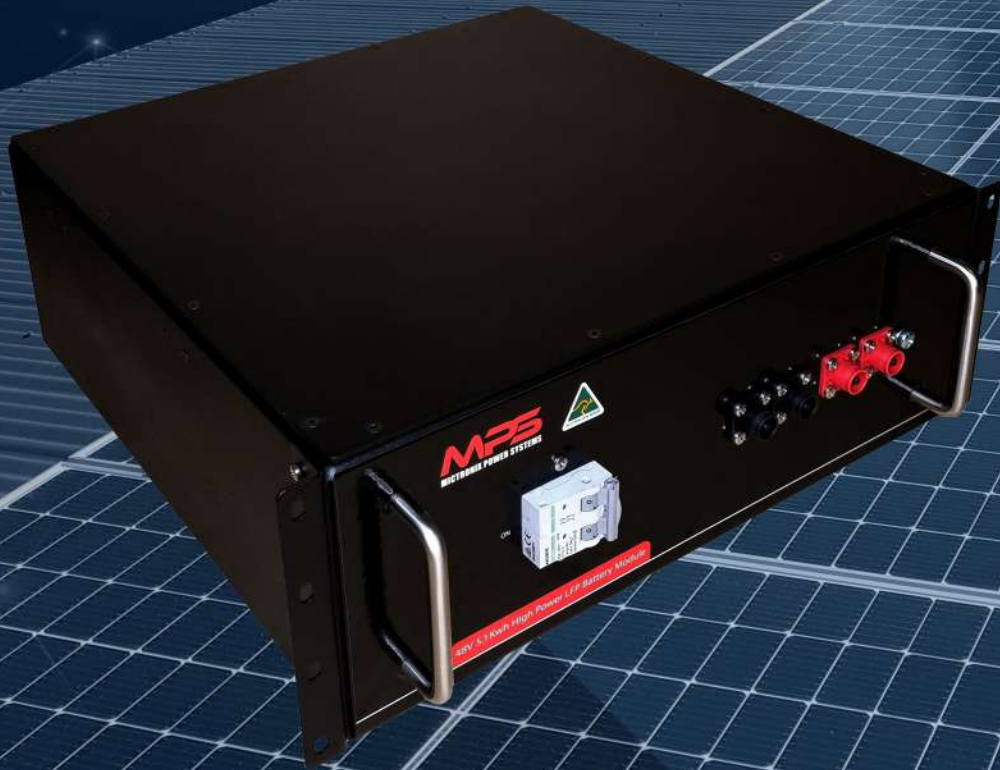


MPS

MICTRONIX POWER SYSTEMS



PRODUCT MANUAL

HIGH POWER LFP BATTERY MODULE



INTRODUCTION

The Micronix 48V, 5.1Kwh high power LFP battery module is a robust energy storage solution that can be used in a wide range of applications.

The battery module has been designed and made in Australia to suit Australian conditions over a long service life, maintaining maximum performance.

Simplicity of installation and maintenance was a priority in the design process.

Micronix Power Systems (MPS) strives to manufacture as much of the battery module in Australia as possible, feeding money back into the local economy.



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Designers and installers must have a detailed understanding of this manual before undertaking any works involving the battery module. They must also be qualified to carry out the installation of the battery module/s in the intended geographical region.

Battery charging, discharging and storage specifications must be followed at all times.

The battery module has a high quality, calibrated Battery Management System (BMS) that protects from all fault conditions including cell balancing, cell over voltage, cell under voltage, discharge over temperature, discharge under temperature, charge over temperature, charge under temperature, discharge over current, charge over current and short circuit protection. Values can be found in the specifications chart of this manual.

A 2 pole, K curve, non-polarised, 63A circuit breaker provides an isolation point for each battery module. This circuit also provides secondary over current and short circuit protection in conjunction with the BMS.

2 x positive and 2 x negative 120A quick connectors are supplied for the purpose of paralleling multiple battery modules and supplying output power. The connectors are internally bridged after the circuit breaker, allowing pass through even when the circuit breaker is in the off position. This should be noted during system isolations. The connectors are non-keyed so attention must be paid to colour and polarity.

Mictronix battery modules use AA grade Lifepo4 prismatic cells that have been graded/grouped according to capacity and internal resistance. Each cell has a built-in safety over pressure release valve.

