



# Installation Manual

## Freedom Won LiTE 2

### Home and Business Ranges

#### *Range of Lithium Iron Phosphate Battery Modules*

Manufactured By Freedom Won (Pty) Ltd

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#### Technical and Installation Assistance – Contact:

Please contact your Freedom Won Distributor or Reseller Installer for technical and installation support. A directory of Distributors and Reseller Installers is available at [www.freedomwon.co.za](http://www.freedomwon.co.za).

For advanced support please contact [support@freedomwon.co.za](mailto:support@freedomwon.co.za).

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## Table of Contents

1. Introduction .....	3
2. Product Description.....	3
3. DC Bus Design Notes .....	9
4. Transport, Handling and Mounting.....	10
5. Mounting and Environmental Requirements.....	13
6. Connecting the Freedom LiTE 2 .....	13
7. Programming the LiTE 2 unit.....	20
8. Switching on the LiTE 2 unit .....	20
9. Settings Required for Configuring Inverters and Charge Controllers .....	21
10. Connecting a Freedom Won LiTE 2 Home to Internet .....	21
11. Accessories .....	22
12. Typical Installations.....	23
13. Warranty and Repair .....	24
14. Troubleshooting Guide .....	25

## 1. Introduction

The Freedom Won LiTE 2 Home and Business Installation Manual provides information for installers to successfully install and commission Freedom Won LiTE 2 Home and Business lithium iron phosphate (LiFePO<sub>4</sub>) energy storage models. This manual covers the LiTE 2 Home and Business ranging from 10kWh to 80kWh, which is specifically designed for residential and business applications.

This manual does not attempt to cover all the details pertaining to the setup of third-party equipment in relation to the interface and necessary functionality to work with the LiTE 2 Home and Business energy storage system. Freedom Won, however, is available at the contact details on page one to provide direct support where necessary for supported inverter brands.

The new LiTE 2 Home and Business has been fitted with a gateway that makes use of Wi-Fi or Ethernet for remote monitoring. This allows remote monitoring of the battery and its parameters. Remote monitoring can also be used to complete fault finding and make parameter changes by Freedom Won technicians or approved installers.

The LiTE 2 Home and Business has an additional Ethernet port which can directly be connected to the internet for remote monitoring if Wi-Fi is not available. The port can also be used to access the BMS through the gateway.

The LiTE 2 Home and Business also now has releasable power connectors which means individual power leads can be replaced without opening the battery. This means longer or shorter length cables can easily be fitted even after the battery is installed on-site. Swapping a battery in an installation will also be much quicker and easier provided that the new battery has the same plugs as the one being replaced.

## 2. Product Description

The Freedom Won battery technology is available in various standard sizes to meet all residential, commercial, and industrial applications, ranging in models. For a detailed overview please visit the website. Larger systems can also be provided by Freedom Won based on specific project requirements by installing multiple units of the same model battery in parallel.

Freedom Won offers the following ranges in the LiFePO<sub>4</sub> technology:

1. LiTE 12V
2. eTower
3. LiTE Home and Business 52V
4. LiTE Home and Business HV
5. LiTE Marine
6. LiTE Mobility (golf carts, forklifts, etc.)
7. LiTE Commercial HV and HV+
8. LiTE Industrial
9. megaTower Plus and megaTower Extra

This manual covers the standard voltage models of the LiTE 2 Home and Business ranging from 10kWh up to 80kWh. Please refer to the manuals specific to the other ranges for more details on those ranges.

The LiTE Marine range of lithium batteries is available on request with similar specifications to the Home range, including 13V and 26V options to suit 12V and 24V systems respectively. These models are water resistant (IP65) and designed for mounting on the floor or horizontal deck and have dimensions that are different to the LiTE 2 Home models. For more information on these models please refer to the Freedom Won website.

Tables 2.1 and 2.2 provide an overview of the 52V LiTE 2 Home and Business range. There are eight LiTE 2 models in the Home and Business range, as listed in Tables 2.1 and 2.2, differentiated based on their energy storage capacity.

An image with numbered labels pertaining to the following paragraphs is provided in Figure 2.1. The model number is denoted by [1]. This is the total energy storage capacity in kWh of each model. The second number [2] denotes the average amount of energy in kWh that should be withdrawn per cycle (on average) to optimise the life of the lithium cells. This equates to 80% of the total for each model i.e., 80% depth of discharge (DoD).

**Note that all Freedom Won LiTE 2 batteries offer a maximum of 90% DoD as standard.**

The LiTE 2 Home and Business range is compact and all models up until 20/16 can be wall mounted. Floor mounting is generally more common – all models are supplied standard with plastic feet. The larger batteries are designed to be floor standing with aluminium feet that have plastic pads underneath.

The maximum current for each model is governed by the rating of the built-in circuit breaker as illustrated in Figure 2.1 [3], which has been sized below the maximum current capability of the battery. There is no significant cell temperature rise during normal duty operation, so no active cooling of the cells is required. The time limit for operation at the maximum current is defined in Tables 2.1 and 2.2. To ensure that the circuit breaker does not trip in normal operation it is advised that the design of the system aims to remain at or below the continuous current value.

For these 52V models the absolute maximum allowable voltage when fully charged is 56V, however, a more typical inverter charge setting range is 55.5V to 55.8V, depending on the inverter voltage tracking accuracy. The voltage normally used as the minimum cut-off is 48V, however, this will not typically be reached on new batteries when operating down to 90% Depth of Discharge (DoD). The Battery Management System (BMS) will command the connected inverter with the CAN Bus interface to stop discharging the battery at 10% SoC (90% DoD), which roughly equates to 49.0V. Under high load, the voltage may drop to 48V whilst still above 10% SoC. A voltage of 48V or even lower can be observed in systems without a CAN Bus interface or where the standby current drawn on the inverter has caused the battery to be discharged below 10% SoC. The battery breaker will eventually trip the battery at around 47V to protect the cells from undervoltage.

Figure 2.1 Labelled Image of the Freedom LiTE 2 Home 15/12  
(Labelling corresponds with the text)



Note: Diagram above is applicable to the following LiTE 2 HOME range batteries: 10/8, 15/12 and 20/16. Larger units incorporate a digital SoC display in place of the colour wheel SoC display.

1. Gross Capacity
2. 80% Capacity recommended for daily cycling (max available is 90%)
3. Breaker
4. Releasable Power Cables
5. CAN Bus Sockets x 2 (RJ45)(one socket must contain a termination resistor if end of line)
6. Reset Button(not visible in photo)
7. State of Charge / Error Colour Wheel Display
8. On Button

9. *Off Button*
10. *Lifting Eye Bolt Hard Point, only applicable to Home 15 and up (not visible in photo)*
11. *Rear access lid*
12. *Wifi Antenna*
13. *Ethernet connection port*
14. *Feet*

The weight of each model is given in Tables 2.1 and 2.2. The unit weights must be carefully considered when planning an installation.

The dimensions given are for the principal outlines of the aluminium housing and exclude items that protrude such as the DC cable glands and the circuit breaker handle.

