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SFK-300HP USER MANUAL

REVISION 1.4



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SFK-300HP Lithium Iron Phosphate

Introduction THANK YOU

Thank you for purchasing your Sun Fun Kits battery kit system, your battery has been hand built by Sun Fun Kits technicians in our Baton Rouge (Louisiana, USA) facility using components from China, United States, and India. We have tested your battery by performing a complete balance, capacity, and load test to ensure it is built to industry standards. Your battery comes ready to use and we recommend you review this manual on how to get the optimum performance and longevity of your unit.

We have built the SFK-300HP battery to be serviceable and upgradeable, this allows for efficient service and repairs and ensures product longevity. The nature of kit built products comes with some considerations; they are not as rugged as non serviceable products so care needs to be given when handling battery kits. However non serviceable products generally have to be disposed of in case of issues (regardless of how insignificant) this contributes to e-waste and is against many right to repair laws; because of this we feel our kit approach offers the best in reliability and longevity for our customers.

Please review this usage manual before using your battery/kit to ensure many years of reliable use. **NOTE:** The battery will arrive with approximately 35% SOC (state of charge) and should be charged to 80-100% before use. This is necessary to comply with shipping regulations; see the charging section for details.

Introduction OVERVIEW



The SFK-300HP is a high performance battery made with LF304 certified automotive grade cells by EVE POWER. Under optimal conditions, it can provide up to 3000 cycles at a depth of discharge of 80% and has an expected life cycle of about 10-12 years. Below we highlight some of the core features of this unit:

Introduction CONSTRUCTION



- ⚡ Made in the USA with domestic and globally sourced components in our facility in Baton Rouge, Louisiana.
- ⚡ Made with **CERTIFIED AUTOMOTIVE GRADE** cells. Every cell in our batteries has its full automotive grade report on its label and this can also be viewed on our website by logging into your account. Sun Fun Kits batteries **DO NOT** use reject / failed / grade B cells in their construction as is the case with practically all batteries coming straight from China and being sold online by retailers.
- ⚡ Upgradable and serviceable, features a tongue & groove construction to allow for sealing the lid to the body for marine use (can be done with permanent or removable sealant).
- ⚡ USA 8 year warranty including all support, service, and repair in the USA.

Introduction PERFORMANCE



- ⚡ 4.0 kilowatt-hours of reliable lithium power, replaces up to 6 lead acid / agm batteries (100ah) and is designed to be fully utilized 0-100%
- ⚡ 2.2 kilowatts of peak power, and 1500 watts of continuous power. Using Amp Boost, max output increases to 2.4 kilowatts with 200 amp discharge.
- ⚡ Expected cycle life of 3000 cycles at 80% depth of discharge, and up to 5000 cycles at 50% depth of discharge, 10-12 year usage life.

- ⚡ Fully compatible with existing 12v infrastructure including standard 12v lead acid/agm battery chargers, trickle chargers and high voltage DC systems up to 48v (when in 4s series configuration).
- ⚡ High and low temperature protection including built in heating pads to allow for low temperature charging.
- ⚡ Automatic low/high voltage cut-off to stop battery damage from occurring.
- ⚡ Automatic short circuit prevention as well as overcharge and over discharge prevention.
- ⚡ Only 57lbs, one of the lightest watt / pound batteries on the market.

Introduction

SMART FEATURES



- ⚡ The battery can be monitored via bluetooth and has apps for Apple IOS & Google Android; view the status of charge, the health of your cells, power output, temperature readings and more.
- ⚡ Users can adjust battery parameters such as setting up power output limits, max/min soc, turn the battery on or off via a software switch and also set up pin code protected access to the battery.
- ⚡ View the combined output of multiple batteries using multi-view; supports up to 4 batteries at the same time.
- ⚡ Coming Soon: Wireless to inverter communication, send battery information to many inverter makes & models such as: Victron, Voltronix (MMPT Solar, EG4, PowMR, Growatt, Renogy), Magnum energy and more.

Physical Specs

WEIGHT & DIMENSIONS



HEIGHT: 10.6" Physical, terminal studs will add 1", total height combined is 11.6"



LENGTH: 14.6" (including handles)

Physical Attribute	Value	Notes
Width	190 MM , 7.5 Inch	The width will taper out 6mm from the bottom to top.
Length	345 MM , 13.6 Inch	14.6 Inch / 371 MM Including handles
Height	265 MM , 10.65 Inch	11.6"/ 285 MM including terminal bolt
Weight	26 KG, 57.7 Lbs	Total weight including terminal bolt, handles & securing nuts.

Before you begin

SAFETY



Sun Fun Kits recommends an experienced electrician setup your battery bank system, or you have extensive knowledge and experience in setting up high power DC systems. Setting up batteries improperly can result in severe injury and even death. Please take caution when working with our batteries and ensure you have proper safety equipment and tools, please follow these safety tips:

- ⚡ Wear safety equipment and tools including eye protection, insulating gloves, and use electrically safe tools.
- ⚡ The use of proper circuit breakers, fuses and DC disconnects is recommended. Please ensure installs and setups are done by certified electricians, or licensed installers/dealers.
- ⚡ Sun Fun Kits SFK-300HP battery contains a battery management system (BMS) that protects the battery from overcharging, discharging and temperature extremes. Users must ensure their electrical setup works within these parameters and assume that the BMS protection is secondary protection ONLY.
- ⚡ Reverse Polarity can cause damage to your battery, ENSURE you have properly set up your electrical wiring.
- ⚡ Battery short-circuits can damage your bms and battery, ensure you are using insulated tools when installing the battery and that you have planned your install carefully before beginning.

-
- ⚡ Ensure bolts are tightened and installed correctly on all cables and power disconnections/bridges, loose terminals can cause permanent damage and lead to electrical fires as it increases resistance in an electrical circuit.
 - ⚡ ALWAYS ensure the battery is oriented properly and has the terminals facing up. **DO NOT** place the battery upside down or on its sides. This will cause permanent damage to your battery.
 - ⚡ Keep away from direct sunlight and water, these battery units are not water sealed in order to make them serviceable. If you are using them in a situation where they are exposed to the elements, you must take appropriate measures to ensure they are isolated from these environmental factors.

General Usage

LFP BATTERY



LFP or Lithium Iron Phosphate is one of the safest lithium based chemistries in the market. Unlike other chemistries such as Li-Ion or Li-polymer these batteries do not have thermal run-away, and will not ignite or burst into flames (in rare circumstances, if the cell is punctured; the electrolyte is flammable and may ignite if exposed to an ignition source). It is the only chemistry recommended for recreational use and has been confirmed to be the safest lithium option by independent labs and government agencies ([FAA transportation study](https://www.fire.tc.faa.gov/pdf/TC-16-17.pdf) <https://www.fire.tc.faa.gov/pdf/TC-16-17.pdf>).

Sun Fun Kits LifePo4 batteries may be used anywhere typical deep cycle lead acid/agm/flooded batteries are used and do not require special charging equipment as they have built in circuitry that ensures proper charging and discharging. It is recommended that you use lithium LifePo4 chargers whenever possible or set your charging apparatus to the AGM charging profile to ensure that your batteries can get fully charged.



SFK-300HP Lithium Iron Phosphate

Sun Fun Kits offers the SFK-PS-330 (<https://www.sunfunkits.com/product/21/sun-fun-kits-136v-330-watt-lithium-charger-lifepo4>) charger that can be used to fully charge your LifePo4 batteries for customers looking for a stand-alone wall outlet charger.

Here are some acceptable uses for the SFK-300HP battery:

- ⚡ Use in RVs as a 12-48 volt power source, or as part of an inverter bank to provide standby power
- ⚡ Use in solar panel installs as a power source for storing power
- ⚡ Use in troller motor applications for boats (requires ensuring that the battery is isolated and protected from water intrusion)
- ⚡ Use in Golf Carts or other small electric vehicles that have amperage governors (care must be taken to ensure that the batters are protected from water intrusion)
- ⚡ As a DC power source for power supplies and other items needing DC power
- ⚡ Use in DC to AC inverters where standby / backup power is needed such as data centers, or residential power sources.

Usage Restrictions

SAFE MODE



Lithium Iron Phosphate batteries are not recommended for applications that require high amperage bursts such as starting engines or use in DC arc welding. This will trigger the maximum amp cut-off in the battery's built in BMS (battery management system) and will engage a 30 second shut down.

If you exceed the amp limit of your battery or have gone to below 0% SOC and find that the battery is not outputting power, it may be because the battery has gone into safe mode. Safe mode protects the battery from damage and requires a cool down period of up to 5 minutes before it can be available for use again. In order to take out the battery of safe mode, you will need to apply an external power source of 13 volts or higher to "wake up" the battery, this can be done using any standard 12v charger.

Usage Restrictions

MAX AMPS & VOLTAGE



Sun Fun Kits SFK-300HP batteries can be connected in parallel or in series. You can connect up to 4 batteries in series to achieve a maximum voltage of 58 volts (this is generally shown as 48v, the nominal reading) and you can parallel these batteries up to 4 units. Regardless of how you configure your batteries, we recommend you keep your combined power output to under 4,000 watts for sustained use with a max peak of 6 kw (30 seconds) and a maximum amp discharge of 150 amps per battery. You will also need to ensure that you have selected the proper wire gauge and wire materials to ensure you can safely deliver your desired power output. A brief chart lists power usage and wire / gauge requirements below:

Guage	Volts	Amps	Power
4 AWG	13.6	75	1,020 watts
4 AWG	27.2	75	2,040 watts
4 AWG	54.4	75	4,080 watts
2 AWG	13.6	125	1,700 watts
2 AWG	27.2	125	3,400 watts
2 AWG	54.4	125	6,800 watts

*For power requirements greater than 4 kw continuous, you will need to have multiple banks of batteries connected to different inverters / dc banks.

