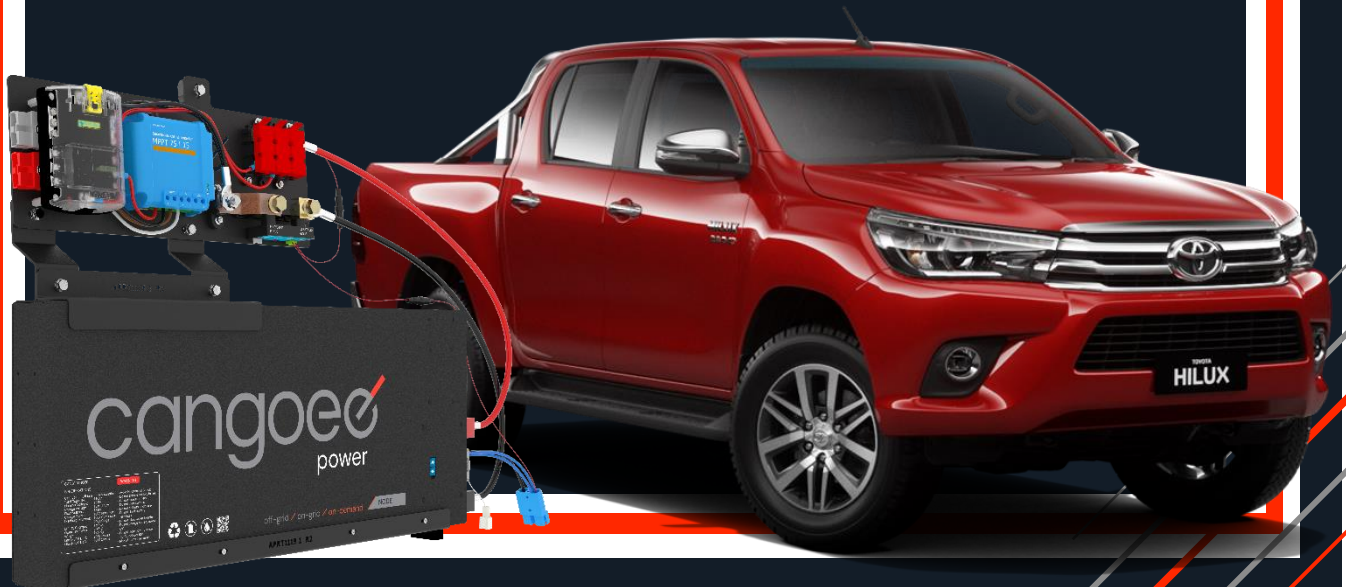


MY23 Toyota Hilux Battery Kit

INS0208



cangoe
power

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

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Revision	Date	Author/ Edit	Checked	Comments
R1	06/06/2024	TW/SH		Initial Revision

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

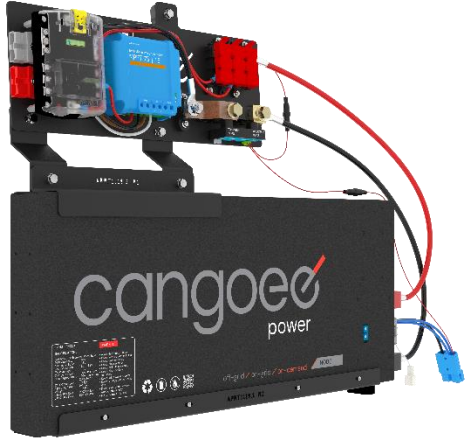
This document serves as a comprehensive guide for users to successfully install the Cangoee battery kit in the Toyota Hilux MY23. As this installation involves electrical equipment and live cables, it is crucial to ensure that the procedure is performed by a competent and cautious individual.

Completed Installation



Item List


Battery Kit

Item Image	Item Name	Part Number	Quantity
	Cangoee Toyota Hilux Vehicle Battery Kit	FASM1119	1




Brackets & Spacers

Item Image	Item Name	Part Number	Quantity
	Cangoee Toyota Hilux Top Clamp	APRT1119.3	1
	Cangoee Toyota Hilux Distribution Board Spacer	APRT1119.5	1
	Toyota Hilux Engine Bay MIDI Fuse Holder	BKT10389	1








Installation Looms






Item Image	Item Name	Part Number	Quantity
 <p>A coiled black braided wire loom with a black connector on one end and a green connector on the other.</p>	<p>Toyota Hilux Ignition Sense Loom</p>	<p>WIR10476.7</p>	<p>1</p>
 <p>A coiled black braided wire cable with a blue connector on one end and a red and white connector on the other.</p>	<p>Cangoee Toyota Hilux DCDC Charge Cable</p>	<p>WIR10476.6</p>	<p>1</p>
 <p>A coiled black braided wire cable with a red and black connector on one end and a metal ring terminal on the other.</p>	<p>Cangoee Toyota Hilux MIDI Fuse to Vehicle Batt</p>	<p>WIR10436.4</p>	<p>1</p>

Modules

Item Image	Item Name	Part Number	Quantity
	Strip MIDI Fuse Holder	PEle SFH	1
	40A MIDI Fuse – Bolt On	CFus SWE-MIDO40	1
	3mm Foam	XAM TT7492GY48	0.9m

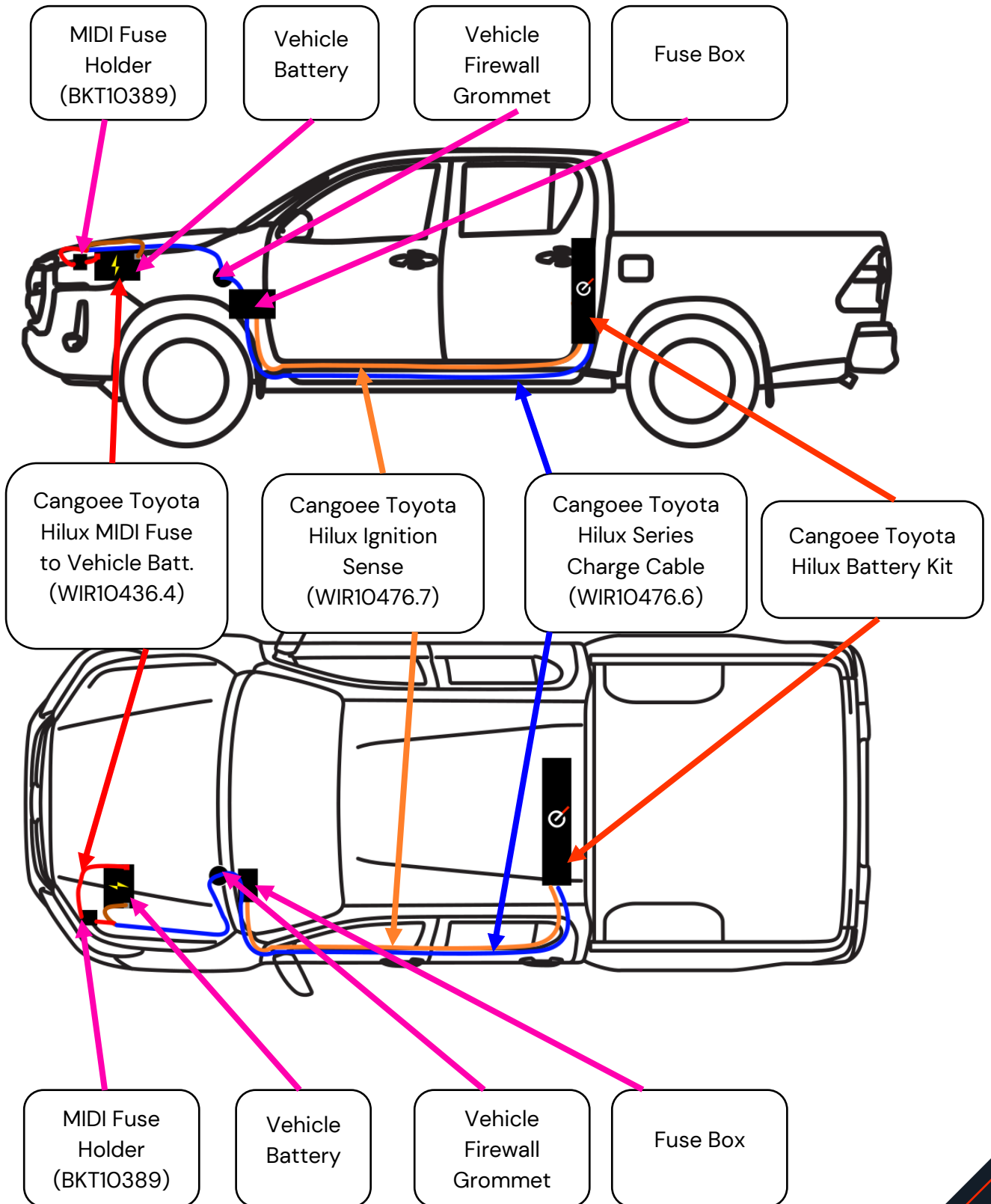
Fasteners

Item Image	Item Name	Part Number	Quantity
	8Gx12mm Pan Head Phillips Black Screw	XAM 8Gx12BZPPCRMT BLK	4
	M3 Nutsert	XAM AALM315	1
	M3x25mm Pan Head Phillips Zinc Plated Screw	XAM 3x25MZPPCRMT	1
	M3 Stainless Steel Flat Washer	XAM 3MG304W	1
	M4x20mm Button Head Phillips Screw	XAM 4X20MG304BHS S	2
	M4 Flat Zinc Plated Washer	XAM 4MZPEW	2
	M4 Stainless Steel Nyloc	XAM 4MG304NN	2