The DC plug terminals are located on the **top right-hand side** of the casing and vary in number according to the model [two in Figure 2.1]. The mating plugs with standard-length cables are supplied with the battery. The correct cable lugs for connecting these cables to the inverter must be in hand when doing an installation. If several inverters and charge controllers need to be connected to the battery, it is advisable to install a DC connector box to use as a junction point from which to branch out to all the battery-connected devices.

Table 2.1 LiTE 2 Home

LiTE 2 HOME RANGE OVERVIEW							
Model	HOME 10/8		HOME 15/12		HOME 20/16		HOME 30/24
Total Energy Capacity [kWh]	10		15		20		30
Energy, 80% DoD [kWh] <sup>1</sup>	8		12		16		24
Energy, 90% DoD [kWh] <sup>1</sup>	9		13,5		18		27
Current Capacity [Ah]	200		300		400		600
Max & Cont. Charge Current [A]	200 v		300		350		600
Max & Cont. Charge Power [kW]	10		15		18		31
Max/Cont. Discharge Current [A] <sup>2</sup>	240/200		360/300		420/350		720/600
Max/Cont. Discharge Power [kW] <sup>2</sup>	12/10		18/15		22/18		37/31
Nominal Voltage [V]	51.2V, to suit 48V Inverters, min 47V, max 56V						
Max Recommended Inverter Total Rated Power (cont.) [kVA]	10		15		15		25
Short Circuit Current [kA]	8		10		12		12
Dimensions - Height X Width X Depth [mm] <sup>3</sup>	745x340x290 (A)	311x367x733 (B)	745x490x290 (A)	420x367x733 (B)	745x640x290 (A)	534x367x733 (B)	1300x413x370
Crated Dimensions Height X Width X Depth [mm] <sup>3</sup>	848x504x509 (A)	311x367x733 (B)	848x656x509 (A)	836x581x588 (B)	848x805x509 (A)	836x696x588 (B)	1396x586x568
Weight [kg]	89 (A)	92 (B)	130 (A)	134 (B)	173 (A)	179 (B)	254
Crated Weight [kg]	111 (A)	114 (B)	155 (A)	159 (B)	206 (A)	200 (B)	293
DC Connection - (no. per electrode) [mm²] <sup>4</sup> (Detachable Power Connector)	1x50mm² Helukabel NSGAF øU		1x95mm² Helukabel NSGAF øU		1x95mm² Helukabel NSGAF øU		2x95mm² Helukabel NSGAF øU
Enclosure	Aluminium enclosure painted white, for use indoors or fully protected under-cover environments, rated to IP20						
Protection	Shunt Trip Circuit Breaker sized to suit max current, can be tripped by BMS if critical fault, manual reset. Includes overcurrent, cell under and over voltage, temperature, weak cell detection, minimum SoC control.						
Control Interface	RJ45 Ethernet connection for diagnostics & troubleshooting through E Connect. RJ45 CAN Strictly for BMS & inverter communication.						
Human Interface	State of Charge Display (0 to 100%), Error light, Error Reset Button, RJ45 Plug for Programming.						
Remote Monitoring	Real time data logging and remote monitoring over Wifi and Ethernet. Internet connection required						
Warranty <sup>5</sup>	Standard Warranty: 10 years (or 6000 cycles) 80% DoD, 0.5C Max Discharge, 0.25C Max Charge, Max 25°C						
Service Life <sup>5</sup>	>16 years (>6000 cycles) expected life at 80% DoD 1						
Essential Accessories	Note that for connecting the battery to a PC an Ethernet cable is required. CAN Bus Termination Resistor - one required per battery (one included with battery), CAN Bus cable (RJ45 LAN cable)- one required per battery (not supplied with battery). Note some inverters will require a special (non-standard pin configuration) cable - see installation manual.						
Notes to Specification Sheet							
1	DoD = Depth of Discharge, recommended 80% DoD for average daily discharge, max for normal operation 90% DoD, max for system in standby 100% DoD.						
2	Max current duration 5min every 10min. 1.5 x Max overload can be handled for 5 seconds. Current limits rated for 10°C to 25°C battery temperature. Derating will apply outside this temperature range.						
3	Dimensions on or against wall excluding protuberances such as glands and breaker handle.						
4	Battery power connection cables 1,8m long, power cable Red = Positive, Black = Negative, conductors in table refer to one electrode i.e. per positive and negative connections.						
5	End of Life (EoL) defined as cell dropping to 60% of Beginning of Life (BoL) capacity. This warranty applies to LiTE units sold after 1 April 2024. For LiTE units sold prior please contact Freedom Won for warranty information.						

Table 2.2 LiTE 2 Business

LiTE 2 BUSINESS RANGE OVERVIEW			
Model	Business 40/32	Business 60/48	Business 80/64
Total Energy Capacity [kWh]	40	60	80
Energy, 80% DoD [kWh] <sup>1</sup>	32	48	64
Energy, 90% DoD [kWh] <sup>1</sup>	36	54	72
Current Capacity [Ah]	800	1200	1600
Max & Cont. Charge Current [A]	600	700	700
Max & Cont. Charge Power [kW]	31	36	36
Max/Cont. Discharge Current [A] <sup>2</sup>	720/600	840/700	840/700
Max/Cont. Discharge Power [kW] <sup>2</sup>	37/31	43/36	43/36
Nominal Voltage [V]	51.2V, to suit 48V Inverters, min 47V, max 56V		
Max Recommended Inverter Total Rated Power (cont.) [kVA]	25	35	35
Short Circuit Current [kA]	15	20	24
Dimensions - Height X Width X Depth [mm] <sup>3</sup>	1300x522x370	1350x800x370	1350x1015x370
Crated Dimensions Height X Width X Depth [mm] <sup>3</sup>	1396x786x568	1506x956x568	1506x1186x568
Weight [kg]	326	508	637
Crated Weight [kg]	376	563	697
DC Connection - (no. per electrode) [mm <sup>2</sup> ] <sup>4</sup> (Detachable Power Connector)	2x95mm <sup>2</sup> Helukabel NSGAF öU	2x95mm <sup>2</sup> Helukabel NSGAF öU	2x95mm <sup>2</sup> Helukabel NSGAF öU
Enclosure	Aluminium enclosure painted white, for use indoors or fully protected under-cover environments, rated to IP20		
Protection	Shunt Trip Circuit Breaker sized to suit max current, can be tripped by BMS if critical fault, manual reset. Includes overcurrent, cell under and over voltage, temperature, weak cell detection, minimum SoC control.		
Control Interface	RJ45 Ethernet connection for diagnostics & troubleshooting through E Connect. RJ45 CAN Strictly for BMS & inverter communication.		
Human Interface	State of Charge Display (0 to 100%), Error light, Error Reset Button, RJ45 Plug for Programming.		
Remote Monitoring	Real time data logging and remote monitoring over Wifi and Ethernet. Internet connection required		
Warranty <sup>5</sup>	Standard Warranty: 10 years (or 6000 cycles) 80% DoD, 0.5C Max Discharge, 0.25C Max Charge, Max 25°C		
Service Life <sup>5</sup>	>16 years (>6000 cycles) expected life at 80% DoD 1		
Essential Accessories	Note that for connecting the battery to a PC an Ethernet cable is required. CAN Bus Termination Resistor - one required per battery (one included with battery), CAN Bus cable (RJ45 LAN cable) - one required per battery (not supplied with battery). Note some inverters will require a special (non-standard pin configuration) cable - see installation manual.		
Notes to Specification Sheet			
1	DoD = Depth of Discharge, recommended 80% DoD for average daily discharge, max for normal operation 90% DoD, max for system in standby 100% DoD.		
2	Max current duration 5min every 10min. 1.5 x Max overload can be handled for 5 seconds. Current limits rated for 10°C to 25°C battery temperature. Derating will apply outside this temperature range.		
3	Dimensions on or against wall excluding protuberances such as glands and breaker handle.		
4	Battery power connection cables 1,8m long, power cable Red = Positive, Black = Negative, conductors in table refer to one electrode i.e. per positive and negative connections		
5	End of Life (EoL) defined as cell dropping to 60% of Beginning of Life (BoL) capacity. This warranty applies to LiTE units sold after 1 April 2024. For LiTE units sold prior please contact Freedom Won for warranty information.		