Sun Fun kits recommends using the highest possible voltage available in your power system for multi battery setups, and limiting the total output to below 125 amps, we also recommend using 2 Awg or lower pure copper wire.

Charging & Discharging BATTERY SPECS



Lithium Iron Phosphate batteries do not require special charging equipment as they have built in circuitry that ensures proper charging and discharging. This means you can use “any standard 12v based battery charger”. We do recommend you use lithium LifePo4 chargers whenever possible, or set your charging apparatus to the AGM charging profile to ensure a good charge. Sun Fun Kits offers the SFK-PS-330 (<https://www.sunfunkits.com/product/21/sun-fun-kits-136v-330-watt-lithium-charger-lifepo4>) charger that can be used to fully charge your LifePo4 batteries for customers looking for a stand-alone wall outlet charger. **NOTE:** For smart lead acid chargers, you may need to force bulk/absorption mode to ensure a

a full charge. The charging and discharging parameters for the SFK-300HP are listed below:

Parameter	Value	Notes
Low voltage cut-off	10.0-11.6 volts / 2.5 - 2.9 volts (cell)	Battery will go into Safe Mode at this voltage.
Full Charge	14.6 volts / 3.65 volts (cell)	Maximum charge voltage.
Nominal Voltage	13.0 Volts / 3.25 volts (cell)	Nominal voltage range is between 13.2-13.6 volts.
BMS Self Discharge	0.052 amps / day	A fully charged battery will discharge to low SOC in about 500 days
BMS Balance	5 amp active balancer.	Balancing will happen between 2.9v-3.65v ONLY .
Recommended Discharge	800 watts	Discharge rates of 800 watts and below will yield the longest battery life.
Max Continuous Discharge	1500 watts	This is the highest suggested discharge for an extended period of use.
Peak Discharge	2.4 kw (120 seconds)	Must not exceed 200 amps .
Recommended Charge Rate	330 watts (23 amps)	Slower charging will result in a complete charge and also extend battery life.
Max Charge Rate	1250 watts (110 amps)	//
Surcharge Disconnect	110 amps	The battery will stop charging if it detects a surge of more than 210 amps.
Recommended Usage Temp.	70° Fahrenheit	Batteries are happiest in the same temperature range we like to be.
Maximum Discharge Temp.	130° Fahrenheit	Battery will go into Safe Mode at this temperature.

Parameter	Value	Notes
Minimum Discharge Temp.	34° Fahrenheit	Battery will go into Safe Mode at this temperature.
Maximum Charge Temp.	130° Fahrenheit	//
Minimum Charge Temp.	34° Fahrenheit	//
Short Circuit Protection	210 amps	The BMS will turn the battery off if more than 210 amps are drawn from the battery.
Usable Battery Capacity	300 AH	This is regulated by the BMS to ensure battery integrity.
Total Cell Capacity	315 - 325 ah	This is the actual cell capacity of the individual cells.

Charging & Discharging MAINTENANCE



Sun Fun Kits Lithium Iron Phosphate batteries require minimal maintenance and do not need to have any liquid added to them such as water (as is the case with flooded lead acid) in order to keep charge. The only maintenance required is to ensure that the state of charge of the battery is in a reasonable state depending on how it is being used. Please see the chart below:

State of Charge	Recommended Use	Notes
80-100%	Normal Use	For normal everyday use, keep your battery in this range if you are using it at least once a month.
50%	Long term storage	Keep your battery in this state when you will not be using it (for more than a month).
25-35%	Transport	For use in transport / maintenance, when your battery is shipped to you, or if you need to return it, it should be in this SOC.

State of Charge	Recommended Use	Notes
15% or lower	Low charge! Charge battery ASAP.	This is a low SOC, do not keep your battery in this state for a long period of time or it will cause permanent damage to it.

Charging & Discharging

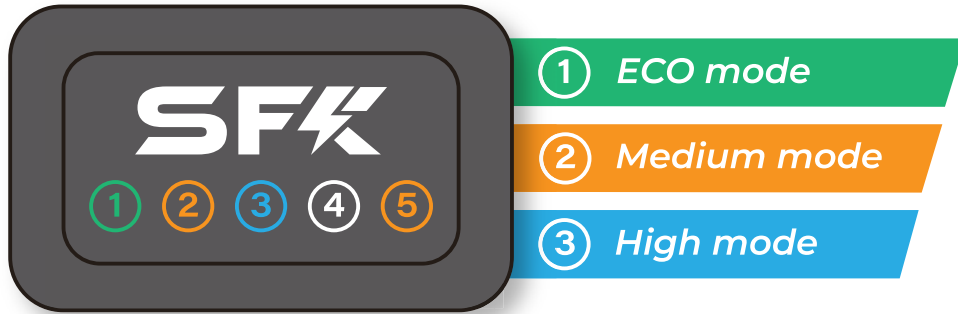
LOW TEMP CHARGING



The SFK-300HP is equipped with internal heating elements (silicone rubber heater pads) that are designed to turn on and warm up the battery during cold environments while the battery is being charged. The settings for this are available in the tools tab within the official Sun Fun Kits management app can be configured to be turned on at 35, 40, 45, or 50 degrees Fahrenheit. In cold temperatures, charging will be disabled and any voltage input to the battery will be sent to the heating elements to raise the internal temperature until it is at least 5 degrees above the setting specified in the tools tab. E.G. If the setting is set to 40 degrees, then the battery will continue to warm up until the internal temperature is at least 45 degrees at which point normal charging will resume. We recommend keeping maximum charging to under 30 amps in temperatures below 50 degrees.

NOTE: The heating mechanism will not turn on during discharging, or when the battery is in standby. If you would like to maintain the internal temperature of your battery, the 300HP can be equipped with a manual 5 mode heating switch that will allow you to maintain an internal battery temperature between 65 - 95 degrees Fahrenheit.





- ① ECO Mode
- ② Medium Mode
- ③ High Mode
- ④ 12 Hour Mode
- ⑤ 24 Hour Mode



Manual Heat Switch: To engage the manual heat switch, press and hold the button for 2 seconds, this will turn on the unit and will set it to mode 1, the ECO mode. Mode 1 will use the heating pads to reach an internal temperature of about 65° - 75°, mode 2 between 76° - 85°, mode 3 between 86° - 95° and modes 4 and 5 are timer modes which will maintain about 75° for 12 and 24 hours respectively. It is recommended to turn off the manual switch when you don't need it, simply press and hold it for 2 seconds to turn off the manual heating. Once off, the standard failsafe low temperature charging heating of the BMS will work as normal.

Wiring & Setup MAINTENANCE



It is recommended to periodically inspect your wiring schematic and ensure all bolts and terminals are properly installed and tight. Depending on the discharge/charge rate you may experience loosening of terminals due to thermal expansion. If this occurs you will need to re-tighten your bolts.

The main terminal bolts on the SFK-300HP are under the battery case, to access this you will need to remove the 4 top M4 countersunk screws. Once the case is removed, you can use a M8 ball-end hex driver or L-wrench to ensure that they are snug and making proper contact with the brass conductor ring. If they are loose, you will need to tighten them. **NOTE:** loose bolts will cause the battery terminals to heat up as they become a source of resistance, this must be addressed or it will cause permanent damage to your battery and can lead to a fire hazard.

You should also check that the battery is kept away from water & moisture and that there is proper ventilation to maintain temperature & humidity. These issues can lead to battery performance and degradation if not resolved; they may not be apparent immediately, but will have a cumulative effect in the long term.

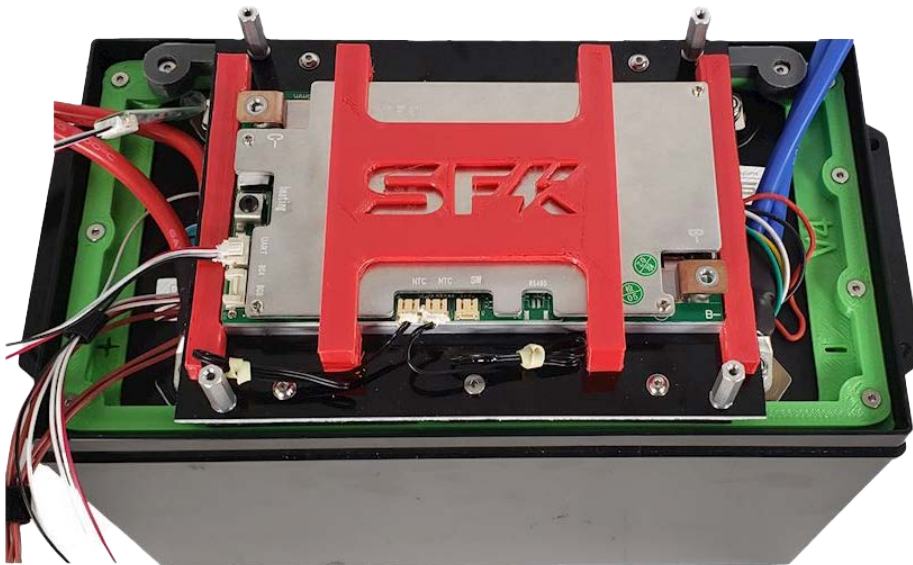


There are 4 countersunk M4-15mm Screws that hold the top lid in place. In order to access the inside of the battery, you will need to unscrew them with an appropriate allen key.