	M6 Steel Nutsert	XAM IN-YLFO6-4.2	2
	M6x20mm Hex Head Zinc Plated Set Screw	XAM 6X20MZPSS	6
	M6x16mm Hex Head Stainless Steel Set Screw	XAM 6X16MG304SS	1
	M6 Stainless Steel Flat Washer	XAM 6MG304W	6
	M6x2.5x1.6 mm Zinc Plated Spring Washer	XAM 6MSW	1
	M6x19mmx1.2m m (1/4"x3/4") Zinc Plated Washer	XAM 14X34ZPEW	1

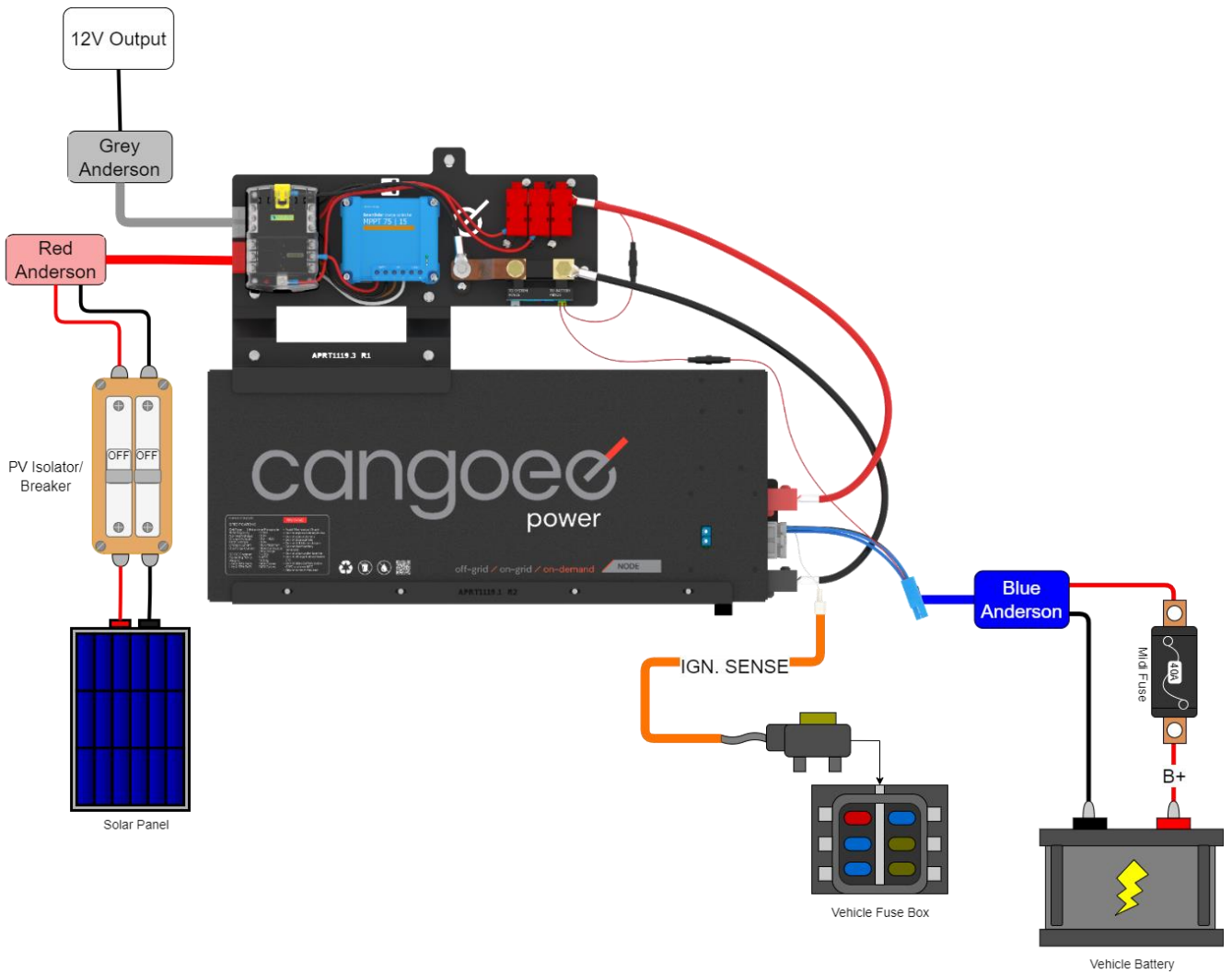
Installation Overview

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



Wiring Schematic

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



Battery Installation Procedure



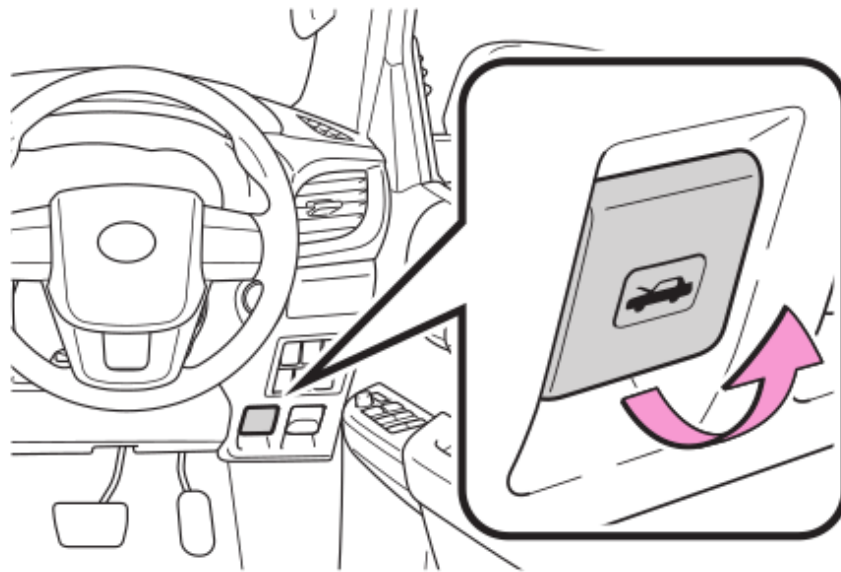
CAUTION REQUIRED

This installation 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 injuries.

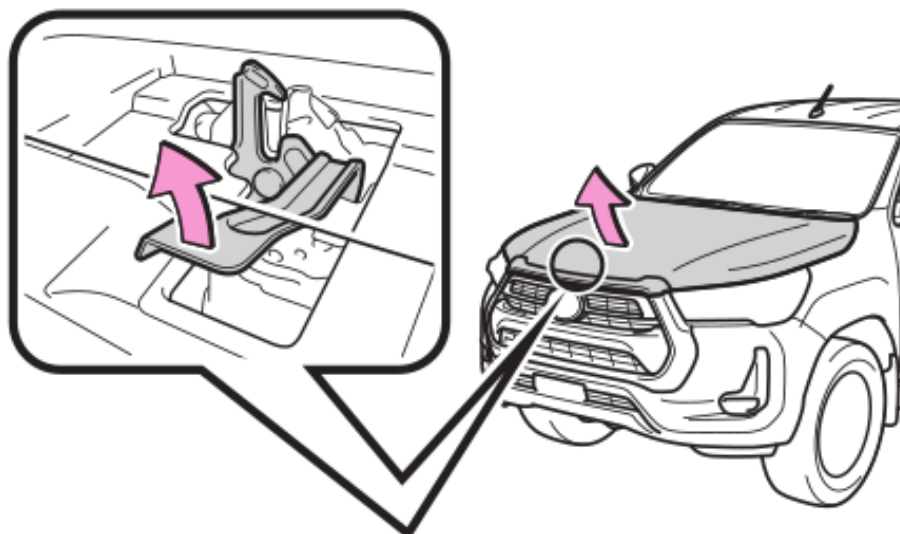
Vehicle Preparation

Step 1 – Accessing the Vehicle Engine Bay

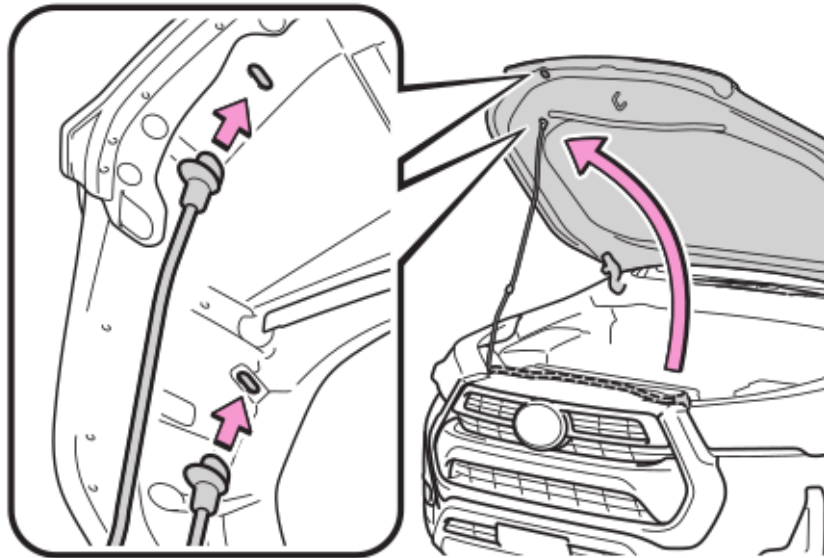
Prop the vehicle's bonnet by pulling the bonnet release lever located on the driver's side below the glovebox.