Two RJ45 sockets [5] are provided, one for connecting the CAN interface from the battery to the system controller or directly to the inverter depending on the brand, and another for connecting the battery to another battery or for a termination resistor described in more detail later in this document

Accessing and programming the BMS happens through the gateway using the Ethernet port shown [13]. For a local PC connection, the E Connect app and an Ethernet cable is required to access the BMS through the gateway. This will be used when updating firmware or loading a new profile. The required profile is typically loaded by Freedom Won before delivery – if a custom profile is required, to suit an inverter with an unusual CAN interface protocol, please contact Freedom Won for assistance.

The ON button [8] and OFF button [9] are located on the colour wheel SoC display.

Figure 2.2 Labelled Image of the Freedom Won LiTE 2 Home Connections



[12] When connecting the Wifi antenna to the battery ensure to fasten the nut finger tight only. Do not use a spanner or tool to tighten the antenna as it could cause irreparable damage.

All LiTE 2 units have feet as standard [14].

### 3. DC Bus Design Notes

The LiTE 2 range includes an integrated battery DC breaker/isolator that breaks the positive cable continuity inside the battery. The system therefore does not require additional protection in the form of a DC isolator or breaker except where required in relation to conformance with local standards, for example, the Clean Energy Council of Australia battery design Best Practice Guide, which states that, should the internal battery isolator not offer isolation of BOTH the positive and negative terminals of the battery, an external isolator is required that can isolate both the positive and negative cables/terminals of the battery.

For approximate short circuit current values of each battery model please refer to Tables 2.1 and 2.2

The external isolating device required for installations in Australia should be designed to withstand these fault levels (short circuit currents).

#### 4. Transport, Handling and Mounting

The Freedom Won LiTE 2 Home and Business units are packaged in protective layering and fastened into a wooden crate with pallet-type feet, which allow lifting with a forklift or a pallet jack. The LiTE 2 Home 10/8 model is easily handled by two people. The LiTE 2 15/12 and 20/16 models may be manually handled by four or six people. LiTE 2 30/24, 40/32, 60/48 and 80/64 models must be handled with care by a forklift or pallet jack of the required lifting capacity rating.

Eye bolts fixed to the top of the LiTE 2 unit can be used for hoisting the battery into position if required (excluding 10/8, which can be lifted manually). The eye bolt on the models up to the LiTE 2 20/16 can be removed after installation. Ensure that you have one M12 x 1,75 thread eye bolt rated for 450kg or more for the models that are not supplied with permanently fixed eye bolts.

If it is necessary to transport the batteries through difficult routes by manual handling, we recommend selecting a smaller model and connecting sufficiently in parallel to reach the desired storage capacity.

In order to lift the Lite 2 range figure 4.1 is an illustration of how the eye bolt can be installed in the battery. Figure 4.1 also shows the access hatch for easy access during maintenance.

Figure 4.1 Eye bolt and access hatch



Eye bolts fixed to the top of the LiTE 2 unit can be used for hoisting it up to the required height for fitting to the wall (excluding LiTE 2 10/8, which can be lifted manually). The eye bolt(s) on the models up to the LiTE 2 20/16 can be removed after installation. Ensure that you have one M12 x 1,75 thread eye bolt rated for 450kg or more for the models that are not supplied with permanently fixed eye bolts.

Lifting the batteries by the eye bolts should be performed using a mobile gantry crane or a high lift pallet jack.

Figure 4.2 Eye bolt Example



Figure 4.3 Eye bolt Installation on a LiTE 2 15/12 model (remove after installation)



The units can alternatively be lifted to the correct height using a high-lift pallet jack as shown in Figure 4.4.

A site-assembled gantry with an electric winch is shown in Figure 4.5.

The Business models must be moved to near the correct location using a pallet trolley.

Lifting the Business models upright - with the top and sides of the crate removed, and with the battery still strapped to the crate bottom, lift the battery upright onto its feet using enough people to ensure a safe operation. While doing so ensure that the battery feet do not slide out on the floor.

Once the Business battery is upright it is easy to "walk" it into position (for the 40/32) or to use a pallet trolley.

Figure 4.4 High Lift Pallet Jack



**Caution:**

1. Handle the LiTE 2 unit with great care when lifting and maneuvering. It should remain either lying flat on its back, or vertically upright (it should not be placed upside down or on its front face).
2. Do not allow the high lift pallet jack to "over-centre" or topple forward.
3. Take care not to knock any of the protruding items against obstacles during handling such as the DC cabling and plugs and the circuit breaker handle.
4. Take care not to scratch the unit during handling. Packaging foam should be used to protect the paint when being handled on a trolley or pallet jack.
5. Always ensure that lifting equipment and slings are adequately rated for the lifting weight.
6. Ensure that the eye bolts are fully screwed into the hard point thread on the top of the unit before lifting.
7. Wear personal protective equipment such as safety shoes and gloves while handling and mounting the LiTE 2 unit.
8. Always ensure that you have enough people on hand to perform the operation safely, i.e. at least one person to guide and stabilise and one person to hoist or handle the pallet jack or gantry.
9. When using a gantry absolute care must be taken to prevent the gantry from being pulled over by non-vertical tension on the rope.

## 5. Mounting and Environmental Requirements

The LiTE 2 Home and Business models are designed strictly for indoor use away from moisture and direct sunlight.

No specific venting is required since the LiTE 2 unit emits no hazardous gases, however, air circulation may be required to ensure room temperature is maintained at reasonable levels, preferably below 30°C (see LiTE 2 range warranty for information upper-temperature limits for hot environments).

Room heating may be required in cold climates to keep the room above 0°C since charging of the LiTE 2 unit is not permitted below 0°C. Ambient environments that regularly exceed 35°C must employ room cooling to ensure optimal service life and to retain warranty validity.

Temporary storage or transport of the LiTE 2 unit is permitted in the range -20°C to 45°C, however extended storage should be between 0°C and 25°C.

The LiTE 2 unit may be mounted directly against a wall or on the floor. There is no minimum requirement for spacing around the unit from other objects, provided that these objects do not generate heat and that the vents on the sides of the unit are not blocked. Note however that access is required to the USB programming port on the left side, and the CAN Bus plug sockets and cable plugs on the right side.

The LiTE 2 unit should be installed at least 500mm away from a heat source. The LiTE 2 Home and Business IP rating is IP20. The breaker is rated for IP40.