KEYSAFETY POINTS

- ✔ Battery modules should be kept dry at all times
- ✔ Battery modules must not be exposed to salt spray
- ✔ Battery modules should not be installed in direct sunlight
- ✔ Battery modules should not be exposed to extreme vibration
- ✔ Battery modules must not be used if crushed, punctured or if visual damage is observed
- ✔ Battery modules must be removed from service if damaged
- ✔ Battery modules must not be installed by unqualified persons
- ✔ Battery module must not be installed in areas with high humidity
- ✔ Battery module must not be disassembled
- ✔ Do not reverse the polarity of the battery module

TRANSPORTATION

- ✔ LFP or Lifepo4 batteries are classified as Dangerous Goods(DG) Class 9 UN3480.
- ✔ Road and sea transport are the designated methods of transport.
- ✔ The battery modules are shipped with the circuit breaker in the off position and at a reduced state of charge.
- ✔ Local shipping labels and regulations should be met.
- ✔ Material Safety Data Sheet (MSDS) can be requested from Mictronix Power Systems.
- ✔ The battery modules should not be placed upside down at any time.

STORAGE

- ✔ The battery modules are shipped at a reduced state of charge. It is recommended to charge the battery every 6 months to approximately 90% SOC.
- ✔ The battery module should not be stored in a fully discharged state. Upon accidental full discharge, the battery must be recharged within 24 hours.

HANDLING

- ✔ The battery is a 2-person lift.
- ✔ Safe work practices should be followed during transportation and installation.
- ✔ If damage to the battery module occurs during transport or installation, it must not be used.

DAMAGED BATTERY

- ✔ Damaged battery modules must not be used. Please contact Mictronix Power Systems or a local recycling facility for disposal.
- ✔ Contact with leaking battery electrolytes should be avoided as it can cause skin irritation and burns.

FIRST AID

Eyes

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Seek medical aid immediately.

Skin

Remove contaminated clothes and rinse skin with plenty of water or shower for 15 minutes. Seek medical aid immediately.

Inhalation

Remove from exposure and move to fresh air immediately. Use oxygen if available. Seek medical aid immediately.

Ingestion

Give at least 2 glasses of milk or water. Induce vomiting unless the patient is unconscious. Seek medical aid immediately.