Slightly lift the bonnet and release the bonnet latch by pushing the secondary release lever up.



Open the bonnet and support it with the prop rod.



Once the bonnet has been propped open, it will expose the engine bay.



Step 2 – Accessing the Vehicle Fuse Box

The fuse box is located beneath the front passenger glove box.



To gain access to the fuse box, there are four clips that will need to be unclipped. The trim panel can be pulled towards the rear of the vehicle to remove.



The fuse box can be found within the space indicated below.



This space will be required later to install the Toyota Hilux Ignition Sense Loom (WIR10454.1).



Please identify exactly which fuse socket this loom should be plugged into (see page 38).

Step 3 – Trim Removal

At the front Passenger door, the door trim can be removed with the assistance of trim removal tools to expose routing conduits to be used later with routing the DC-DC Charge Cable and the Ignition Sense Cable.



The front Passenger Kick Panel can also be removed to enable easier access for routing.



Now at the rear Passenger Side Door, the door trim can be removed with the assistance of trim removal tools to unclip the trim from the vehicle.



The trim on the Rear Passenger Door (C-Pillar) of the vehicle can also be removed with the assistance of trim removal tools to help with the releasing of plastic pin clips.



Step 4 – Rear Seat Removal

For this installation, the rear seats will need to be completely removed to secure the battery to the rear vehicle chassis wall.

The rear seats can fold up towards the backrest by pulling the pull tab on both the driver side and the passenger side of the vehicle.



The seats will need to be secured to the backrest by looping the pull tab around the stems of the headrest and buttoning to itself.



Once the seats have been lifted and secured, the mounting points of the seats are revealed at the base of the backrest. The bolts can be removed using 12mm sockets.



There are a total of 5 bolts to remove.



Before lifting the seats and moving them forward or out of the vehicle, please ensure that the seatbelt buckles have been removed from the securing loops. There are three buckles to be removed from the loops. The seats can be lifted vertically to remove from seat mounts.



Step 5 – Rear Trim and Fabric Cover Removal

Once the seat is either moved forward or removed, the trim can be removed by first removing the mounting point with a 14mm socket.



Using trim removal tools, the plastic bracket mount can be removed.



The trim can be removed by un-clipping the plastic clips securing the trim with the assistance of trim removal tools.



The seatbelt guide bracket can be removed by removing the four bolts with 14mm socket for the top bracket and 12mm for the bottom bracket.

Please note: the top guide bracket is attached to the seatbelt.



The white seatbelt anchor cover can also be removed by unclipping the two top plastic clips.



To remove the fabric cover to expose the rear chassis wall, there are five plastic pins that hold the fabric in place that need to be removed beforehand. Trim removal tools will help in removing the plastic pins. The fabric can then be unhooked and be removed.



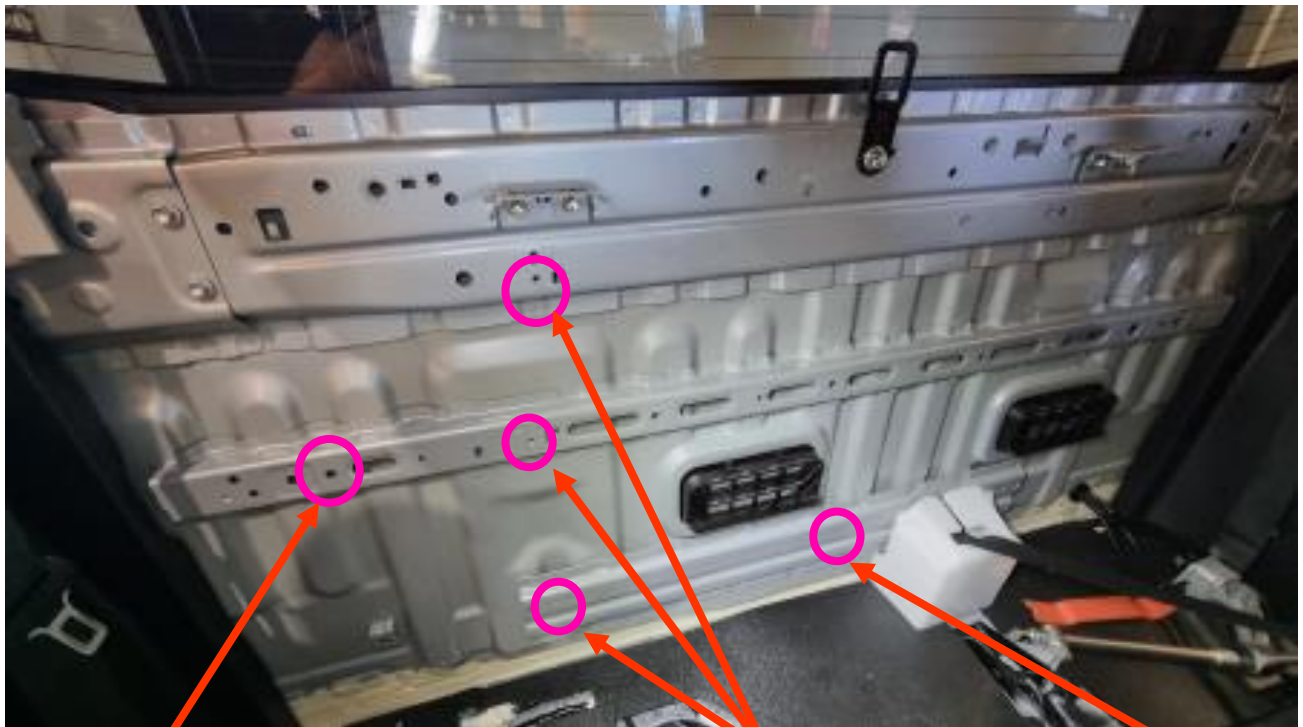
Installing the Battery Kit

Step 1 – Installing Nutsert for Battery Kit Mounting

Item Name	Part Number	Quantity
M6 Nutsert	XAM IN-YLF06-4.2	1
M3 Nutsert	XAM AALM315	1

The rear chassis wall of the vehicle cab will be revealed once the fabric has been removed.

Mounting holes for the battery kit are indicated below. One M3 and one M6 Nutsert is required for two of the mounting holes. The other mounting holes are already threaded.