## 6. Connecting the Freedom LiTE 2

### 6.1 Power Cables

The LiTE 2 Home makes use of new easy to release power connectors. Please make sure the connectors are fitted and latched correctly before connecting power to the cables.

The LiTE 2 unit is simple to connect to the inverter. Connect the cables to the battery and then route the cable to the inverter to assess the length required, cut the cables to the correct length on the open ends and fit the required lugs.

**Caution: Prior to plugging the cables to the battery and connecting the positive and negative cables to the inverter be sure to check that the main battery circuit breaker is switched off. This will ensure that there are no short circuits between the loose ends of the cables.**

For the crimp lugs to be fitted to the ends of all cables, ensure that the correct terminal size is used, and the lug is matched to the size of the cable. The positive cable and battery plug is red, and the negative cable and battery plug is black. The polarity is also confirmed by + and - signs on the battery casing beside the respective plugs. See Tables 2.1 and 2.2 for the cable size and quantity fitted to each LiTE 2 unit. The cable cross sectional area is based on an acceptable voltage drop with the inverter being mounted on the wall adjacent to the battery so that the cable run is less than 5m (Note: however, that the standard cable length is 1,8m, longer cables available on request).

Cable runs longer than 5m should be assessed and larger cables considered for extending the LiTE 2 unit cables to minimise voltage drop. Double Insulation welding cable is recommended.

The cables may be routed through trunking and connected into the inverter on the positive and negative terminals respectively. The inverter terminals on most inverters can then be used for linking up the charge controller(s) to the DC Bus. On Installations where there are too many inverters and/or charge controllers to connect to the DC bus using the inverter terminals as a junction point a DC connector box is required. Where more than one cable is fitted per pole, the battery cables can be separately routed directly to separate equipment (inverters and charge controllers) – if this is done the installer must take care to ensure that any one of the cable pairs will not be overloaded. The cables for each pole are connected together inside the battery.

It is important to ensure that if batteries are to be used in parallel all the battery power cables have the same length.

## 6.2 Control Cables – Overview

For controlling external devices, you will need to connect the CAN Bus cable that allows the BMS inside the LiTE 2 unit to control and interface with these devices.

The CAN Bus connection is made using the RJ45 plug with the pin configuration on the battery plug end is provided in Table 6.1.

*Table 6.1 Colour Coding and Pin Configuration for CAN Bus UTP Control Cable*

RJ45 Pin No.	Standard Ethernet Cable Colour	Wire Function
Pin 1 to 6	-	Not Connected
Pin 7	Brown/White	CAN High
Pin 8	Brown	CAN Low

Please refer to the respective inverter brands manual for their pin configuration or contact Freedom Won for assistance.

## 6.3 CAN Bus Control – Detailed Description

CAN is a widely used communication protocol in systems that involve multiple devices needing to report their status or send commands to others on the same network. The LiTE 2 unit BMS can transmit messages and commands using the CAN protocol to provide information to, and more importantly, control external devices. CAN offers significant versatility and enables simple installation, requiring only two wires for communication: CAN High and CAN Low.

For an inverter or charge controller to be controlled via CAN, it must first be equipped with a CAN interface and a suitable method for connecting the CAN wires. Additionally, the LiTE 2 unit's Battery Management System (BMS) must be programmed with a CAN messaging profile tailored to the specific inverter or charge controller being used. This profile must be developed individually for each inverter model or model range. To date, Freedom Won has developed CAN profiles for most common inverter brands on the market, details are available in the Freedom Won Inverter Compatibility Guide.



Freedom Won welcomes requests to develop BMS CAN profiles for additional inverters that are equipped with a CAN interface for BMS integration

The CAN interface can provide the following functionality to compatible devices:

1. Charge Current Limit of all LiTE 2 units connected
2. Discharge Current Limit of all LiTE 2 units connected
3. Actual State of Charge (minimum of all LiTE 2 units connected)
4. Actual Battery Temperature (highest of all LiTE 2 units connected)
5. Actual Voltage
6. Actual Current (total of all LiTE 2 units connected)
7. Maximum real-time charge voltage setpoint
8. Battery Name
9. Highest Cell Voltage of all LiTE 2 units connected
10. Lowest Cell Voltage of all LiTE 2 units connected
11. Firmware Version
12. Ah capacity of all LiTE 2 units connected
13. Advanced communication between all connected LiTE 2 units

The CAN 2.0 Part A and Part B standard uses the SAE J1939 standard in the LiTE 2 unit. It is necessary to install a 120Ω resistor on each end of the CAN cable (splices do not require a resistor). Most devices operating on CAN have two plugs to connect in and then out again on the CAN Bus. The first and the last device in the chain must have a termination resistor plugged into the spare (second) plug. The LiTE 2-unit resistor plugs are available from the inverter manufacturer and from Freedom Won. Where one LiTE 2 unit is installed or where it is the end-of-line CAN device, the LiTE 2 unit must be fitted with a termination resistor.

The LiTE 2 unit is supplied with a termination resistor as standard. Other devices must be equipped with the correct termination resistor for that specific brand, as the pin configuration may differ from the battery plug. The third-party device manuals must be referenced for all details regarding connecting the CAN interface. Most brands use 500kbps. If 250kbps is required, it is available on LiTE 2 units with a specific profile loaded, which must be requested when ordering the unit or can be loaded during commissioning by your distributor for Freedom Won technical support.

If you did not purchase a CAN Bus cable to suit your inverter you can make your own according to Table 6.2. Fig 6.1 provides the standard colour coding for an ethernet cable (note that there are other variations – cross reference with Table 6.2. to confirm the correct configuration for the inverter brand).

Fig 6.1 Pin Configuration for standard Type T-568B RJ45 plug.



Table 6.2 Pin Configuration for CAN Bus Control Cable for various supported inverters