We only recommend opening the lid of your battery with hand tools and not with powered screwdrivers or impact drivers.

Only use insulated tools when working with the battery with its lid open.



Ensure the wires are tight and make good contact with components, tighten if needed.

Wiring & Setup

MULTI-BATTERY SETUPS



The SFK-300HP offers various multi-battery setups, these allow you to increase your total available amperage as well as voltage. The flexibility of this allows batteries to be used in 12v, 24v, 36v, as well as 48v setups. We will detail these options below.

NOTE: for many parallel setups we recommend the use of a common DC bus bar with equal wire lengths to ensure proper load splitting. The Sun Fun Kits DC Bus Bar works great for most parallel setups: <https://www.sunfunkits.com/product/35/heavy-duty-bus-bars-250a-600v> . We always recommend you consult an electrician before proceeding to ensure your loads are adequately spread among your batteries.

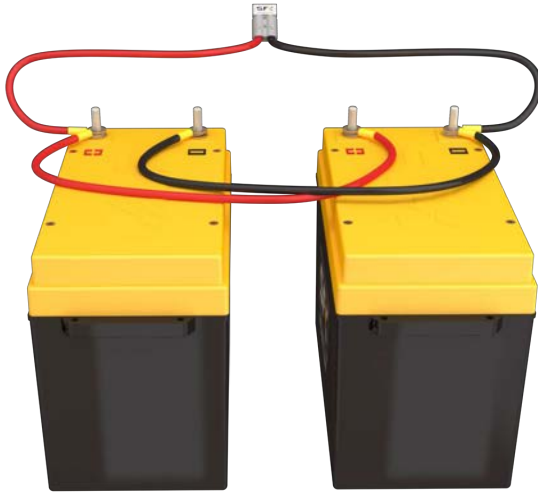
The SFK-300HP should only be used with batteries of the same type. You should avoid mixing and matching the: SFK-260, SFK-260HP, SFK-275HP, or SFK-275EX batteries or batteries of other brands in the same bank. Doing so may overload or cause unequal loads in your bank. Regardless of which setup you decide to use, the total number of batteries in a bank should not exceed 4/bank. If you need more than 4 batteries, you should consider making another bank and then connecting them with appropriate load balancers.

Wiring & Setup

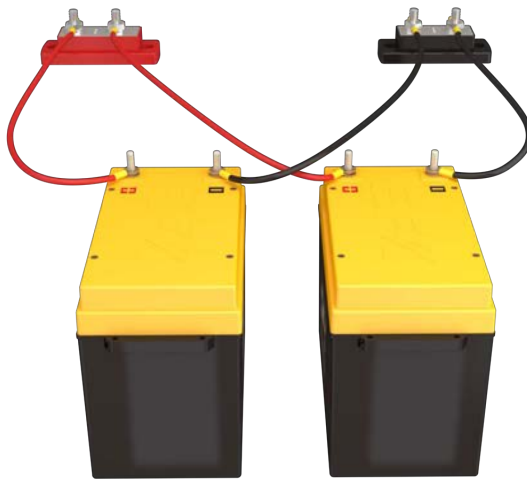
PARALLEL OPERATION



The most common parallel setup is the 2P setup, where two batteries are connected in parallel thereby increasing battery capacity to 600 AH while keeping the voltage at 13.6 volts. These setups can be used with piggyback cables, or can be set up using DC bus bars.

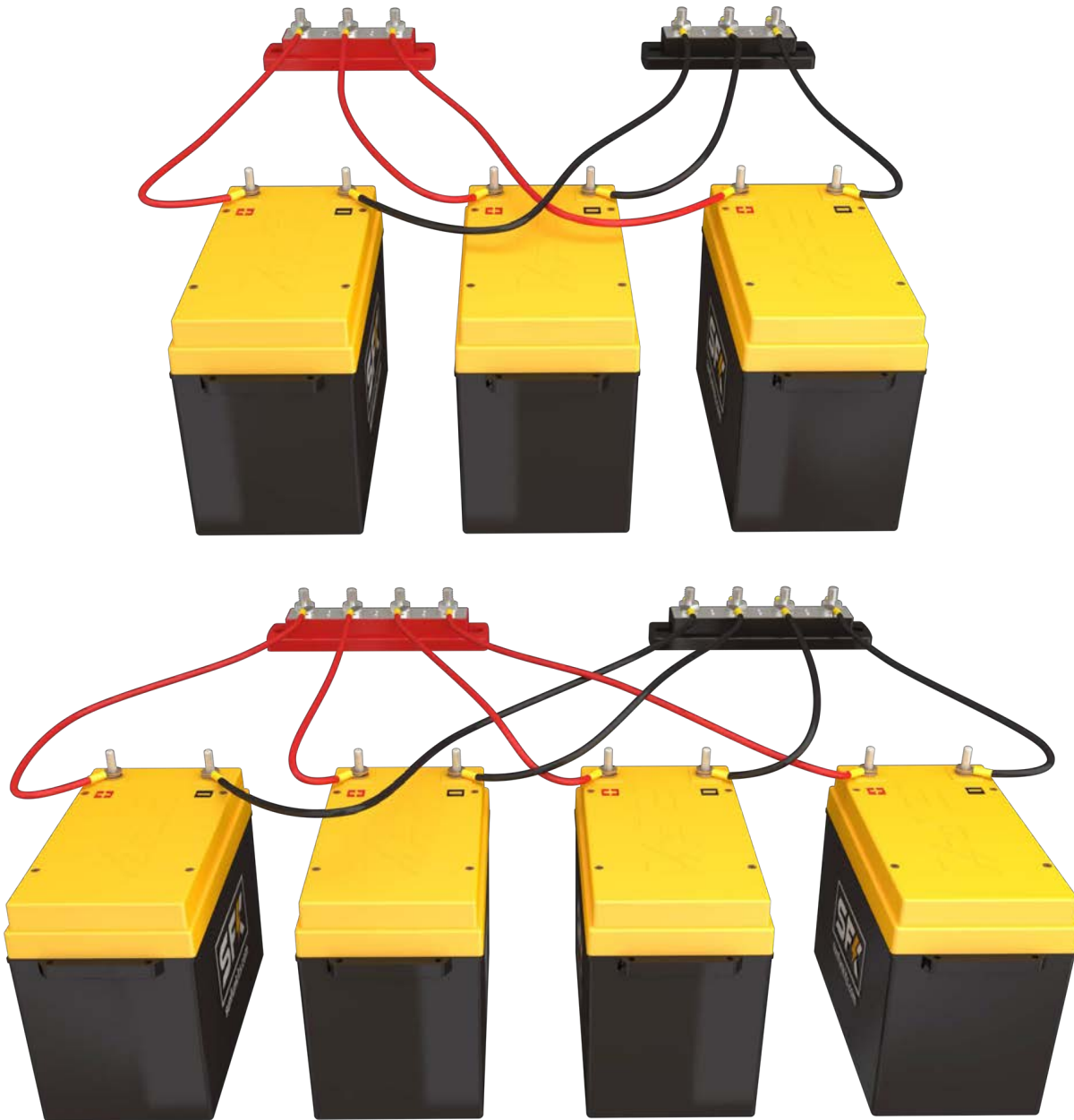


In all parallel setups, you must ensure your cables are of equal length, we recommend using 2 AWG or lower gauge for best performance.



For optimal performance, consider the use of dedicated bus bars.

For even greater capacity, the SFK-300HP can be wired in 3P and 4P configurations, this will increase overall battery capacity to 900AH and 1200AH respectively. **NOTE: DEDICATED BUS BARS ARE REQUIRED FOR 3P AND 4P SETUPS.** Sun Fun Kits does not support more than 4P connections due to the very high amp loads it can generate.

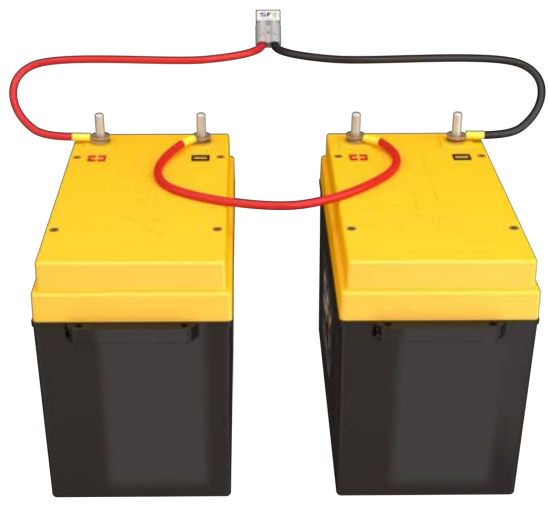


Wiring & Setup

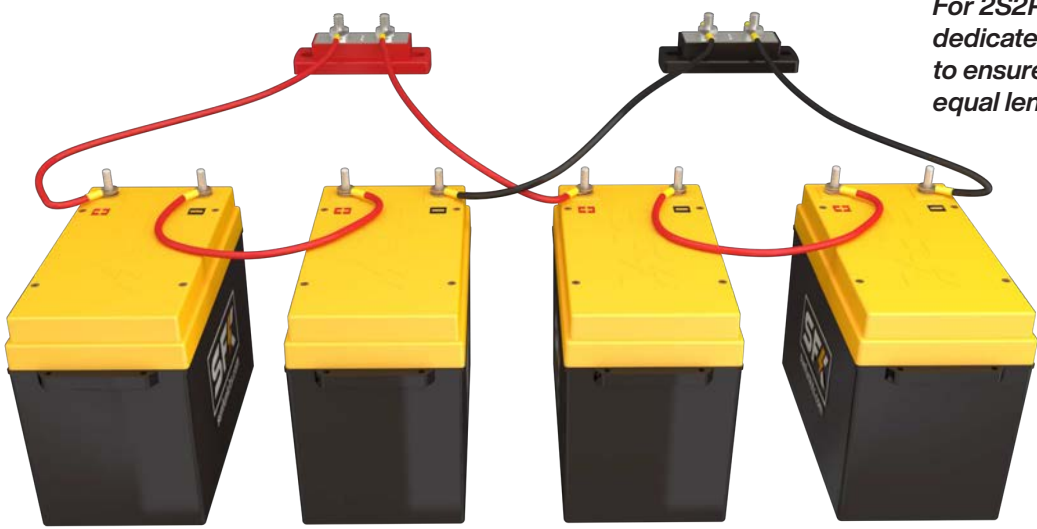
SERIES OPERATION



With series configurations, you can increase your overall pack voltage while keeping the capacity the same. Below we show a 2S and a 2S2P setup (where two sets of 24v batteries are connected in parallel to increase voltage and capacity) this provides 24v - 300AH and 24v - 600AH respectively.