M6 Nutsert
Location

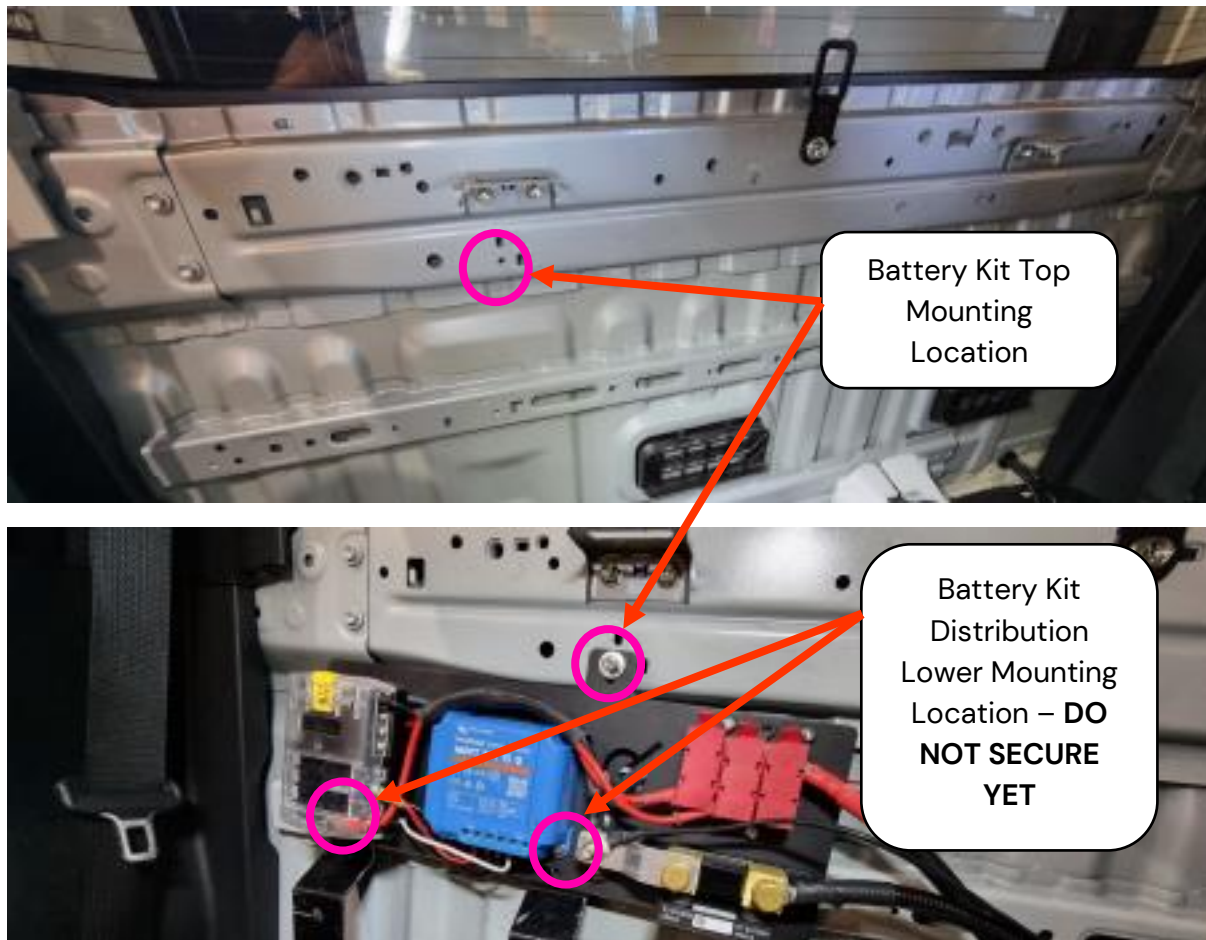
Threaded
Mounting Holes
Location

M3 Nutsert
Location

Step 2 – Installing the Battery Kit Distribution Board

Item Name	Part Number	Quantity
Cangoee Toyota Hilux Battery Kit	FASM1119	1
Cangoee Toyota Hilux Distribution Board Spacer	APRT1119.5	1
M6x20mm Hex Head Zinc Plated Set Screw	XAM 6X20MZPSS	1
M6 Stainless Steel Flat Washer	XAM 6MG304W	1

Place the Cangoee Toyota Hilux Distribution Board Spacer at the top mounting location and secure the distribution board from the battery kit with a M6x20mm Hex Head Set Screw and a M6 Flat Washer.

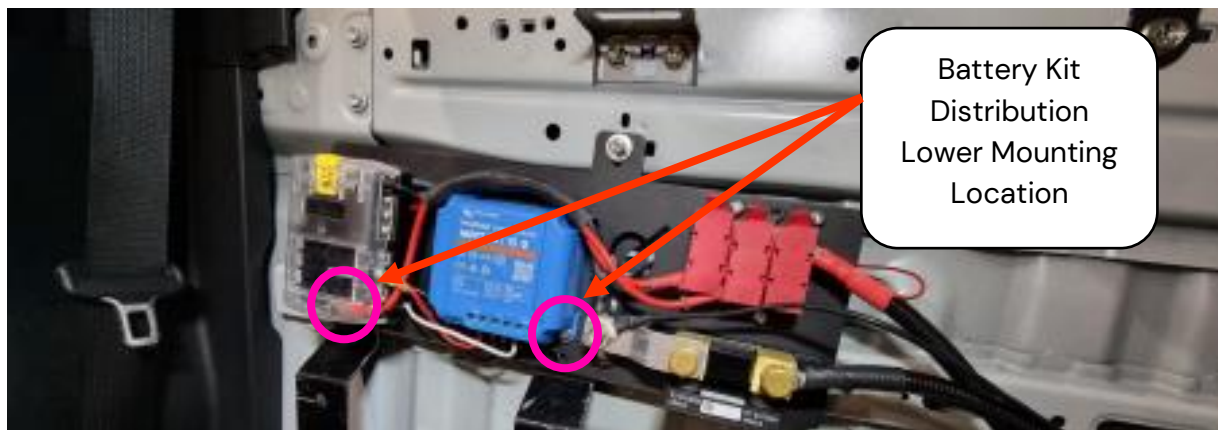


There are two lower mounting holes on the distribution board which do not need to be secured yet – these will be secured together with the Cangoee Toyota Hilux Main Battery Bracket.

Step 3 – Installing the Battery Kit Main Battery Bracket

Item Name	Part Number	Quantity
Cangoee Toyota Hilux Battery Kit	FASM1119	1
M6x20mm Hex Head Zinc Plated Set Screw	XAM 6X20MZPSS	3
M3x25mm Pan Head Zinc Plated Phillips Screw	XAM 3x25MZPPCRMT	1
M3 Stainless Steel Flat Washer	XAM 3MG304W	1
M6 Stainless Steel Flat Washer	XAM 6MG304W	3

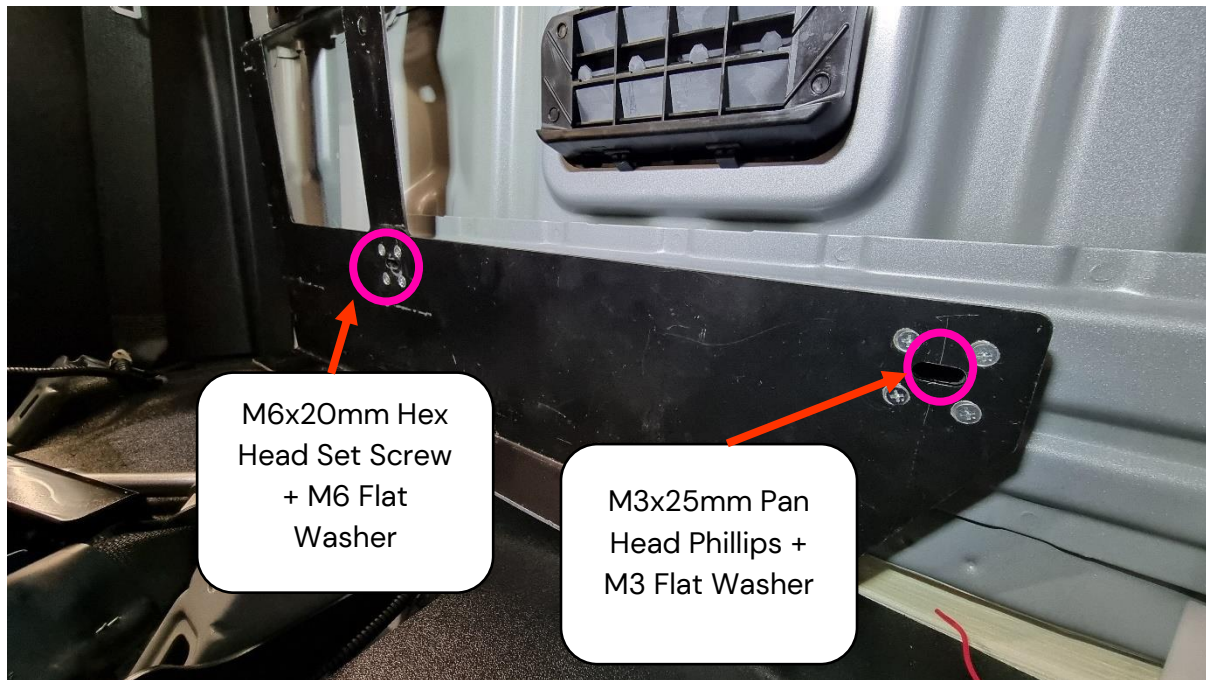
The Cangoee Toyota Hilux Main Battery Bracket will need to be slid into position behind the two lower mounting holes on the distribution board and then secured together with a M6x20mm Hex Head Zinc Plated Set Screw and a M6 Stainless Steel Flat Washer.



Now at the bottom of the main battery bracket, the bracket will need to be secured to the chassis through the two spacers.

One will secure the bracket to the chassis with a M6x20mm Hex Head Zinc Plated Set Screw and a M6 Stainless Steel Flat Washer.

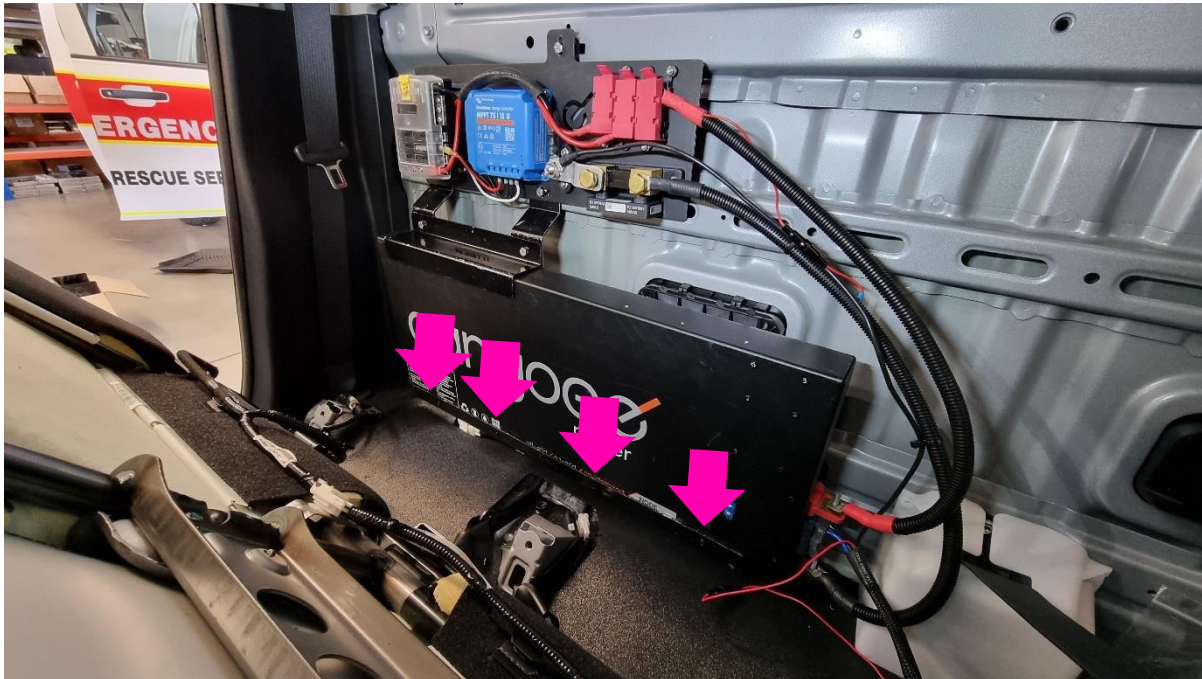
The other will secure the bracket to the chassis with a M3x25mm Pan Head Zinc Plated Phillips Screw and an M3 Stainless Steel Flat Washer – This will secure to the M3 Nutsert that was previously installed.