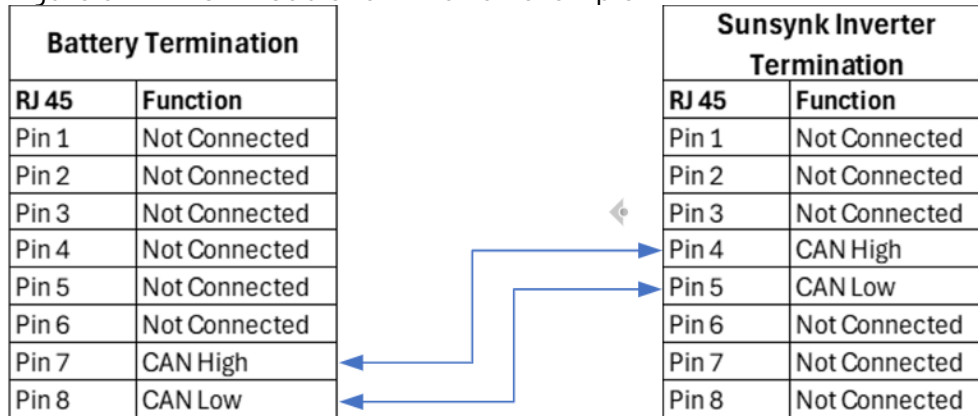
Inverter Brand	CAN L	CAN H	Comments
Freedom Won Encore	Pin 5 (blue/white)	Pin 4 (blue)	
Victron (Venus Controllers)	Pin 8 (brown)	Pin 7 (brown/white)	
SMA (Sunny Island)	Pin 5 (blue/white)	Pin 4 (blue)	Bridge Pin 3 and Pin 6 on Inverter end of cable with a 120Ω resistor.
Imeon	Pin 2 (orange)	Pin 1 (orange/white)	
Solax	Pin 1 (orange/white)	Pin 2 (orange)	This brand requires a special cable to accommodate pin assignment on inverter.
Goodwe	Pin 5 (blue/white)	Pin 4 (blue)	
Sofar	Pin 2 (orange)	Pin 1 (orange/white)	
Struder			The Struder X-Com can be configured to suit one of the options in Table 5.1 using jumpers supplied with the X-Com CAN unit.
MLT Drives	Pin 5 (blue/white)	Pin 4 (blue)	
Sunsynk	Pin 5 (blue/white)	Pin 4 (blue)	
Sunforce/Growatt	Pin 4 (blue)	Pin 5 (blue/white)	This brand requires a special cable to accommodate pin assignment on inverter.
Revo	Pin 5 (blue/white)	Pin 4 (blue)	
Axpert King			Requires RS232, CAN Bus not supported, compatible only with the Freedom Won eTower, not the LiTE 2 2 ranges.
Solis	Pin 5 (blue/white)	Pin 4 (blue)	

Table 6.2 lists some of the standard inverter pin configurations. If your inverter brand is not listed here please refer to the compatibility guide on the website.

Figure 6.2 illustrates an example of how a CAN cable will be made up between Freedom Won battery and an inverter.



Figure 6.2 Pin CAN Cable termination example.



#### 6.4 Parallel Configurations

It is permissible to connect multiple LiTE 2 units in parallel provided that the model size used is the same throughout. It is however more cost effective to purchase one larger LiTE 2 model than connecting multiple units in parallel. This type of installation should be reserved for future expansion where it is not feasible to purchase a model large enough upfront for future requirements (financial constraints).

The LiTE 2 batteries configure themselves automatically once they are switched on, with the first battery that is switched on assuming the role of the "master". All others to be switched on subsequently assume the role of "slaves" by automatically assigning themselves with unique addresses. A maximum of 20 units can be connected in parallel. All the LiTE 2 units must be connected onto the CAN Bus via the CAN Bus using standard LAN cable.

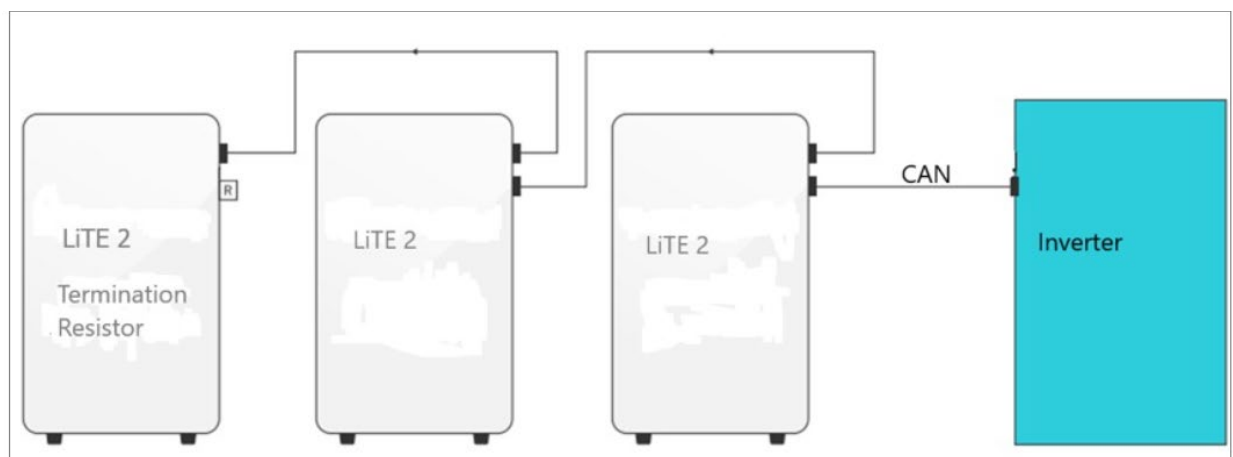
When using the CAN Bus to control the inverter(s) and charge controller(s), the CAN Bus from any battery can be connected directly to the inverter or the system controller, depending on the product brand. The LiTE 2 is equipped with two RJ45 sockets (refer to Figure 6.3.). On the last unit in the cable connection line, one socket is used for an end-of-line (termination) resistor, with the second RJ45 being used to connect to the next device, whether it be another battery, an inverter, a solar charge controller, or a system controller. On a unit connected in the communication line, both sockets are used to connect to other equipment. This connection method is referred to as a "daisy chain".

Figure 6.3 Picture Illustrating 2 x RJ45 Sockets for CAN Bus



Freedom Won LiTE 2 batteries configure themselves automatically for master and slave configurations with up to 20 batteries in a system. No programming is required, simply connect the CAN Bus cables and switch on the LiTE 2 unit. The Master will be the first battery that is switched on. Figure 6.4 is a connection example of multiple batteries in parallel with the positions of the termination resistors shown.

Figure 6.4 CAN Bus Connection Example with Four LiTE 2 units



If the master LiTE 2 unit trips, one of the slaves will take over as the master automatically, without any interruption of service.

Freedom Won offers a fair trade-in on LiTE 2 units on the purchase of new units, which is an option for somebody wishing to expand their battery capacity instead of installing parallel units. Please request more details from Freedom Won if this is your upgrade preference.

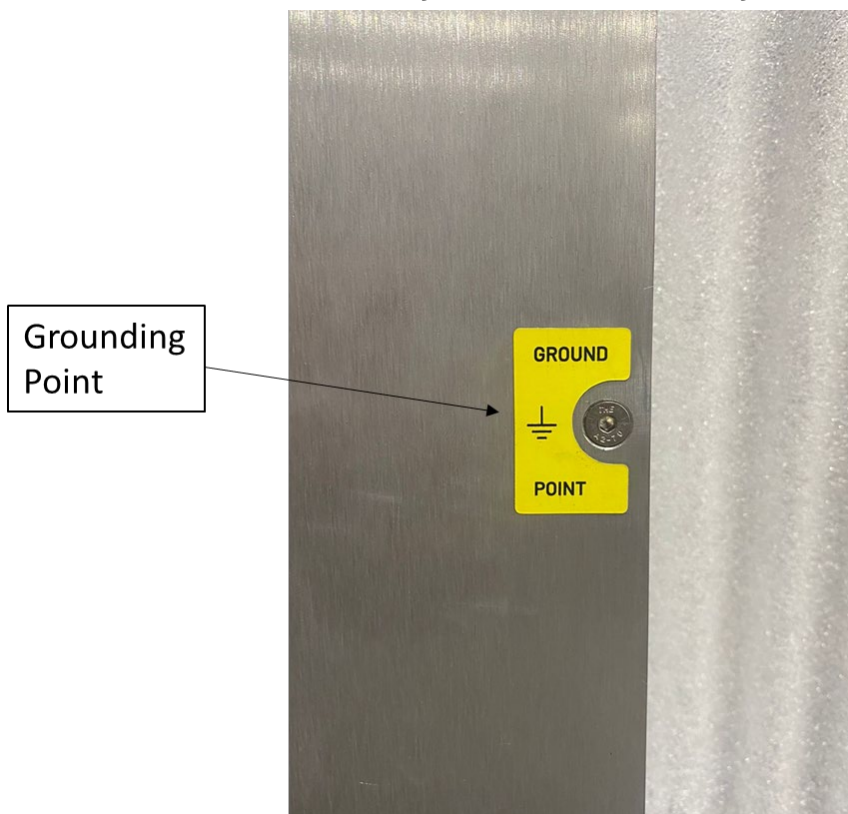
New units can be placed in parallel with old units up to about 4 years or 1500 cycles, after which it is preferable to trade in for a new larger unit.