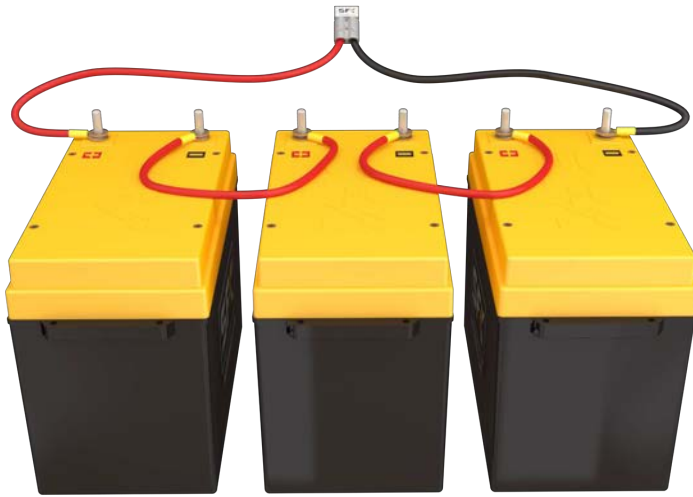
Cables of equal length are recommended but not critical in series setups. We recommend using 2 AWG or lower gauge for best performance.



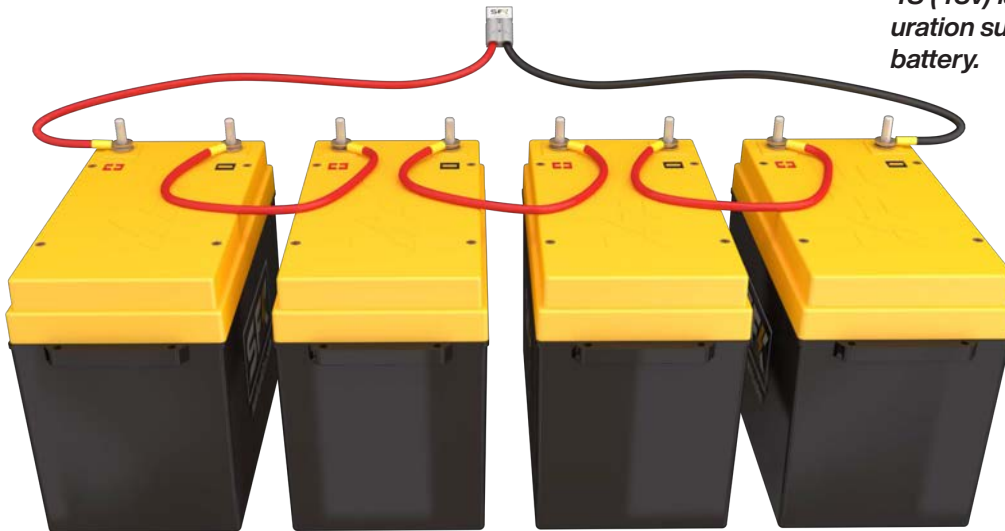
For 2S2P setups, consider the use of dedicated bus bars, you will also need to ensure your parallel cables are of equal length and wire gauge.

SFK-300HP Lithium Iron Phosphate

For even higher voltage setups, the SFK-300HP can be connected in 3S as well as 4S (36v, and 48v respectively) setups. These sets can not be paralleled in the same bank, if you require additional capacity you will need to create a separate bank. 4S or 48v is the maximum series connection supported by the SFK-300HP, anything greater than this will permanently damage your battery.



3S setups are not as common but provide 36 volts which is used by some marine troller motors.

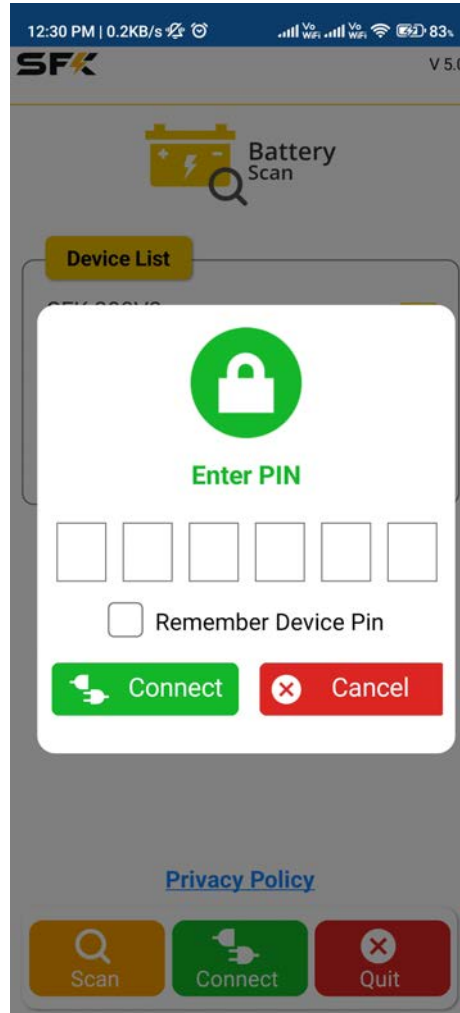


4S (48v) is the highest series configuration supported by the SFK-300HP battery.

Management Apps IOS & ANDROID APPS



To manage your SFK-300HP, Sun Fun Kits has created easy to use management apps. These are available on the Google Play Store and Apple IOS App Store. In order to use these apps you must have a device that is compatible with the BLE Bluetooth protocol, these apps are available at no charge and can work with all Sun Fun Kits products. Below we provide a basic overview of the app's features (images in this manual are from the android version of the app):



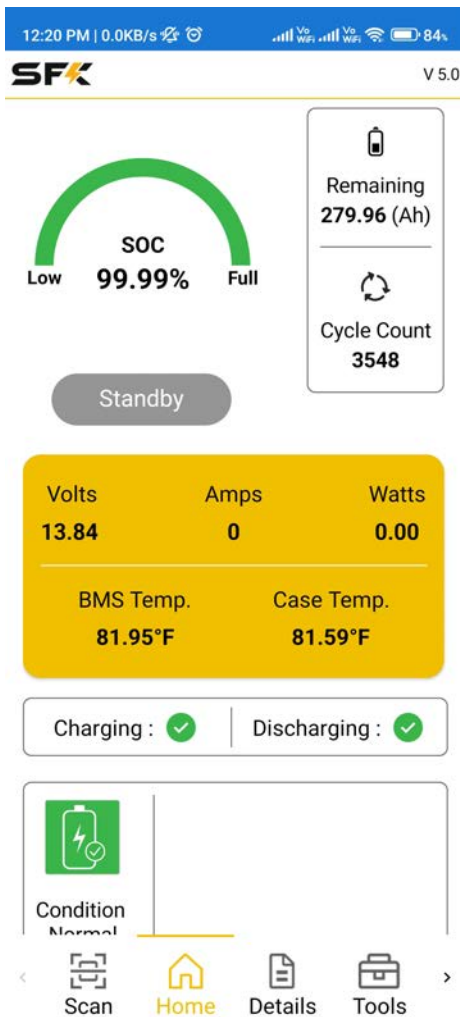
After you have downloaded the app, you will need to enable location services to allow a connection to your SKF-300HP battery. Once enabled you can scan for available devices and connect to the battery you wish. With version 4.X and higher; the SFK BMS app supports up to 4 simultaneous device connections, this is explained on page: 35.

You can return to the scan page at any time by clicking the **Scan** tab, you can also quit the app by clicking on the **Quit** button.

NOTE: Quitting the app will not close the app as it will continue to run in the background, use your device's close app feature to permanently close the app.

PIN CODE: If you have setup an access pin the device will ask you for the 6 digit pin (explained on page 31)

Management Apps MAIN TAB



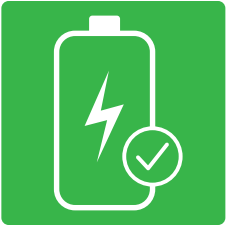
After downloading and connecting to your battery you can view information in 5 tabs. The Main tab will display general battery information like the state of charge of the battery, the temperature, remaining capacity, as well as the current and watt output.

NOTE: When you first setup your battery, you may need to charge it overnight on a slow charger (around 20 amps) to allow the battery to fully charge and calibrate its capacity meter (SOC gauge).