Step 4 – Installing the Battery onto the Bracket

Item Name	Part Number	Quantity
Cangoee Toyota Hilux Battery Kit	FASM1119	1
Cangoee Toyota Hilux Top Clamp	APRT1119.3	1
M6x20mm Hex Head Zinc Plated Set Screw	XAM 6X20MZPSS	2
8Gx12mm Pan Head Phillips Black Screw	XAM 8Gx12BZPPCRM TBLK	4

Once the previous steps to install the bracket are completed, the Cangoee battery can be installed into place by placing it into the Main Battery Bracket. Secure the battery at the bottom of the bracket with four 8Gx12mm Pan Head Phillips Black Screw at the indicated locations below.



The Cangoee Top Clamp can also be placed on top of the battery and secured using two M6x20mm Hex Head Zinc Plated Set Screw.



Step 5 – Connecting the Battery to the Distribution Board.



CAUTION REQUIRED

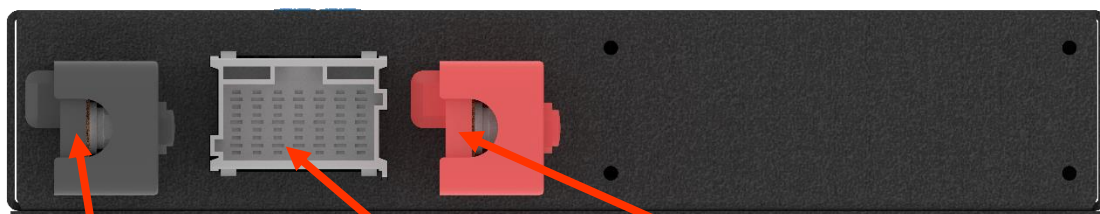
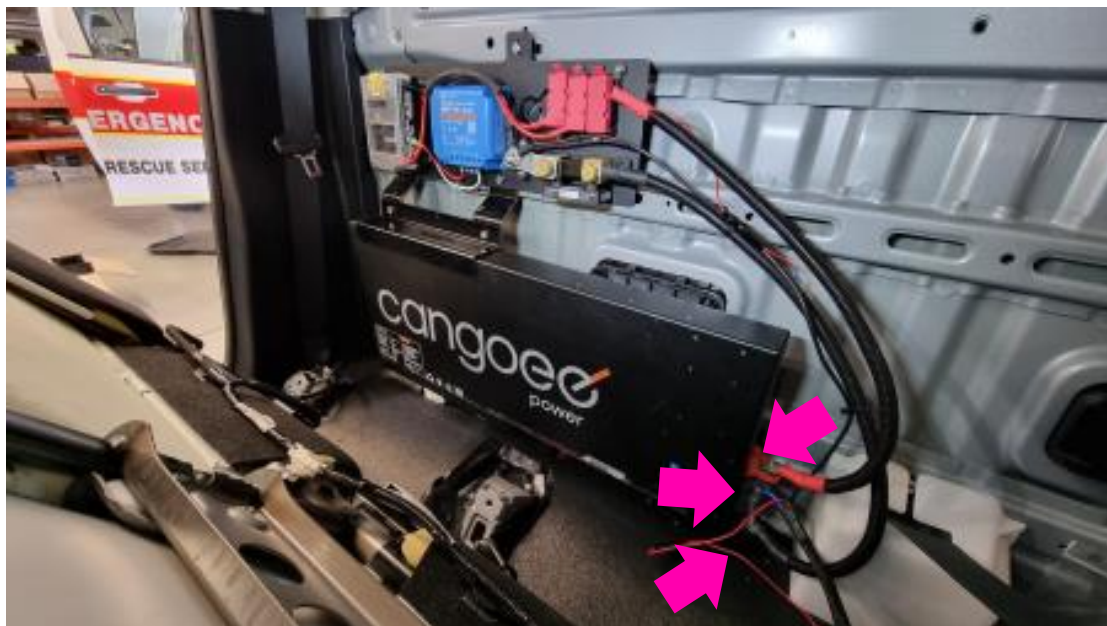
This section details works involving the battery and electrical cabling, ensure all safety guidelines are followed and proper equipment is used during this procedure. Failing to follow these guidelines could result in incorrect installation of the Cangoee battery, malfunction, or severe injuries.

Now that the battery is secured into the battery brackets, the connections to the distribution board cannot be secured.

Connect the main **RED POSITIVE** cable to the main **RED POSITIVE** terminal that is on the battery first.

Once the positive is connected securely, connect the main **BLACK NEGATIVE** cable to the **BLACK NEGATIVE** terminal on the battery.

The **MCP Plug Connector** can also be plugged into the **MCP Receptacle Housing** on the battery.



Battery **NEGATIVE**
Terminal

MCP Receptacle
Housing

Battery **POSITIVE**
Terminal

The MCP Cable with the BLUE Anderson SB50 Connector for DC-DC Charging and the Faston 250 Receptacle Connector for Ignition Sense Cable can be routed underneath the seatbelt anchor.



Toyota Hilux Charge Cable Routing

Step 1

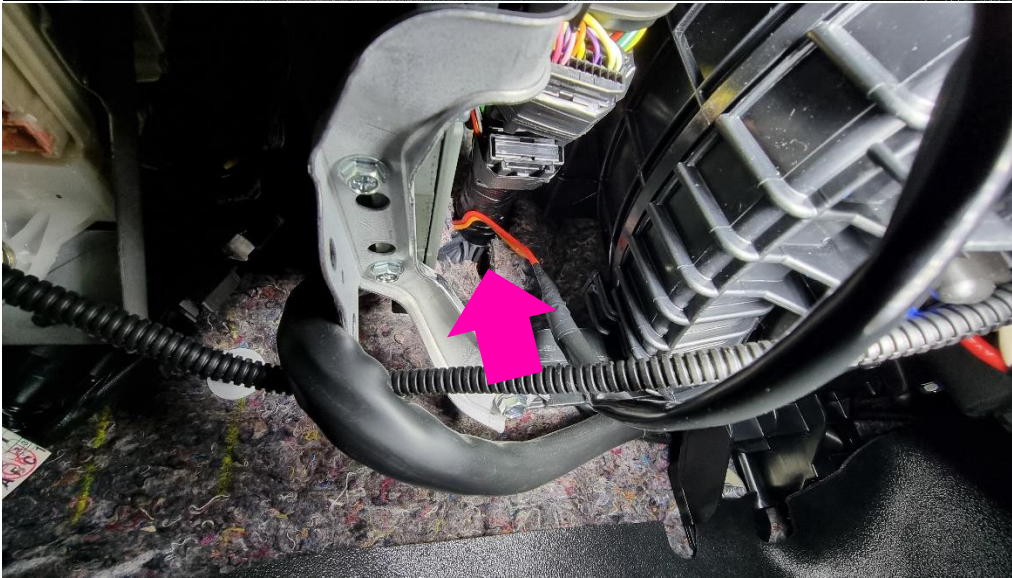
Route the Toyota Hilux Charge Cable from the installed Battery Kit along the vehicle cable routes underneath the passenger side door trims towards the firewall grommet, to underneath the vehicle glove box.

The Blue Anderson SB50 plug can be temporarily plugged in to assist with the routing process and to ensure that there is still sufficient cable length within the vehicle.





Route the charge cable through the firewall grommet and into the engine compartment.





Once enough cable has been routed through the firewall grommet to reach the vehicle battery with the BLACK NEGATIVE cable, set the cable aside and **DO NOT CONNECT YET.**

Please ensure that the Blue Anderson SB50 is unplugged from the battery as well.