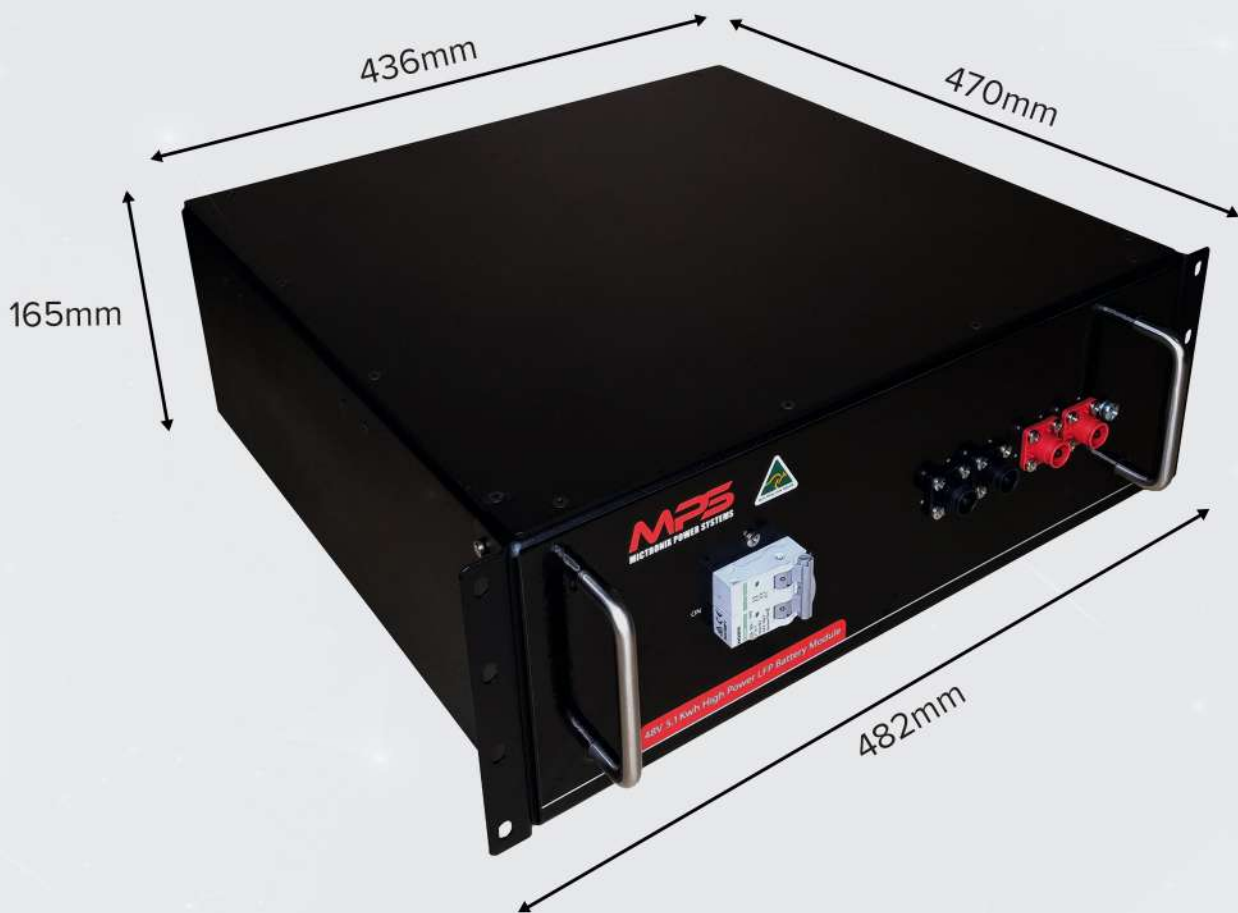
FIRE

- ✔ Water should not be used in the event of a fire. Carbon Dioxide (CO₂) or dry powder can be used.
- ✔ The internal cells may vent when subjected to excessive heat, exposing the battery contents.
- ✔ Toxic fumes may be released in the event of a fire. Fumes should be avoided.
- ✔ Material Safety Data Sheet (MSDS) can be requested from Micronix Power Systems.

SPECIFICATIONS

WEIGHT AND DIMENSIONS

Depth	470mm
Width	436mm
Width with rack mount ears	482mm
Height	165mm
Weight	44kg
Mounting width	19-inch rack mount compatible



MODEL NUMBER	MPS-48-5.1
Nominal Voltage	51.2V
Nominal Capacity	100Ah
Nominal Capacity watt hours	5.1Kwh
Cell type	Prismatic
Cell configuration	1P 16S
Cycle Life 100% DOD @ 25 degrees C	≥ 4,000 Cycles
Cycle Life 75% DOD @ 25 degrees C	≥ 5,500 Cycles
Cycle Life 50% DOD @ 25 degrees C	≥ 10,000 Cycles
Cycle Life 100% DOD @ 45 degrees C	≥ 1,800 Cycles
Capacity @ 0°C	85Ah
Capacity @ 55°C	95Ah
Series connection	Not permitted
Parallel connection	Unlimited - contact Mictronix
Recommended depth of discharge	90%
Usable capacity	4.608 Kwh
Battery Charging Temperature range. Protected via internal BMS	0 - 55°C
Normal Charge Voltage CV/CC*	56.00V
Standby (Float) Voltage	55.90V
Maximum Charge Current	63A @ 25°C limited by circuit breaker
Recommended Charge Current for Maximum Life	≤33A
Battery Discharge Temperature range. Protected via internal BMS	-10 - 60°C
Battery Output Voltage Range	44V - 56V
Maximum Discharge Current	63A @ 25°C for 30 mins
Continuous Discharge Current	50A @ 25°C
Pulse Discharge Current	80A @ 25°C for 30 sec
Maximum Discharge Power	3.2Kw @ 25°C for 30 mins
Continuous Discharge Power	2.5Kw @ 25°C
Pulse Discharge Power	4Kw @ 25°C for 30 sec