Lithium iron phosphate batteries have a very shallow discharge curve; this means that voltage alone is not a good indication of the state of charge (SOC), for this reason a 3.3 / cell or 13.2volt reading may be as high as 80% SOC or as low as 30%, hence, the SFK-300HP uses columb readings to determine the soc of the battery. However, this should only be used as a rough estimate; if you require a highly accurate state of charge reading, an external calibrated shunt would be required. You'll also need to fully charge your battery to recalibrate the SOC meter roughly every 5-10 cycles.

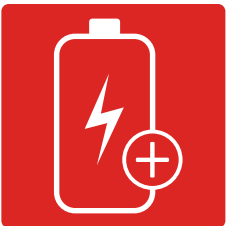
Management Apps

BMS ALERTS



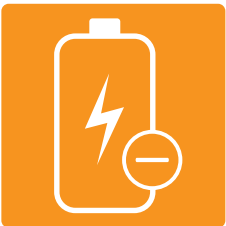
Cell Condition Normal

This symbol indicates that the battery is in normal condition and is operating optimally.



Cell Overvolt

Disables charging if the voltage of any cell exceeds 3.65. Charging is re-enabled when the cell's voltage falls to 3.5.



Cell Undervolt

Disables discharging if any cell's voltage drops below 2.5 - 2.9 volts (depending on the settings in tools). Discharging is re-enabled when the cell's voltage rises to 3.0 volts.



Pack Overvolt

Disables charging when the battery reaches 14.6 volts (based on the setting in tools). Charging is re-enabled once battery voltage drops to 14.0 volts.

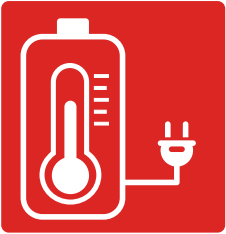


Pack Undervolt

Disables discharging if the battery's voltage drops below 11.6 - 10.0 volts (configurable in tools). Discharging is re-enabled when battery voltage reaches 12.0 volts.

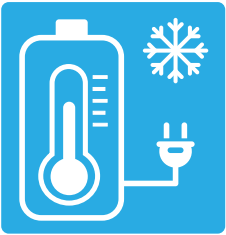
Management Apps

BMS ALERTS



Charge Over Temp

Battery temperature exceeded the high temp threshold (130° F) during charging. Charging will be enabled once internal temperature falls below 115° F.



Charge Under Temp

Battery temperature is below the threshold (34° - 55° F) while charging. Heating pads will turn on and charging will be re-enabled once internal temperature rises above 40° - 60° F.



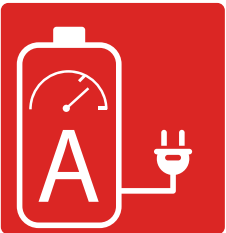
Discharge Over Temp

Discharging is disabled as internal temperature exceeded the high temp threshold of 130° F. Discharging is re-enabled once internal temperature falls to 115° F.



Discharge Under Temp

Discharging disabled as internal temperature is below freezing, discharging will be re-enabled once internal temperature is above freezing. This can be overridden in tools which will lower the discharging temp threshold to -10° F.



Charge Over Current

Charging will become temporarily disabled as charging amps exceed the threshold set in the tool settings.

Management Apps

BMS ALERTS & ERRORS



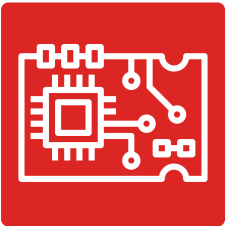
Discharge Over Current

Discharging will become temporarily disabled as discharging amps exceed the threshold set in the tool settings.



Short Circuit Error

The SFK BMS has detected a short circuit. Check wires and correct immediately to prevent BMS damage. Charging / Discharging functions will be disabled until the short circuit has been corrected.



Front-end IC Error

This is a hardware error, please contact Sun Fun Kits Techs to request repair service for your battery. You can also submit a ticket online:

<https://www.sunfunkits.com/app/support>

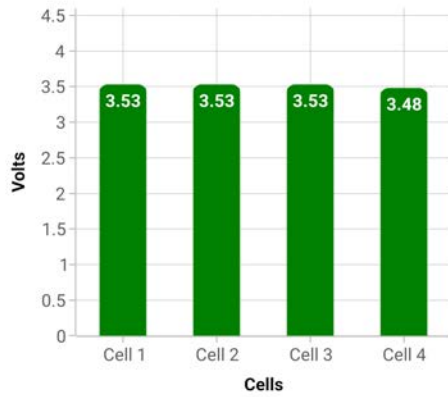
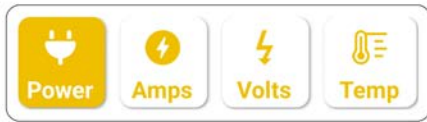
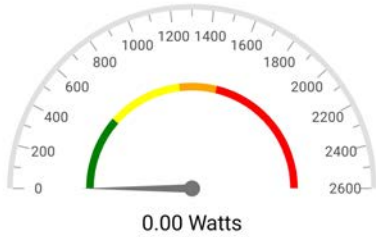
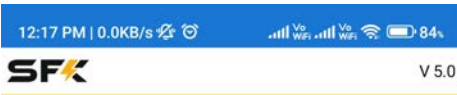


Charge / Discharge Lock Error

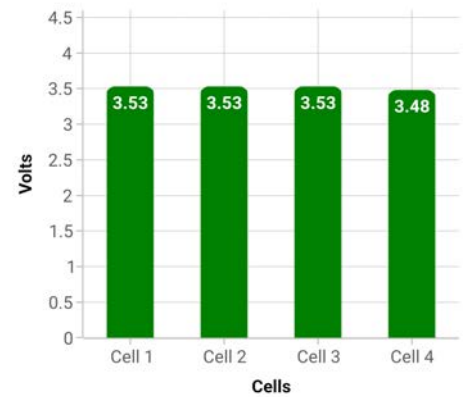
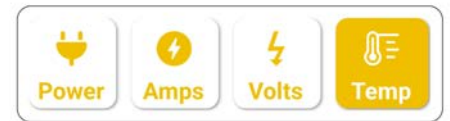
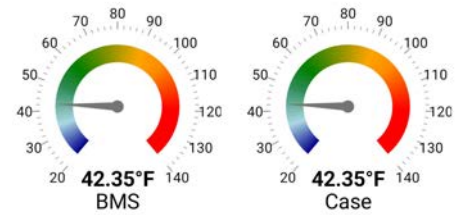
This error may happen due to connection problems or repeated charge / discharge errors. Generally this error will happen due to inverter compatibility / configuration problems. To correct this error, you will need to go to the tools tab and manually enable discharging & charging (**NOTE:** if the SOC of the battery is full or depleted then you may not be able to enable both until the SOC is between 10-90%).

Please contact the manufacturer of your equipment to find the best settings for SFK / Lithium batteries.

Management Apps DETAILS & TOOLS TAB

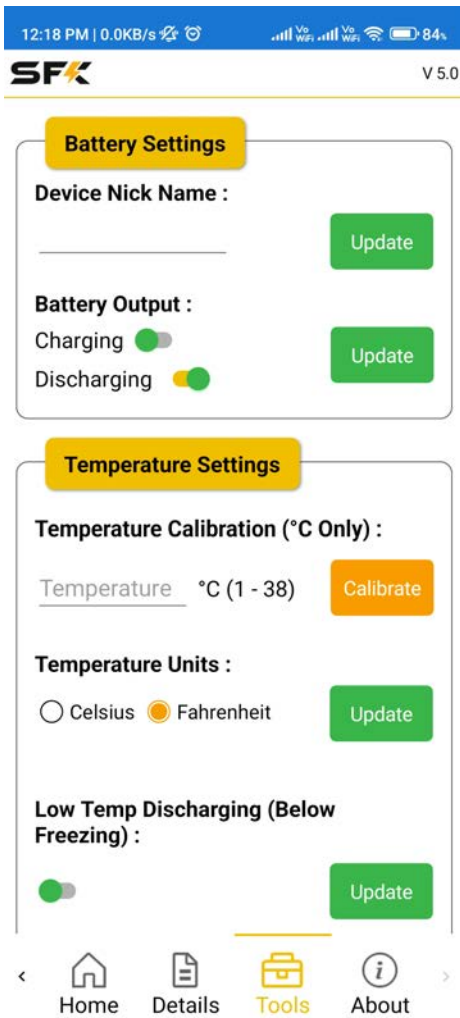


The details tab includes many sub-tabs which can allow you to drill down and view detailed battery information.



The details tab provides additional information for your battery, this can be useful in finding out issues you may be experiencing such as HVC or LVC (high/low voltage cut-off). If you are finding your cells are being stressed under loads you can use the information to make changes to the load accordingly. NOTE: The SFK-300HP has 3 temperature probes but at any given time only 2 are shown on the details tab, this is by design as the case temperature is an average of the 2 external temperature probes of the BMS unit.

The tools tab is a powerful device management system that allows you to set parameters for the SFK-300HP battery, these options are discussed below:



Battery Output:

You can set options on your unit to enable or disable charging and discharging. This acts like a soft-switch for your battery. **NOTE:** these options may change if the battery is at full charge, whereby the charging enabled will be turned off. On the same token, if the battery is at a low state of charge, the status may show discharging disabled.

Ambient Temperature Calibration:

The SFK-300HP has 3 temperature probes and these are calibrated at the factory. If you find that the readings are significantly off (more than 5 degrees fahrenheit) you can adjust the temperature. **NOTE:** Only perform this adjustment on a battery that has been in standby for at least an hour, temperature adjustment on a very warm or cold battery will result in an incorrect calibration.