### 6.5 Grounding Instructions

Correct grounding of the LiTE 2 casing is essential. If the LiTE 2 is not properly grounded, it may lead to communication issues.

Correct grounding also provides a safe path for stray or excess electrical current, reducing the risk of electrical shock caused by unexpected voltage spikes. A dedicated grounding sticker is provided on the casing to ensure the frame illustrates the correct grounding position. Ensure the frame is always grounded at this designated point, as shown in Figure 6.5 below.

Figure 6.5 Lite 2 Grounding Instructions



## 7. Programming the LiTE 2 unit

The BMS can be programmed with a PC through the Ethernet port using E Connect and a standard Ethernet cable. Once the PC is connected to the BMS it is possible to setup up the profile on the BMS and load new firmware. The computer must have the correct utility software installed.

It is also possible to program the profile on the battery remotely through the Freedom Won Portal.

Programming of the BMS is intended only as a function to be performed by Freedom Won and approved distributors and installers. The manual on how to operate the BMS along with the utility is available from Freedom Won. Write access to the BMS profile is password protected, however users and owners may request read-only access.

## 8. Switching on the LiTE 2 unit

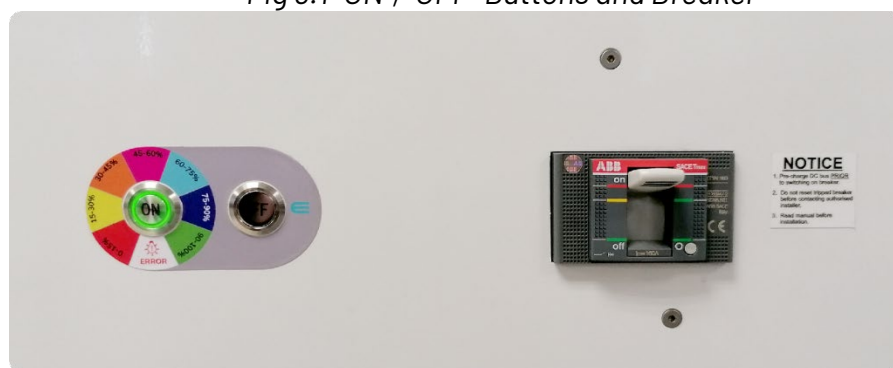
The LiTE 2 unit is fitted with an "ON" button. Press this button for at least 5 seconds to switch on the BMS inside the battery. Once the BMS has been energised you will observe the SoC display come to life with the SoC level shown. Confirm at this stage that the error light is not illuminated. If it is, contact Freedom Won. If the Reduced Power light is illuminated, do not be concerned, it should turn off automatically after the battery has been in operation for a few hours.

Once the BMS has been energised, the main breaker may be switched on by pushing the breaker upwards. Ensure beforehand that you have secured the DC cables to their proper locations and that the rest of the system is ready to receive battery voltage. If the breaker is in the tripped position, it will be necessary before lifting the breaker to first push down the breaker lever to reset the internal mechanism.

**Note:** On some inverters there is a large inrush current when switching on the DC supply. It is important in these instances to pre-charge the DC bus. With Victron, this can be achieved by switching on the PV to the MPPT's to allow them to apply voltage to the DC bus before closing the battery breaker. If this option is not available, you can switch on the AC input power to the Victron inverter as this allows the inverter to place voltage on the DC bus. If you are using inverters that cannot do this, you will need to use a pre-charge resistor.

To switch off the DC output from the LiTE 2 unit, pull down the breaker. To switch off the power to the BMS, press the "OFF" button as illustrated in Figure 8.1. This will also trip the breaker if it is still on at the time. The LiTE 2 unit must be switched off fully when not in use to prevent self-discharge.

Fig 8.1 "ON", "OFF" Buttons and Breaker



## 9. Settings Required for Configuring Inverters and Charge Controllers

The Freedom Won LiTE 2 batteries are designed to operate with a CAN bus compatible inverter. The CAN Bus allows the battery to transmit limits and data. This means there are few parameters that need to be set into the inverter during commissioning.

Some inverters allow setting limits for charge and discharge current, and for maximum and minimum voltage. If these parameter fields are present, set according to the following:

- Charge and Discharge Current Limits – set as per the maximum continuous values provided in the specification sheet for the applicable model (see Table 2.1 and 2.2).
- Max charge voltage – 55.8V
- Minimum voltage – 49,0V

A SoC can be set on the inverter according to user requirements, determining how much battery power can be used before grid power takes over (if available). This should be based on the desired minimum battery State of Charge (SoC) to ensure sufficient capacity is retained for handling a grid outage or load shedding. The user should also consider the daily cycling depth, as it impacts the overall battery service life. The recommended SoC for forcing the inverter back to grid power in a self-consumption setup is generally 20% but may be set higher according to user requirements.

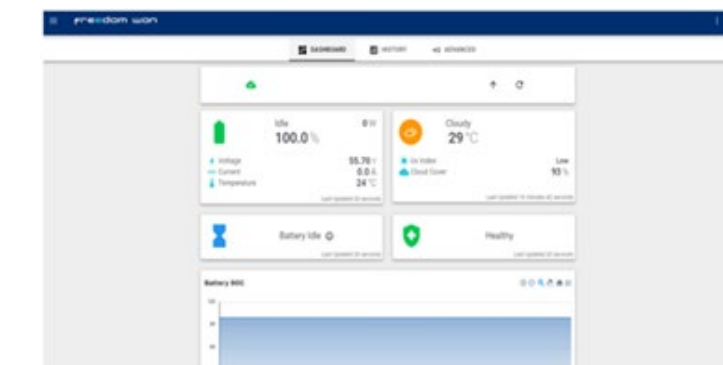
## 10. Connecting a Freedom Won LiTE 2 Home to Internet

It is possible to connect your new Lite 2 battery to the Internet for remote monitoring, setup and fault finding. You can connect your battery with either a Wifi connection or an Ethernet connection.

For detailed connection procedures refer to the online Lite 2 internet connection guide found on the website

If the battery has been successfully connected to the network via Wi-Fi/ Ethernet. The Freedom Won portal is now accessible via the following link: <https://portal.fw-cloud.net>

**Viewing your battery on the portal:** You may now navigate to the final link which is the “Dashboard” Button. This will direct you to your battery’s view on the Freedom Won portal where you can access the live data, view historical records and view the more advanced parameters logged by the system. These can be navigated through the appropriate tabs at the top of the page, as shown below.