MODEL NUMBER	MPS-48-5.1
Over-charge Protection Per Cell	3.75V ± 0.05V
Over-charge Release Per Cell	3.55V ± 0.05V
Over-charge Release Method	Cell discharges below release voltage
Over-discharge Protection Per Cell	2.50V ± 0.05V
Over-discharge Release Per Cell	2.70V ± 0.05V
Over-discharge Release Method	Disconnect load
Discharge Over Current	80A for 1s
Short circuit protection	250A for 960us
Over Current Release Method	Disconnect Load
Battery Discharge Over Temperature	Protection to 65°C ± 5°C Release at 50°C ± 5°C
Battery Charge Over Temperature	Protection to 55°C ± 5°C Release at 45°C ± 5°C
Electrical connection type	5.7mm quick connector (120A rated)
Cooling method	Natural convection
Casing material	Aluminium
Depth	470mm
Width	436mm
Width with ears	482mm
Height	165mm
Weight	44Kg
Mounting arrangement	Horizontal mounting. Vertical mounting with permission
IP rating	IP40
Maximum altitude	2000M
Humidity Range non condensing	≤ 80% RH
Self-discharge Rate	≤ 3% Per Month
Warranty period	Refer to Mictronix warranty statement
Certifications (cell level)	GB/UN38.3 IEC62619

CHARGE AND DISCHARGE SETTINGS

The battery installer should have an accurate method of determining state of charge based on coulomb counting. Voltage is not an appropriate method for determining state of charge for Lifepo4 battery systems. The Victron smart shunt or BMV-712 is the recommended product for this task due to its high accuracy and programmability. Inverters which measure state of charge based on current flow and or battery voltage are notoriously inaccurate. This inaccuracy is compounded over time when a full charge is not reached regularly.

Under-voltage shut down settings should not be relied upon for correct shut down of the battery loads. They are merely a fall back. SOC (state of charge) should be used.

When the battery module has a voltage of greater than 55 volts and charge current is dropping it can be assumed the battery is greater than 99% charged.

When the battery module has a voltage of less than 48 volts at less than 10A discharge load, it can be assumed the battery is less than 3% charged.

The battery module has a very flat discharge curve. Typical voltage under load is 51.2V.

The battery module should reach full charge weekly to ensure internal balancing of cells and accuracy of the state of charge counter.

The battery module is intended to be a suitable replacement option for lead batteries, however charger settings must be changed to suit.

Charge voltages above 56.8V will cause unnecessary balancing of the individual cells and possible high voltage disconnect of the battery module's BMS.

If multiple charging sources are used which are not synchronised, voltages can be stepped to stop the chargers fluctuating around the end point voltage. For example, in an installation with 3 x MPPT chargers, you could set the following: MPPT1 Bulk voltage = 56.00V, MPPT2 Bulk voltage = 55.90V, MPPT3 Bulk voltage = 55.80V. Total maximum charge current rate should be accounted for.

Actual charge voltages should be measured against settings. Inferior inverters and chargers can have large discrepancies between voltage set points and the actual voltage measured at the terminals.

EXAMPLE VICTRON SETTINGS

INVERTER

← 48/5000/70-50

Absorption charge

Battery is charging at constant voltage and with decreasing current until it is fully charged.

← Inverter

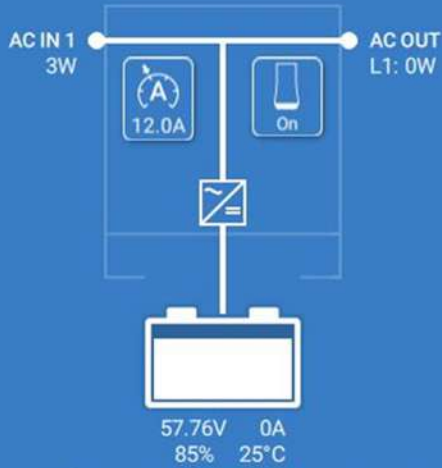
Inverter output voltage	230V
Ground relay	<input checked="" type="checkbox"/>
DC input low-shutdown	44.00V
DC input low restart	50.00V
DC input low pre-alarm	48.00V
Low SOC shut-down	Disabled
AES	<input type="checkbox"/>
Start AES when load lower than	30W
Stop AES when load higher than	60W
AES type	Search mode
PowerAssist	<input checked="" type="checkbox"/>
Assist current boost factor	2.0

DEMO PRODUCT

CHARGER

VictronConnect

← 48/5000/70-50



Absorption charge

Battery is charging at constant voltage and with decreasing current until it is fully charged.