Low Temp Discharging:

Allows battery discharging below freezing, up to -10° F.

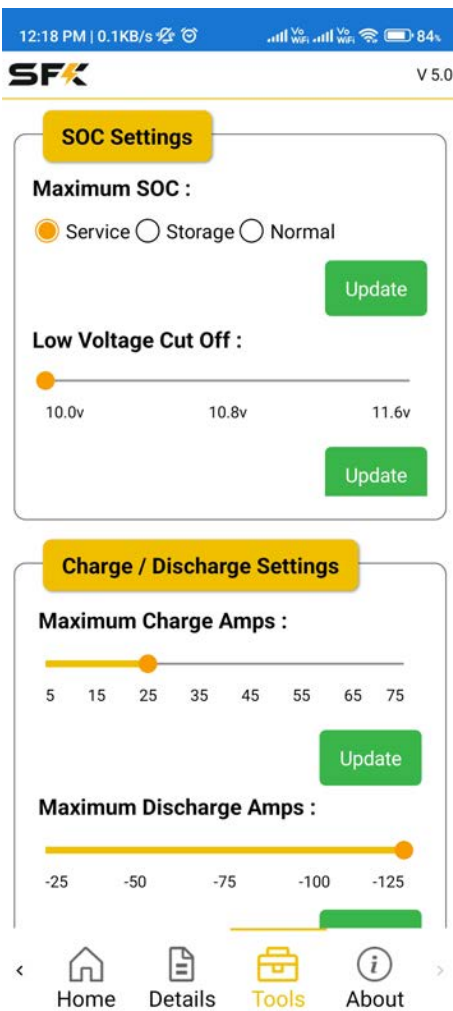
Maximum SOC:

The maximum SOC refers to the maximum state of charge; this is the highest voltage level the battery will reach during charging. For normal use it should be set to the **Normal** setting. If you are not planning on using your battery or an extended period of time (over 2-3 months) you can set it to the **Storage** setting. **NOTE:** Setting the SOC setting will not lower the voltage of the battery; to bring it within range, discharge your battery and then re-charge it. On the subsequent charge, the Maximum SOC setting will limit the

charge voltage to the setting you have selected. If you need to send your battery in for service, please set it to the **Service** option, this will limit the maximum voltage to be within shipping guidelines.

Low Voltage Cut Off:

Setting the LVC (low voltage cut-off) of your battery can be useful if you wish to limit the lowest voltage levels of your battery. For normal use we recommend keeping it at the **10.8v**; however, you can set a higher limit to keep some power in reserve with the **11.6v** setting. The **10.0v** setting should only be used when you are benchmarking your battery.



Maximum Charge Amps:

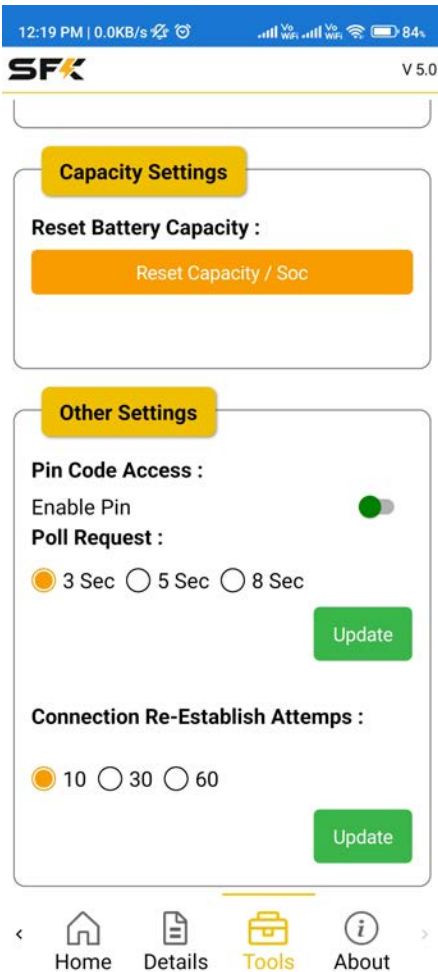
This setting allows you to adjust the maximum amperage going into your battery during charging. This setting can be useful if your setup is using higher gauge wiring or you do not want to overload your charging apparatus. **NOTE:** This will not “throttle” the charge speed, instead if the battery detects incoming amps exceeding the setting; it will turn off charging for about 30 seconds.

Maximum Discharge Amps:

This setting can be very useful in ensuring you do not overload your battery setup or devices. The range for the SFK-300HP is between 40 to 200 amps, you can set a lower setting if you want to limit the output power of your battery. **NOTE:** This will not “throttle” the battery output, instead it will disable battery output if you exceed the setting selected for about 30 seconds.

Low Temperature Heating (Charging):

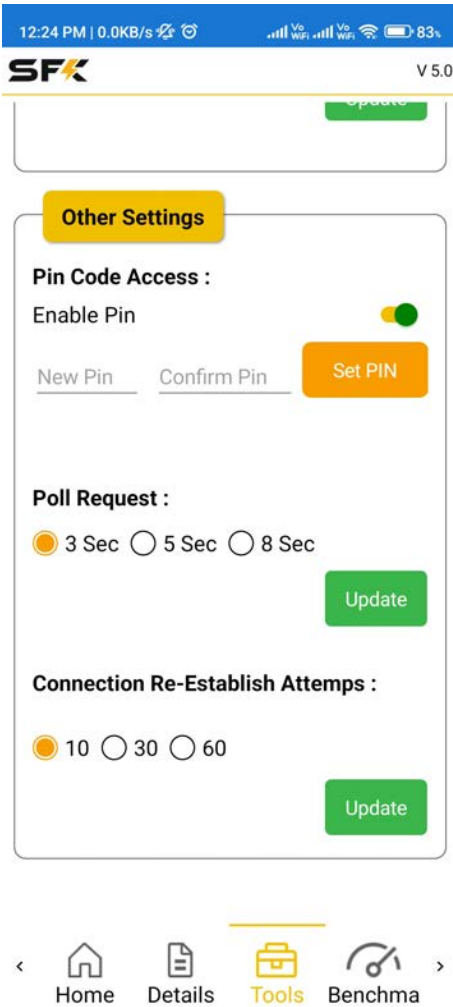
This function specifies the temperature at which the internal heating pads of the SFK-300HP will turn on. This is only active during charging, meaning that if the temperature falls below the specified setting, the heating pads will turn on and send any incoming charging power to the heating pads instead of the cells. LFP batteries should never be charged during low temperatures (below freezing), and while the BMS has automatic low temperature disconnect preventing damage to your battery, the built in heating pads will raise the internal temperature of the battery so that charging can resume. **NOTE:** The heating pads will only turn on during charging, not discharging or when the battery is in standby. Once the internal temperature has risen by 5 degrees from the selected setting, the heating pads will turn off and normal charging will resume.



Reset Capacity:

If you notice that the state of charge of your battery seems to be off (e.g. it is reporting a higher percentage than it should or perhaps a lower percentage), you can use the reset capacity button to re-calibrate the SFK-300HP SOC meter. **NOTE:** This should only be done on a fully charged battery where each cell is reading 3.50 volts or higher (3.6V or higher is the ideal setting) and the battery is in standby (i.e. not being charged or discharged) mode.

NOTE: When performing a reset capacity, you will automatically reset the LVC to **10.8v** and Maximum SOC values to **Normal**.



Pin Code Access:

The SFK-300HP battery has bluetooth functionality that is great for monitoring and making adjustments to your batteries operation, however, this information is freely available to anyone that downloads the Sun Fun Kits BMS management app. In order to secure this information and access, we recommend setting up a PIN code for your battery. The pin code is a 6 digit numerical code that is user definable and is required to make a connection to the battery once enabled. To set up the pin, enable the option in the app and confirm it, then select update.

EXTREMELY IMPORTANT do not forget your pin, if you lose your pin you will need to send your battery back to Sun Fun Kits to unlock your battery. **THERE IS NO WAY TO REMOTELY REMOVE A PIN IF YOU FORGET IT**

You also have the option to disable the pin code; once updated, the app will no longer request a pin code to grant access to battery information.

Connection Re-Establish:

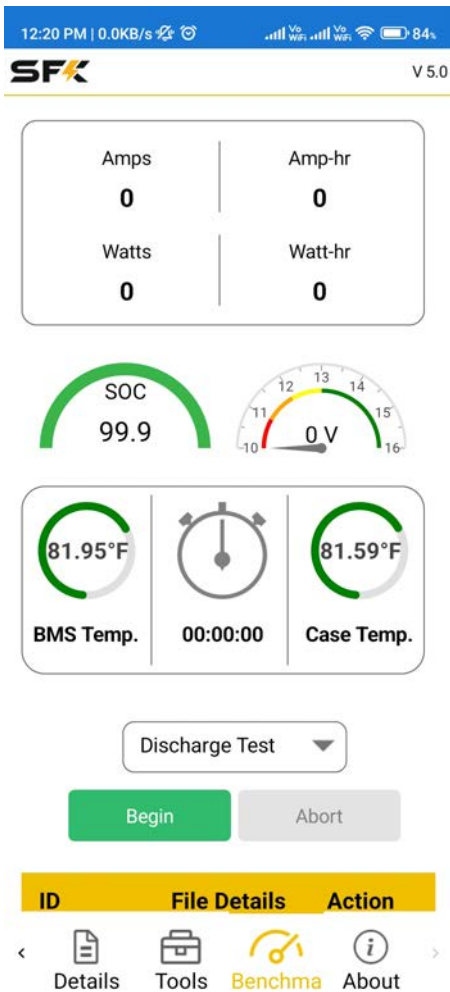
BLE or Bluetooth Low Energy is a very energy efficient technology, however, it comes with some downsides such as limited range and signal quality. Because of this, it is possible that connection to your battery may get interrupted. If this were to happen the app will attempt to automatically reconnect to the battery.