## 11. Accessories

Freedom Won offers the following accessories:

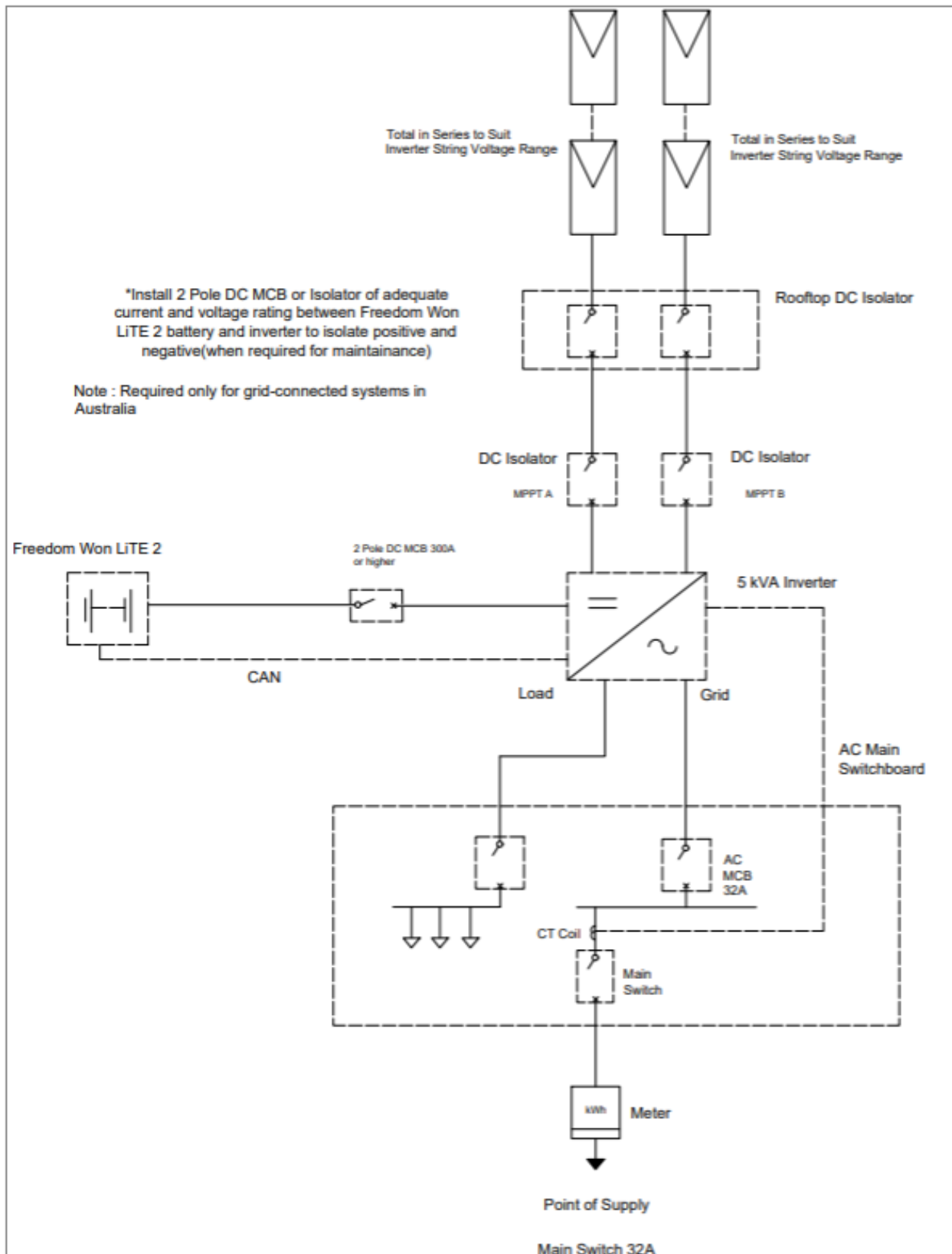
Table 12.1 List of Accessories

Item	Description
120Ω Termination Resistor - RJ45	For plugging into the second CAN port for an end-of-line Battery (these are supplied with each battery and hence it is generally not necessary to purchase separately from Freedom Won.
Eye Bolt M12	Required for lifting 15/12 and 20/16 models using the hard point on top of the unit
CAN Bus Cables	For various inverters requiring non-standard cables.
Wi-Fi Antenna Extender	The LiTE 2 range comes with a Wi-Fi feature as standard, and the antenna is supplied with every battery. An antenna extender is available on request. See price list for options.

## 12. Typical Installations

Below is a diagram of a typical battery and inverter installation

Fig 12.1 Typical Installation of Lite 2 Battery





For assistance with connecting and configuring the supported inverters, please contact Freedom Won Technical Support

### 13. Warranty and Repair

The LiTE 2 unit is sealed with a tamper proof warranty seal. It may not be opened by anyone other than Freedom Won and installers or repairers that have been explicitly approved by Freedom Won. The warranty on the unit will be void if the seal is damaged or missing.

If the LiTE 2 unit indicates an internal problem, please contact Freedom Won or the installer that installed the system. Freedom Won will arrange that it is inspected and repaired.

The warranty will not cover damage to the control wiring resulting from draw of excessive current or any damage resulting from lightning. Damage caused by physical means to the battery housing, external and internal fittings, such as impact with other objects, or being dropped, is not covered by the warranty.

The standard warranty period is 10 years or 6 000 cycles at an average of 80% DoD, whichever should first occur. The battery is required to provide at least 60% of its new capacity at the end of this period or cycle count. The BMS records the number of cycles used. If you suspect that your LiTE 2 unit is delivering substantially below its minimum performance, please contact Freedom Won for an investigation. If the unit is found to be underperforming, it will be serviced such that the minimum performance guarantee is again restored. Freedom Won may arrange at their discretion for an on-site service or request delivery of the unit to Freedom Won for servicing at our facility. This will be mostly determined by the geographic location, ease of access for removal of the unit, and size of the unit. Note that the warranty does not cover shipping and transport costs.

For more detailed warranty information please refer to the warranty on the Freedom Won website.

*Note: This warranty applies to LiTE 2 units sold after 1 April 2024. For LiTE2 units sold prior please contact Freedom.*

#### 13.1 Surge Protection

It is crucial to fit surge protection to any storage solution procured from Freedom Won. This will help protect the battery and BMS from voltage spikes. The warranty does not cover damage from surges of lightning strikes.

Below is an example of a surge protection product that can be used for this purpose, the part number for this product is MIM-NID. Similar surge protection will also be accepted as long as they offer the same protection and performance level as the Mimosa device.



Figure 15.1 Mimosa Surge Arrestor (Network Interface Device)



### 13.2 Expected Product Life

LiTE 2 models are designed for optimal life cycle cost; LiTE 2 models are expected to operate for about 16 years in a daily cycling scenario for more than 6000 cycles. The defined end of life in this instance occurs when the battery capacity falls to 60% of the new capacity.