← Charger

Enable charger	<input checked="" type="checkbox"/>
Charge current	30A
Absorption voltage	56.00V
Float voltage	55.90V
Repeated absorption interval <small>The charger will enter in repeated absorption mode at the specified interval to "refresh" the battery.</small>	7.00d
Repeated absorption time	1.00h
Maximum absorption time	8h
Temperature compensation	Disabled
Charge curve Charge curves description	Adaptive ▾
BatterySafe	<input type="checkbox"/>
Lithium batteries Click here to know the effect of enabling or disabling Lithium battery mode	<input type="checkbox"/>
Storage mode <small>When is fully charged keeps the battery at reduced constant voltage to limit gassing and corrosion.</small>	<input checked="" type="checkbox"/>
Use equalization <small>Traction batteries require regular additional charging. Read more...</small>	<input type="checkbox"/>
Weak AC input <small>Should be checked in cases where problems during charge arise. Read more...</small>	<input type="checkbox"/>
Stop after excessive bulk <small>Safety setting. Read more...</small>	<input type="checkbox"/>

DEMO PRODUCT

BATTERY MONITOR

ONE MODULE

VictronConnect

— □ ×

← BMV-712 Smart

← Battery settings



Battery capacity	100Ah
Charged voltage	55.0V
Discharge floor	0%
Tail current	4.00%
Charged detection time	1m
Peukert exponent	1.00
Charge efficiency factor	98%
Current threshold	0.10A
Time-to-go averaging period	1m

Battery starts synchronized
Battery SOC after a reset will be 100%

State-of-Charge 50.0%
Manually set the current state-of-charge

Synchronize SOC to 100% [SYNCHRONIZE](#)

Zero current calibration [CALIBRATE](#)

DEMO PRODUCT

BATTERY MONITOR

TWO MODULES

VictronConnect

← BMV-712 Smart

← Battery settings

A circular gauge with a white arc and the text "50%" in the center. Below the gauge is a menu icon and the text "State of charge".

Battery capacity	200Ah
Charged voltage	55.0V
Discharge floor	0%
Tail current	4.00%
Charged detection time	1m
Peukert exponent	1.00
Charge efficiency factor	98%
Current threshold	0.10A
Time-to-go averaging period	1m
Battery starts synchronized	<input type="checkbox"/>
<small>Battery SOC after a reset will be 100%</small>	
State-of-Charge	50.0%
<small>Manually set the current state-of-charge</small>	
Synchronize SOC to 100%	SYNCHRONIZE
Zero current calibration	CALIBRATE

DEMO PRODUCT

VICTRON MPPT SOLAR CONTROLLERS

VictronConnect

MPPT 150/35

1999_W

Solar

Last 30 days Detailed

12.46kWh

6.23kWh

12 11 10 9 8 7 6 5 4 3 2 1 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12

May April

Lifetime total 1215kWh Since reset 1154kWh

Settings

Battery voltage	48V
Max charge current	35A
Charger enabled	<input checked="" type="checkbox"/>
Battery preset	User defined
Expert mode	<input type="checkbox"/>
Charge voltages	
Absorption voltage	56.00V
Float voltage	55.90V
Equalization voltage	55.90V
Equalization	
Automatic equalization	Disabled
Manual equalization	START NOW
Voltage compensation	
Temperature compensation	Disabled
Battery limits	
Low temperature cut-off	Disabled

DEMO PRODUCT

This manual should be followed for correct installation of the battery module/s.

RACK MOUNTING

The battery modules have been designed to fit a regular 19-inch rack mount enclosure. Each battery module will take up 4RU of vertical space.

Ears are supplied with screws to enable secure fixation to the cabinet rails using cage nuts or threaded holes. The ears should not be relied upon alone to support the weight of the battery. Shelves can be used. Micronix Power Systems can supply clip in rails to provide adequate support.

FLOOR MOUNTING SOLUTION

Micronix Power Systems has a floor mounted stacking solution available. Adjustable feet are used to level the base plate. Stacking legs are used to stack and secure each battery module.

Due to the weight of the battery modules, stacking in this configuration is limited to 6 x battery modules.

HORIZONTAL VS VERTICAL MOUNTING

The battery modules are designed to mount in the horizontal position with the handles facing outwards. This is to ensure maximum life, enabling the electrolytes to make full contact with the anode and cathode.

Vertical mounting is allowed with written permission from Micronix Power Systems.

TEMPERATURE

Temperature has a dramatic effect on the life of batteries. Minimum and maximum temperatures are documented in the specifications section of this manual and must be adhered to.

Sustained high temperature operation will significantly shorten the life span of the battery module.

High charge and discharge rates will increase the temperature of the battery.

Low temperatures limit the amount of discharge power and storage capacity of the battery module. This effect is removed once nominal operating temperatures are achieved and is not permanent.