Engine Bay MIDI Fuse Holder Bracket Installation

Step 1

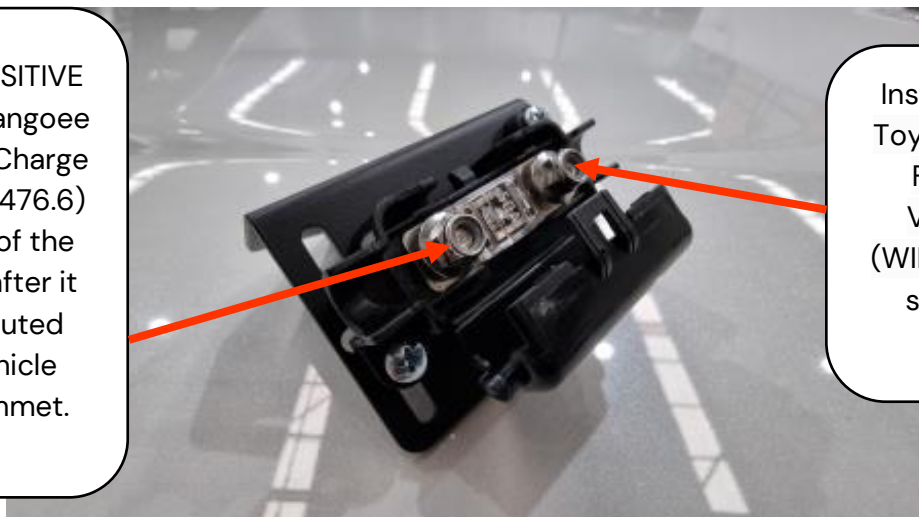
Item Name	Part Number	Quantity
M4x20mm Pan Head Phillips Screw	XAM 4X20MG304PCRMT	2
M4 Stainless Steel Flat Washer	XAM 4MG304W	2
M4 Stainless Steel Nyloc	XAM 4MG304NN	2
Strip MIDI Fuse Holder	PEle SFH	1
40A MIDI Fuse – Bolt On	CFus SWE-MIDO40	1
Cangoee Toyota Hilux Charge Cable	WIR10476.6	1
Cangoee Toyota Hilux Fuse Holder to Vehicle Battery	WIR10436.4	1
Toyota Hilux MIDI Fuse Holder	BKT10389	1

Prepare the Engine Bay MIDI Fuse Holder Bracket (BKT10389) by first installing the fuse holder (PEle SFH) onto the bracket and secure it with two M4x20 Pan Head Phillips Screws, two M4 Flat Washers and two M4 Nyloc Nuts.



Before installation of the prepared MIDI Fuse holder into the vehicle, the 40A MIDI fuse and the Toyota Hilux Fuse Holder to the Vehicle Battery (WIR10436.4) wiring loom can be pre-installed. Please ensure that the opening clip of the fuse holder is closer to the top of the bracket.

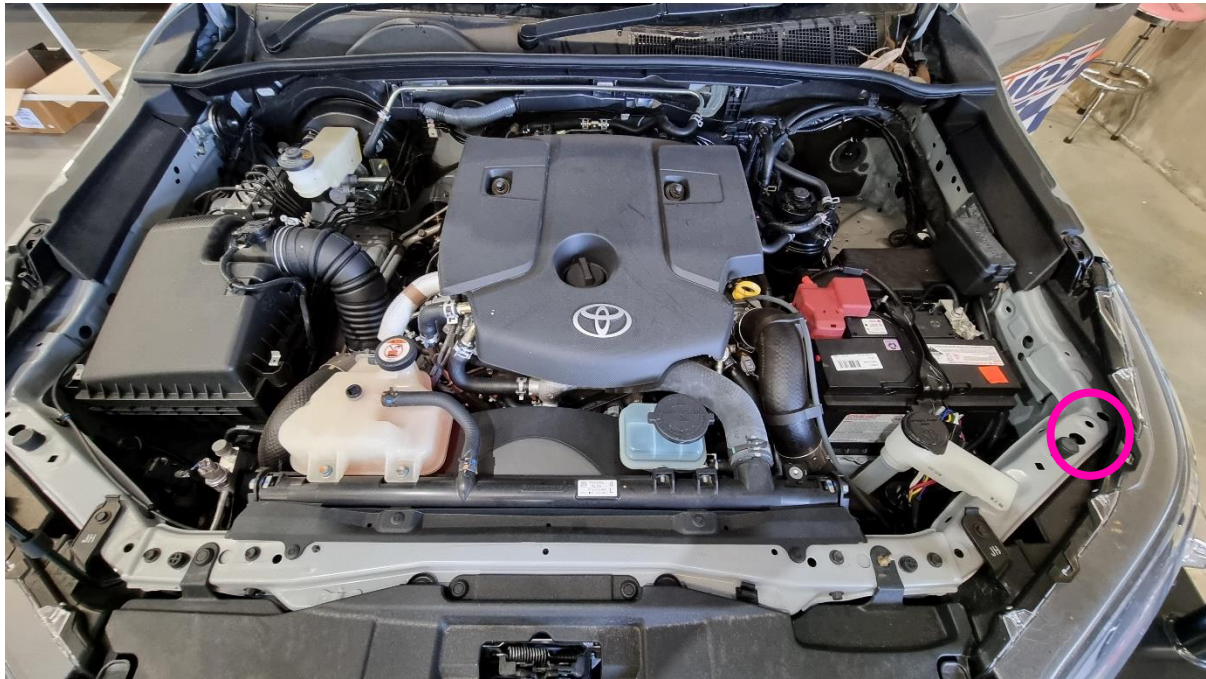
Install the POSITIVE cable from Cangoee Toyota Hilux Charge Cable (WIR10476.6) on this side of the fuse holder after it has been routed through vehicle firewall grommet.



Install the Cangoee Toyota Hilux Vehicle Fuse Holder to Vehicle Battery (WIR10436.4) on this side of the fuse holder.

Item Name	Part Number	Quantity
M6 Nutsert	XAM IN-YLFO6-4.2	1
M6x16mm Hex Head Stainless Steel Set Screw	XAM 6X16MG304SS	1
M6x19mmx1.2mm (1/4"x3/4") Zinc Plated Washer	XAM 14X34ZPEW	1
M6x2.5x1.6 mm Zinc Plated Spring Washer	XAM 6MSW	1

The MIDI Fuse Holder will be installed in the location indicated below.



An M6 Nutsert installation will be required in the location indicated below to allow for the mounting of the MIDI fuse bracket.





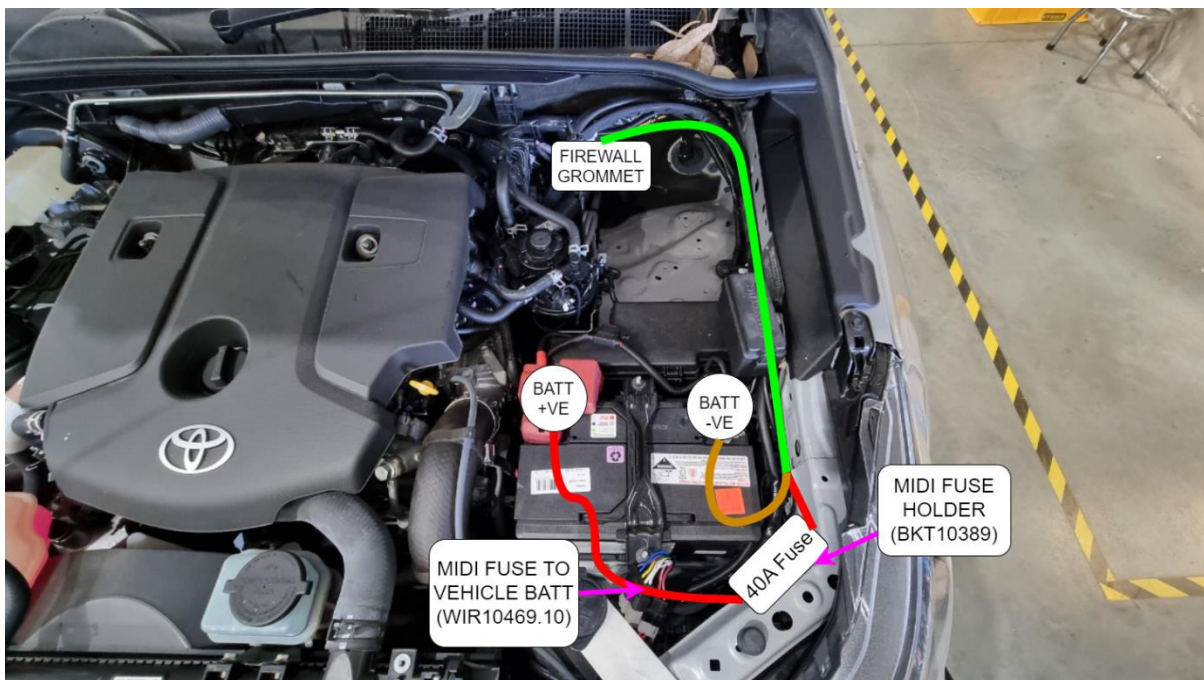
The MIDI Fuse Holder can be secured in the engine compartment using an M6x16mm Hex Bolt with M6x19mmx1.2mm (1/4"x3/4") Zinc Plated Washer and a M6 Spring Washer.





Note: Please ensure that the Blue Anderson SB50 is unplugged from the battery before connecting the charge cable terminals to the vehicle battery.