The Re-Establish Connection menu option specifies the number of attempts the app will use to reconnect to your battery in case of a lost connection. Once the maximum number of attempts expires it will no longer try to connect to your battery and you will need to close the app and re-launch it to connect.

Poll Request:

The poll request option specifies the number of times the app will contact your battery for updates. The lower the number, the more frequent the updates; the higher the number the less frequent. If you are experiencing connectivity issues you can adjust the poll rate request as needed to establish a stable connection.

Management Apps: BENCHMARK TAB

The screenshot shows the SFK app interface for the benchmark tab. At the top, it displays the time (12:20 PM), data usage (0.0KB/s), and battery level (84%). Below the SFK logo and version (V 5.0), there are four digital readouts: Amps (0), Amp-hr (0), Watts (0), and Watt-hr (0). Below these are two analog gauges: SOC (99.9) and Voltage (0 V). Further down are three circular gauges for BMS Temp. (81.95°F), a timer (00:00:00), and Case Temp. (81.59°F). At the bottom, there is a dropdown menu set to 'Discharge Test', a green 'Begin' button, and a grey 'Abort' button. A navigation bar at the very bottom contains icons for 'Details', 'Tools', 'Benchmark' (highlighted), and 'About'.

Discharge & Charge Test:

Starting with version 5, a new feature called benchmark has been added which includes various self diagnostic tests for your battery. Initially a Discharge and Charge test are available which will allow you to perform a capacity test on your battery and find out the available KW and AH of your battery pack. Each test will inform you of the requirements needed to complete the test, however, the device running the benchmark will require a power supply to run as most of these will need 5-9 hours to complete. An Android based tablet is the recommended device for most tests.

You can view the results on your device, or upload them to the Sun Fun Kits' website to share with SFK technicians or your friends.



Management Apps

BMS ALERT & ERROR LOG



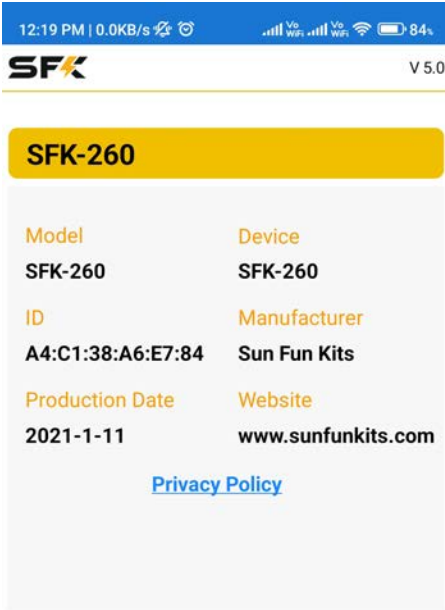
The logs tab will show you a summary of alerts & errors generated by the BMS inside your battery. This tab can help diagnose recurring issues you may be experiencing. **NOTE:** not all alerts are considered to be issues, it is common to see **Cell & Pack overvolt** alerts as this happens every time your battery is charged, however, serious errors such as **Short Circuit** or **IC Error** can lead to issues that would need to be addressed to avoid damage to your battery.

Please see page 24-26 for details on what each alert or error represents.



Management Apps

ABOUT TAB



About Tab:

The About Tab provides you information about your battery including important details such as the date it was manufactured, IDs and serial numbers (**NOTE:** some information may not be available on IOS devices). You can also view the warranty information of your device as well as the details for each of the four certified cells used in your battery by clicking on the battery information link, this will take you to the Sun Fun Kits website where you can view the details of your battery.

APP LINKS:

You can find the Sun Fun Kits BMS app on your device's app store; if you are having difficulty, use the links below to go directly to the device listing:



Sun Fun Kits BMS App for Android devices (Tablets & Smartphones):

https://play.google.com/store/apps/details?id=com.companyname.sfkble&hl=en_US&gl=US

Sun Fun Kits for Apple IOS Devices (Tablets, Smartphones, and other Bluetooth enabled devices):

<https://apps.apple.com/us/app/sun-fun-kits-bms/id1600445506?uo=4&at=100015Zh>

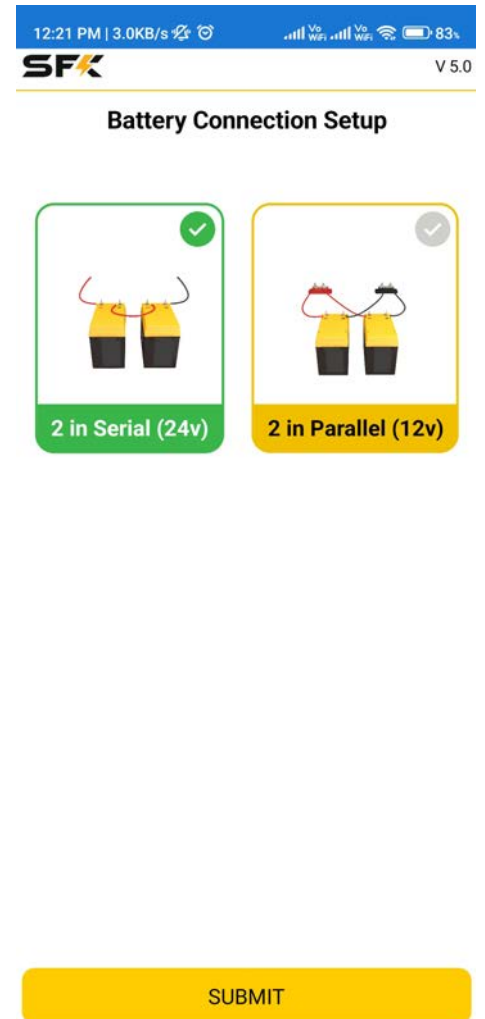
Management Apps

MULTI-VIEW

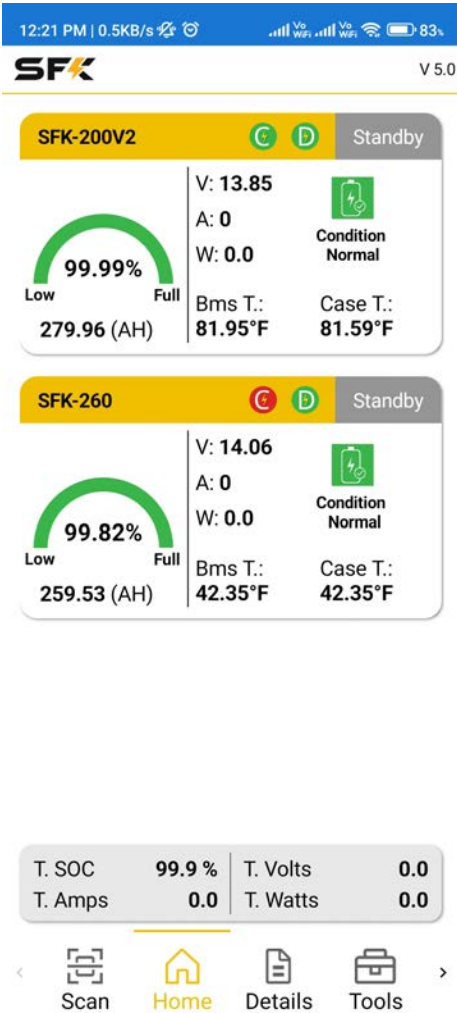


With Multi-View, the Sun Fun Kits BMS app allows you to simultaneously view up to 4 devices. Multi-View will also show the combined amp and watt output of your batteries.

NOTE: when connected in multi-view, many details such as tools and device details will not be available; if you need to view this information, you will need to go back to the scan menu and only select a single device to connect to.



Once you have selected the batteries to connect to (maximum of 4), you can then inform the app on how you have them connected (e.g. in parallel, series, or parallel & series). This will then display information to you regarding the voltage levels, amps, and approximate state of charge of the batteries as a combined bank.



The multiview system allows you to view up to 4 batteries simultaneously (this will expand to 16 batteries with the RS485 hard link option in the future). Here you can view a condensed version of information that is normally available when you connect to a single battery at a time. Due to space constraints some information is not displayed or has been truncated to fit on screen. For users that plan on using the multi-view functionality on a regular basis, a dedicated device such as an Android tablet is recommended as it will have a higher power BLE antenna and range which will assist in keeping a connection active with up to 4 batteries.

A summary of the combined **SOC** (state of charge), total volts, total amps, and total watts is displayed on the gray overlay summary bar which will give you a snapshot of your connected battery bank.

NOTE: You will notice some information is displayed only as icons, we explain what the **C** and **D** icons mean on the next page.

Management Apps

CHARGING DISCHARGING STATUS



Charging Enabled

This symbol indicates that charging for this device is enabled.



Charging Disabled

This symbol indicates that charging for this device is disabled.