The internal battery management system continuously checks cell temperature. If an over-temperature event is reached, the BMS will not allow discharging. If an under-temperature event is reached, the BMS will not allow charging. Charging and discharging will resume automatically when correct operating temperature is reached. Temperature set points can be found in the specifications section of this manual.

When the temperature of the battery module is below 15 degrees Celsius, charging should be limited to less than 0.2C.

LOCATION

Local regulations should be followed when determining a mounting location for the battery module. Direct sunlight should be avoided.

Salt spray in coastal locations should be avoided. Otherwise, a sealed enclosure/or filtration may need to be used.

Suitable vermin protection should be used to suit the location.

Humidity levels should be within the figures detailed in the specifications section of this manual. As the battery is a large thermal sink, care should be taken to avoid humidity condensing on or around the battery module.

For maximum life in climate-controlled rooms, the cooling/heating system can be set at 25 degrees Celsius.

MAIN DC CONNECTIONS

The battery module is equipped with 2 x positive 5.7mm quick connectors, which are bridged internally and 2 x negative 5.7mm quick connectors, which are bridged internally. All connectors are capable of delivering and receiving power.

Connectors are of the non-keyed type. Care must be taken not to mix positive and negative connections.

Linking cables can be used to bridge battery modules to increase battery capacity. Series connections i.e. positive to negative connections are strictly prohibited.

Bridging batteries should be limited when the maximum discharge current will exceed the power capability of the connector as detailed in the specifications. Multiple take offs can be used and bridged to increase the discharge capability and reduce voltage drop. Take offs should be the exact length and cross-sectional area to allow the battery module to discharge evenly and reduce circulating currents.

When using linking cables, the main output cables should be placed at opposite ends of the battery bank ensuring the modules charge / discharge evenly across the bank, and reduce the risk of circulating currents between modules.

Cable sizes should be maximised to reduce voltage drop and DC ripple. If smaller cables are used, this can cause excess ripple currents which can make the inverter shut down on an over ripple event. It will also cause excessive heating of the cables and premature failure of capacitors in the inverter and or PCE's.

EARTHING

When case earthing is required, the supplied M6 screw can be used to fix an appropriately lugged bonding cable to the battery module or modules.

COMMISSIONING AND INSTALLATION

Upon commissioning of the battery module, the following guide can be printed and checked off:

- ✔ Ensure the battery module circuit breaker/s are in the off position
- ✔ Install batteries to final location ensuring all requirements in this manual and local government requirements are followed
- ✔ Install linking cables between battery modules ensuring correct colour and polarity is maintained
- ✔ Install main output cables from battery modules to a final battery bank main circuit breaker, before connecting to the power conversion equipment
- ✔ Check connected power conversion equipment is set to manufacturer specifications and is ready for voltage to be applied
- ✔ Check and test all circuit connections for polarity and tighten all terminals
- ✔ Engage the battery circuit breaker on 1 x battery module only and test correct polarity on power conversion equipment
- ✔ Engage the battery circuit breaker on the remaining battery modules
- ✔ Commission all power conversion equipment based on the requirements in this manual
- ✔ Using a DC clamp meter, measure the current flow into and out of each battery module, ensuring even current flow
- ✔ Allow the system to reach the float charging state and test actual battery voltages vs setpoints programmed into the power conversion equipment

MAINTENANCE

The battery module is designed to be maintenance free ensuring maximum reliability and trouble-free operation. The below items can be checked as part of a regular maintenance program regardless:

- ✔ Check for signs of water or condensation around the battery module
- ✔ Check for signs of vermin
- ✔ Remove excessive dust build up
- ✔ Check the operation of circuit breakers
- ✔ Check connectors are seated properly and there are no signs of hot joints
- ✔ Check for splitting and tearing of cabling

DISPOSAL

The battery module has been designed for ease of recycling at its end of life. 98% of the battery by weight can be recycled and has been assembled in a way that the module can be easily broken down into its individual components.

Before disposal it is recommended the battery module be reused in low demand applications at reduced performance levels.

A suitable recycling facility should be used if disposal of the battery module is required.

WARRANTY

Please refer to the warranty statement at www.mictronix.com.au



Available through Battery Works Australia.

www.battery.com.au

Brisbane

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Archerfield Queensland 4108

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Smithfield, New South Wales 2164

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Perth

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PRODUCT MANUAL
HIGH POWER LFP BATTERY MODULE