Connect the RED POSITIVE cable from the MIDI fuse to the POSITIVE terminal on the vehicle battery. Terminal connections must be secured with the hex nut that is on the battery terminals. Once the POSITIVE connection is secure on the battery, connect the BLACK NEGATIVE cable from the Charge cable (WIR10476.6) to the NEGATIVE terminal on the vehicle battery. **Please secure to existing cable runs and ensure the connections and cables are secure – DO NOT FORGET TO USE AUTOMOTIVE SEALANT ON GROMMET ONCE CABLE LENGTHS HAVE BEEN REACHED.**



Connecting the Ignition Sense Cable

CAUTION REQUIRED

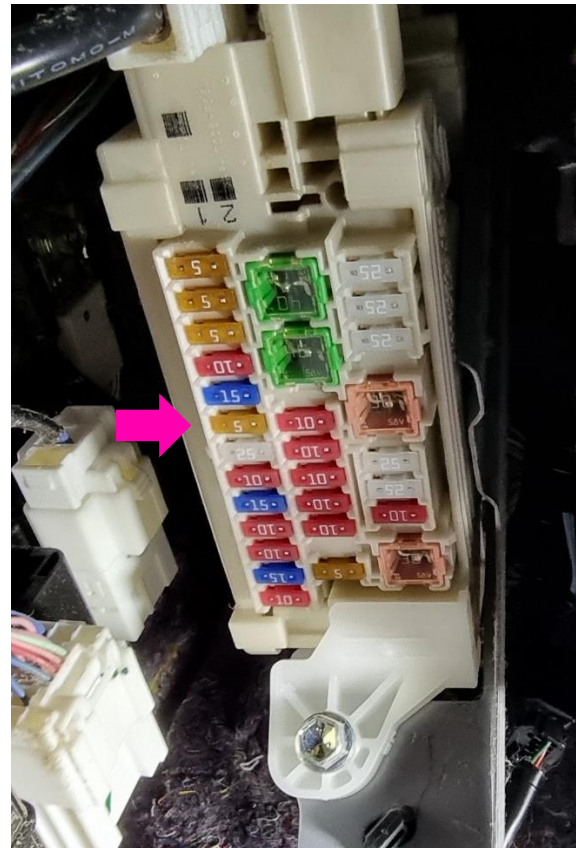
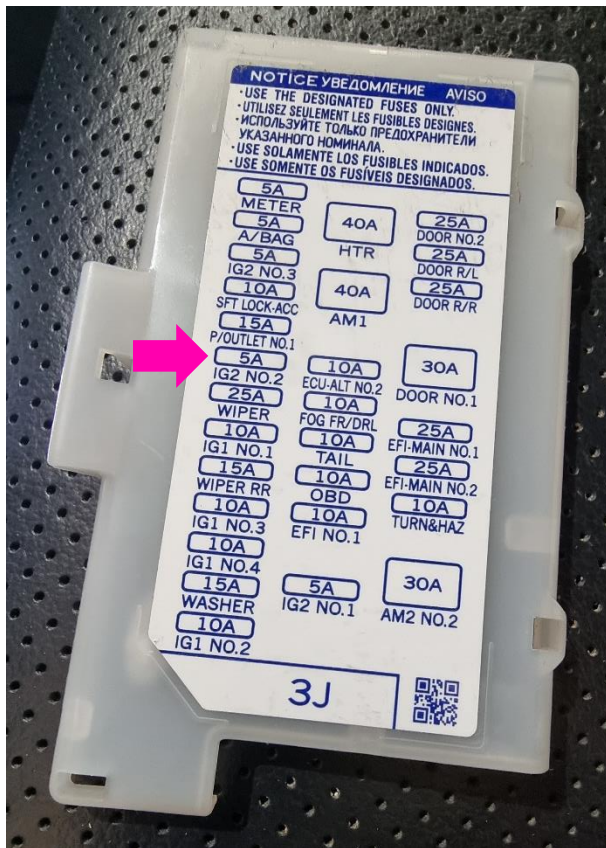


This section details works involving the vehicle fuse box, ensure all safety guidelines are followed and proper equipment is used during this procedure. Failing to follow these guidelines could result in incorrect installation of the Cangoee battery, malfunction, or severe injuries.

Step 1

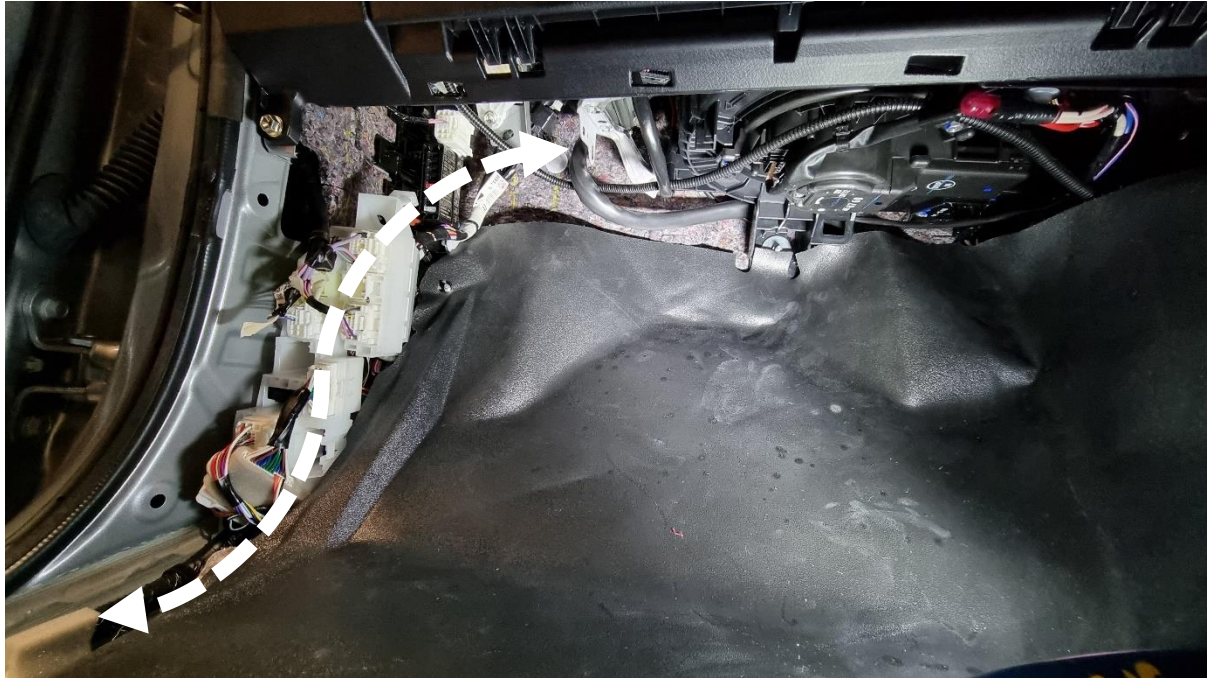
Item Name	Part Number	Quantity
Cangoee Toyota Hilux Ignition Sense Loom	WIR10476.7	1

The Cangoee Toyota Hilux Ignition Sense Loom (WIR10476.7) will need to connect to the Fuse Socket (IG2 NO.2). Replace the 5A fuse that is currently in place with the fuse attached to the Ignition sense cable.



Step 2

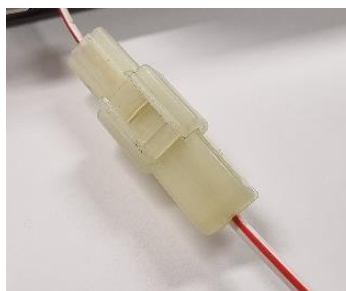
Route the Ignition Sense Loom from the vehicle fuse box underneath the front passenger glove box, underneath the kick panel, the door trims on the passenger side, and finally towards the battery kit.





Step 3

Connect the Faston 250 Plug connector on the Ignition sense cable to the corresponding Faston 250 Receptacle connector on the battery kit. The Blue Anderson SB50 Plug connector can also be plugged into the battery kit.



Battery Protection (Optional)

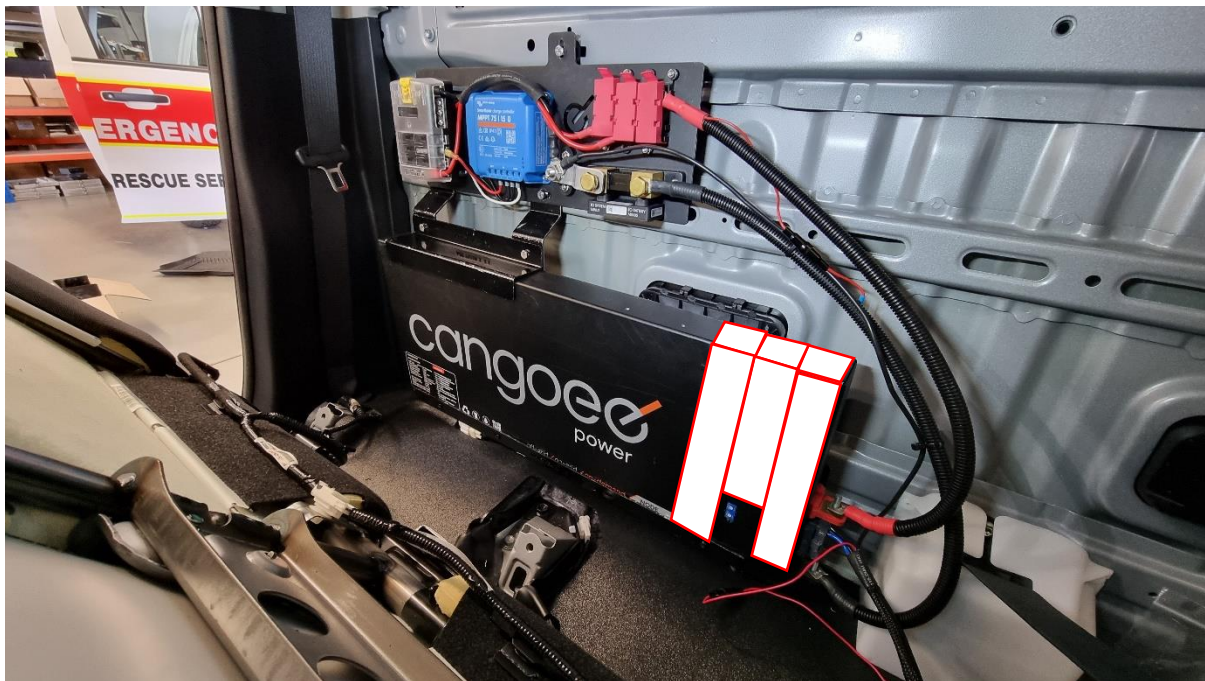
Step 1

Item Name	Part Number	Quantity
3mm Foam	XAM TT7492GY48	0.9m

As the battery kit is installed behind the rear seats and near the metal frame of the rear vehicle seats, additional foam padding can be applied to the battery kit to prevent damage to a certain degree if there is any impact on the rear seats that results in the metal frame to contact the battery kit.