LiTE 2 models are expected to operate for about 16 years in a daily cycling scenario for more than cycles with an average of 80% DoD. To ensure optimal product lifetime it is essential to cycle the battery regularly. Battery degradation is worse if kept at full charge for long periods

For applications where the cost per kWh delivered by the battery during its lifetime is of prime importance (i.e. maximum return on investment), we recommend that the battery be sized for an average cycle discharge of 50-60% DoD. In a daily cycling scenario such as for optimal solar self-consumption and off grid systems, the expected service life is then 20 years or more than 7500 cycles. The defined end of life in this instance occurs when the battery capacity falls to 60% of the new capacity.

To achieve long life, it is critically important to operate the battery below 25 degrees Celsius. The ideal operating range being 15-25 degrees.

## 14. Troubleshooting Guide

Most issues with the LiTE 2 unit can be resolved using Table 17.1 below. If a problem cannot be resolved after referencing this table please contact Freedom Won or your approved Freedom Won supplier.

Table 17.1 Troubleshooting Guide (applicable to units with On and OFF buttons)

No	Problem Description	Cause/Solution
1	Eye bolts do not screw into hard point on top of LiTE 2 units	Check that you have the correct eye bolt with the correct thread pitch - M12 x 1,75
2	The rawl bolt head does not fit into the hole on the back of LiTE 2 units (wall mounted models)	Check that you are using the correct size Rawl Bolt as specified in this manual and that you have after positively tightening the internal gripping collar turned the bolt out again so that there is about 5mm of the bolt shank exposed so that the back plate can fit easily behind the bolt head. If the wall is uneven, it may be necessary to turn the bolt head out a little more. Do not turn it so far out that there is less than the full thread length engaging on the internal locking collar.

3	The LiTE 2 models have no voltage on the main output cables	<p>Check that you have switched on the main breaker switch. Note – only turn this on once you are satisfied that you have completed the installation and that there are no DC or control wires that can short out or touch ground or other wires. Also ensure that you are ready to accept AC voltage onto the inverter output before switching this breaker on. Also, confirm that you have energised the BMS first by pressing the “ON” button for 3 seconds and as evidenced by the lights on the SoC display.</p> <p>If voltage is still not present with the breaker switched on it is possible the breaker has been damaged – please contact Freedom Won.</p>
4	The BMS(indicated by battery SoC display lighting up) does not stay on after the ON button is pressed	<ol style="list-style-type: none"> <li>1. Error on the BMS. Check whether the red error light is illuminated on the SOC display when the ON button is held in. You can try to reset the error by pressing the RESET button for about 2 seconds and release. This should clear the error and allow the BMS to stay on after releasing the ON button.</li> <li>2. Battery has been discharged to critically low level – remove all potential loads from the battery and switch off the inverter(s). Then try to switch on the BMS. Battery has been charged to critically high voltage level – usually leaving the battery for an hour will allow the cell levels to drop down within the acceptable levels and allow the BMS to be switched on again.</li> <li>3. usually leaving the battery for an hour will allow the cell levels to drop down within the acceptable levels and allow the BMS to be switched on again.</li> <li>4. If the BMS still does not switch on, please contact Freedom Won or Authorised Distributor.</li> </ol>

5	The main breaker switch keeps tripping each time I attempt to switch it on	<p>There are several potential causes:</p> <ol style="list-style-type: none"> <li>1. The BMS has not been switched on. The ON button must be pressed for 5 seconds. On release the SoC Display must remain illuminated.</li> <li>2. High inrush current on certain inverters – First preference is to pre charge the DC bus by switching on the solar charge controllers if present and in daytime. If this is not possible switch on the AC feed into the inverter and switch on the inverter. Some makes will then pre-charge the DC bus. You can also use a pre-charge resistor for this. If this does not work after the second attempt investigate the other options.</li> <li>3. Short circuit on the DC Bus or faulty inverter or MPPT causing high currents.</li> <li>4. In a system with multiple LiTE 2 units in parallel, the reason could be that the unit you are trying to switch on is at a different voltage to the others – the voltages must be similar (within 1V of each other) on all batteries when switching them onto a common DC bus.</li> </ol> <p>If none of the above solve the problem, you will need to contact Freedom Won or your authorised installer for assistance with this issue.</p> <p>It will be necessary to establish the reason for the error before continuing with the normal operation of the system. Repeated tripping is damaging for the breaker.</p>
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6	After resetting the BMS the main breaker still will not stay up	<p>The is most likely because the battery is fully discharged and the BMS is protecting the cells from further discharge. Ensure that there is no chance of load being applied to the battery by isolating the AC output from the inverter. Ensure that the AC input to the inverter is live so that the charger may begin charging the battery after you switch it on. Alternatively, an MPPT can be used for this immediate charge if there is sunshine at the time. This charge should increase the battery voltage to prevent further tripping. This problem should not occur if the inverter control is working properly.</p> <p>If this does not work, it is because the battery has been discharged too deeply and will need to be reset remotely by Freedom Won by accessing your Windows PC connected to the battery. The PC must have TeamViewer installed and you will need the RS232 adaptor to connect the PC to the battery. Please contact Freedom Won.</p>
7	I have switched off the main battery breaker switch to prevent discharge of the battery but the SoC display lights are still on	The BMS and SoC display receive power directly from the battery and therefore the "OFF" Button must be pressed to switch off the internal electronics.
8	The inverter will not come on even though the inverter switch is selected to 'on'	<p>The enable command may not be coming from the BMS or may not be properly connected to the inverter or the inverter may not be properly configured to deal with the enable command.</p> <p>If you are running on a CAN Bus control with a compatible inverter and you are not observing the correct enable response from the inverter, check that the CAN High and CAN Low wires are connected properly (ensure that you have the High and Low the right way around and that you have connected the two end of line 120Ω resistor in the applicable places. If this is not the problem, then you need to confirm that you have the right CAN profile programmed onto the BMS for the inverter in use (baud rate or CAN messages may be for another inverter brand) or that you have configured the inverter or system controller correctly. Check that your CAN Cable is properly made up on the pin configuration and that the terminations are good. Contact Freedom Won or your Authorised Distributor for assistance.</p>
9	The charger will not come on even though there is power on the AC input of the inverter and the charger is activated in the inverter settings	The battery might be full. Try discharging the battery for a while and observe if the charger then comes on. If not, then the fault finding process is similar to above.

10	The error light keeps illuminating after each reset	If the battery voltage is within limits this should not ordinarily occur. Contact Freedom Won or an approved installer for assistance with determining the problem. If the main breaker does not trip it is not a critical error and you may continue using the battery while you make, contact for assistance.
11	The pack voltage is within limits, but the main breaker still trips seemingly at random	This could be caused by many things but is most likely because the current draw is exceeding the battery current limit setting. Measure the current with a tong tester while drawing your maximum typical load to determine if you are exceeding the rated current for the respective LiTE 2 model. If it is not the current causing the trip it could be a weak cell or the extreme temperature of the surroundings. Both are unlikely. If the problem persists, contact Freedom Won.
12	There is no Wi-Fi or the battery does not want to connect to Wi-Fi	Before connecting an antenna, make sure that Wi-Fi is available near or around the room where the battery is installed. If there is no signal near the battery, then consider getting a Wi-Fi range extender/booster or alternatively run an Ethernet cable directly to the system. Freedom Won has Wi-Fi extenders and boosters available on request.