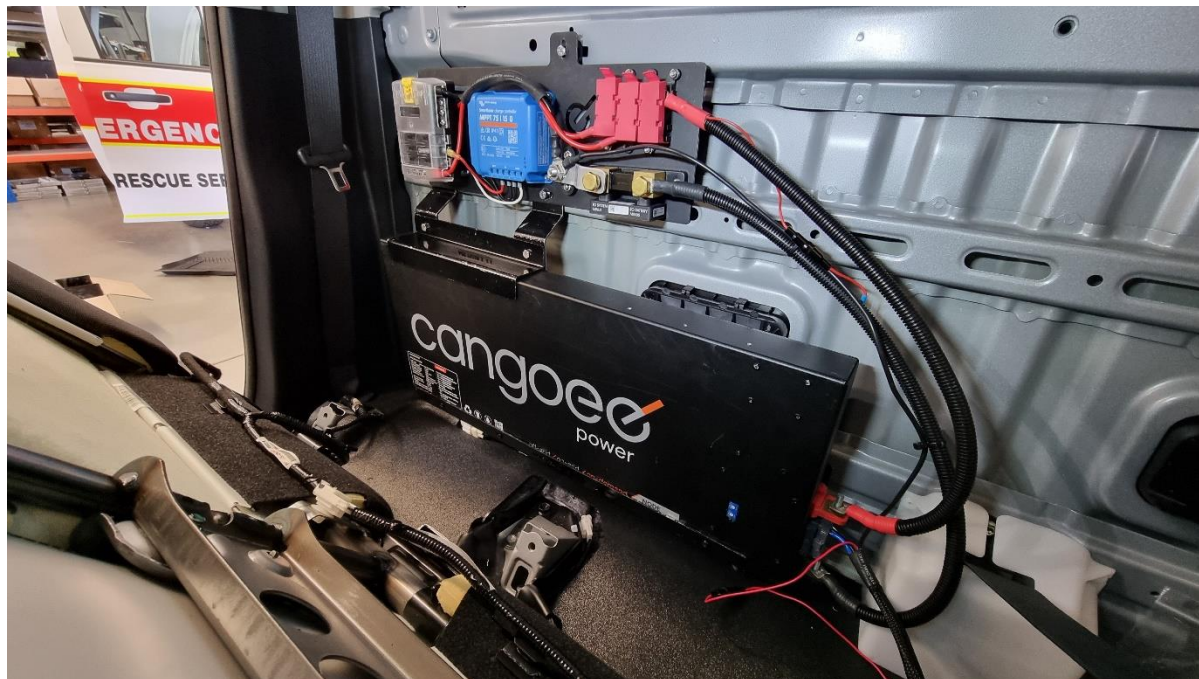
Cut the foam into three strips – two strips of 300mm and one strip of 200mm

Please apply the foam to the indicated location starting from the top of the battery. Please be aware to not cover the rotary switch for the DC-DC Charger Settings (use the short strip of foam for this location).



Completed Installation

Battery Installation (Without Additional Foam)



Re-assembly Checklist

Please ensure that the following components of the vehicle have been re-secured, re-installed, or re-sealed.

Item	Location	Checked
Fuse Box Lid	Under Front Passenger Glove Box	
Under Glove Box Trim	Under Front Passenger Glove Box	
Front Passenger Kick Panel	Front Passenger Seat	
Front Passenger Door Trim	Front Passenger Door	
Resealing of Firewall Grommet with Automotive Sealant	Engine Compartment/Under Front Passenger Glove Box	
B Pillar Trim	B Pillar – Passenger Side	
Rear Passenger Door Trim	Rear Door Passenger Side	
Rear Passenger Door Side Trim (C-Pillar)	Rear Door Passenger Side	
Rear Middle Seatbelt Guide Brackets x 2	Rear Chassis Wall	
White Rear Middle Seatbelt Anchor Cover	Rear Chassis Wall	
Rear Wall Trim	Rear Chassis Wall	
Mounting Point	Rear Chassis Wall	
Plastic Bracket Mount	Rear Chassis Wall	
Rear Passenger Seats Reinstalled	Rear Passenger Seat	

Congratulations for completing the installation for the Cangoee Battery Kit on a Toyota Hilux MY23.

DC-DC Charger

The DC-DC charger in the Cangoee 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 Cangoee 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 IMPORTANT to consider voltage drops . 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	

Measured Voltage Switch Position Table



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



Right Rotary Switch for Off Delay Applications outlined in RED.

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 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



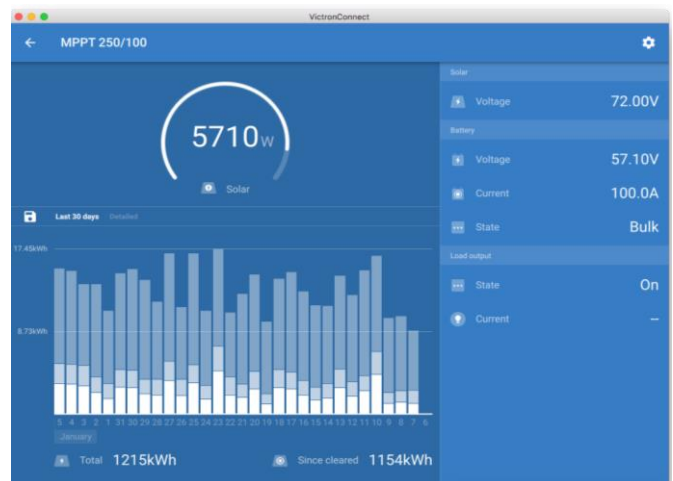
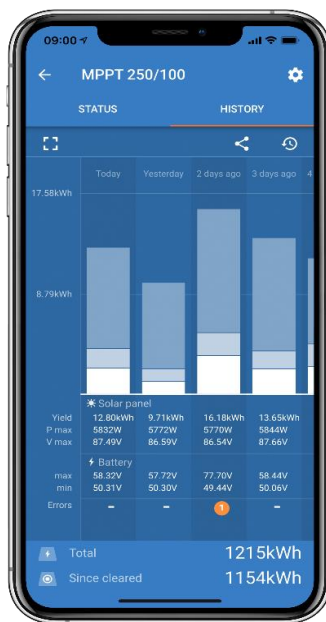
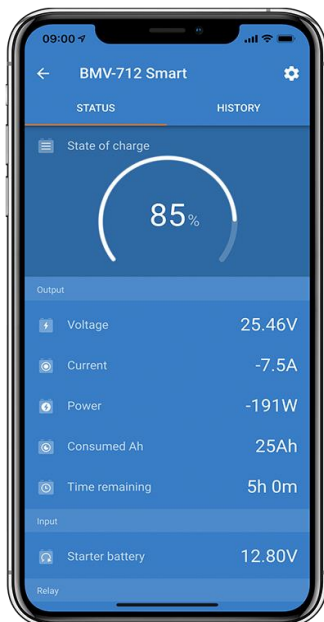
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Victron Energy SmartSolar MPPT 75/15



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

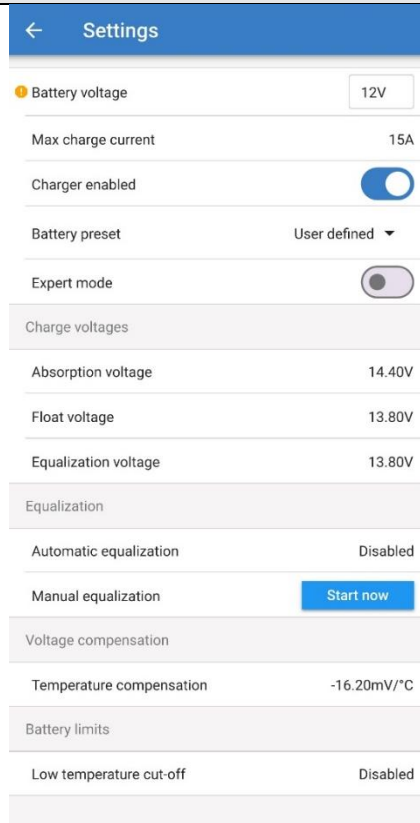
MAX OPEN CIRCUIT VOLTAGE (Voc): 75 V

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 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%	<input type="button" value="Synchronize"/>
Zero current calibration	<input type="button" value="Calibrate"/>

Battery Management System

The Battery Node 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 and activates 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 Cangoee Vehicle Kit 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. Correct battery mounting positions are shown in Table on page 8.
- ❑ 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.
- ❑ Update firmware for Victron components whenever available.

Storage 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.