Discharging Enabled

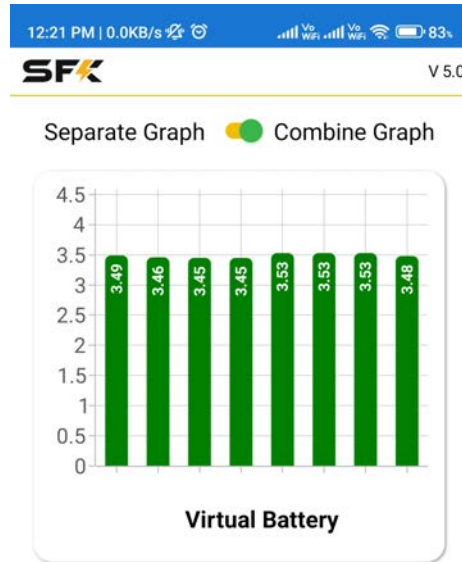
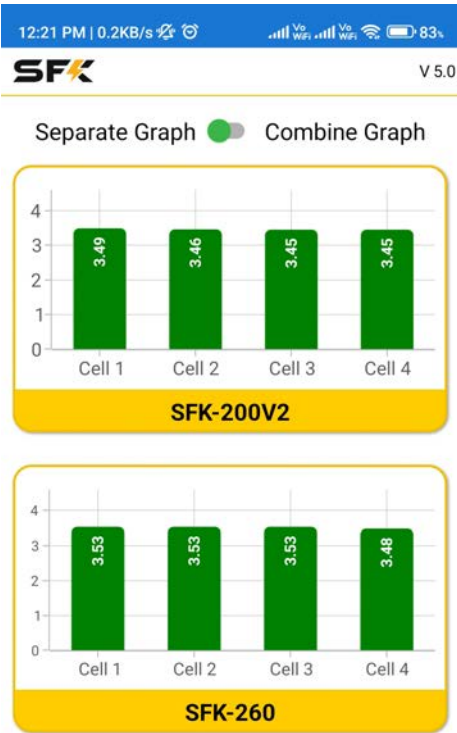
This symbol indicates that discharging for this device is enabled.



Discharging Disabled

This symbol indicates that discharging for this device is disabled.

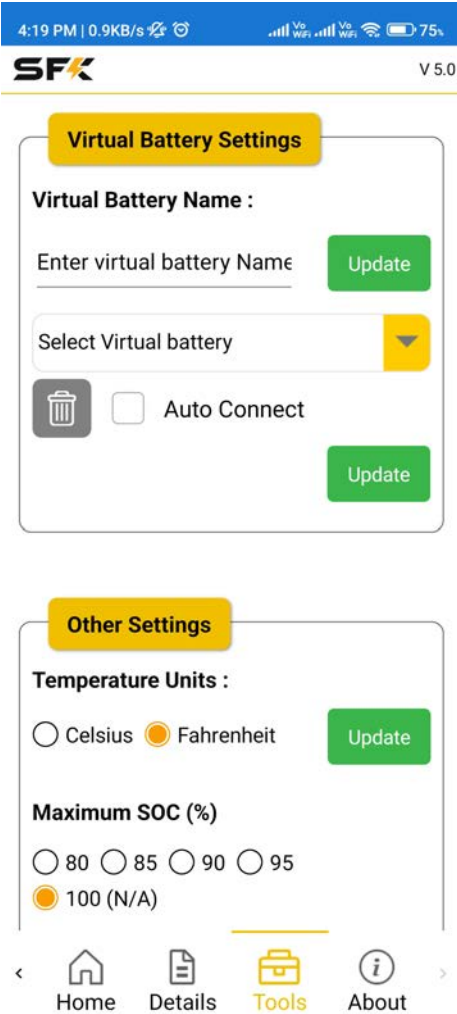
Management Apps MULTI-VIEW DETAILS & TOOLS TAB



When connected to multiview you will notice various options that differ from the single view. Here you can analyze information that represents all of your connected batteries as a single bank. The details tab will display information for your cell voltages per pack, or you can view them together in a single large graph. This is useful to ensure all of your cells are balanced and are working properly as well as able to hold voltage under load.



NOTE: For devices connected wirelessly the graph can show up to 4 connected batteries or up to 16 cells. Future versions of the app and the SFK-300HP with the RS485 hard link will support up to 16 connected batteries and 64 cells.



Virtual Battery Settings:

Multi-view supports saving battery configurations as virtual batteries. Virtual batteries are a quick way to reconnect to a configuration you have set up, e.g. if you have 2 batteries in parallel 12v, you can now save them as a virtual battery in the app. Once saved you will see this battery appear in the scan screen, selecting it will connect to both batteries along with the correct wiring configuration.

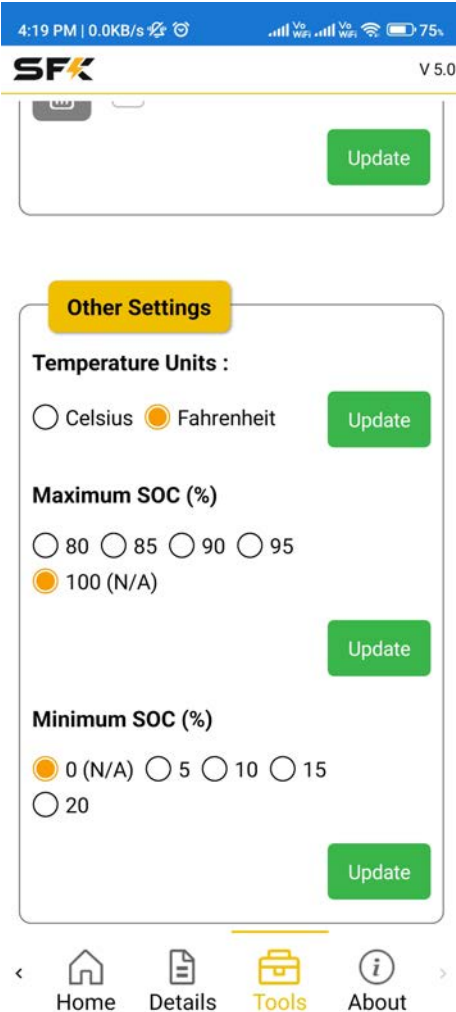
You can set a name for your virtual battery so it's easier to manage in the app, this can also be set to auto connect when the app launches. Should you have separate banks; you can create more virtual batteries as needed.

NOTE: Batteries can only be connected to a single bluetooth device at a time, please make sure no other device has an active bluetooth connection to the battery before trying to connect or the connection may fail.

SOC Max / Min Limits:

With virtual batteries and multi-view, users can now manage the maximum and minimum state of charge of their bank. This monitoring works as long as the devices remain connected to the app and works best with a dedicated monitoring device such as an Android tablet. The SOC is based on the actual SOC meter inside each battery and not just based solely on the voltage.

For normal uses we recommend a 100% maximum and 20% for minimum SOC. This will ensure your cells are fully balanced when charged and you will get the maximum usage life from your batteries as



as you will not go below 80% depth of discharge.

It is important to ensure your batteries are properly balanced before setting up the maximum and minimum SOC limits. Imbalanced batteries can cause this functionality to not work as intended; if your SOC is not properly calibrated per battery, it will cause the app to send incorrect commands to the battery.

Another important factor to consider before setting up SOC limits is to make sure the battery settings for all of your batteries are identical, this means the maximum / minimum charge and discharge settings are the same, as well as SOC is set to **Normal** and LVC is **10.8v** (more information is available on page 29).

Temperature Units:

Temperature units control how the temperature is displayed in multi-view. You can select between Celsius or Fahrenheit.

SFK-300HP Warranty

8 YEAR WARRANTY



Sun Fun Kits guarantees purchases made from its website or authorized retailers are free from manufacturer defects and will repair or replace battery and kits that fail to meet specifications at our discretion within the warranty period. Warranty is only offered to the original purchaser and will require a warranty transfer to any user that the battery has been sold to thereafter by the end user (limited to a maximum of 1 transfer). Warranty details are explained below:

SFK-300HP 8 Year 60/96 Warranty

The extended 60/96 warranty provides free repair/replacement of items for the first 60 months, and a prorated repair/replacement for the remaining 36 months. This warranty also guarantees a minimum of 80% battery capacity retention for a period of 96 months. After approximately 1500-2000 cycles customers can expect between 80-70% of the original rated capacity. Capacity is measured based on the amp-hour rating of the battery for warranty purposes at a .2C discharge rate.

SFK-300HP Warranty

EXCLUSIONS



Improper Installs

Damage resulting from improper installs are not covered under warranty, this includes (but is not limited to) short circuits, reversed polarity damage, not placing the battery upright, excessive moisture, temperatures that exceed OEM thresholds, improperly installed terminal cables, poor ventilation, and excessive vibration.

Modifications to electronic components

Customer agrees not to perform modifications to battery cells, bms components, case mounting, or any



SFK-300HP Lithium Iron Phosphate

other change that alters the OEM specifications. Doing so will void the warranty.

Changing BMS parameters with unauthorized tools

Customer agrees to only use official Sun Fun Kits software tools made for IOS / Android / Windows to manage battery systems, the use of unauthorized software tools will void the warranty.

Using battery in non-approved applications

Customer agrees not to use battery & components in automotive operations such as using it as an engine starting power source (CCA applications), high power applications that exceed 5000 watts total output, subjecting battery & components to unreasonable tests that do not represent real-world scenarios (e.g. putting battery in a cold freezer or oven), using the battery as a power source for DC arc welding. These and other non approved scenarios will void the warranty.

Physical damage and neglect

Customer agrees any physical damage to the battery systems and components (such as dropping the battery, impaling the battery, submerging the battery in liquid) will result in voiding the warranty. Customer furthermore agrees subjecting the battery systems and components to environmental factors that exceed OEM thresholds (exceeding rated temperature limits, charge/discharge watt limits) will result in voiding the warranty.

Failure to maintain battery

Customer agrees to perform proper maintenance on the battery. This includes ensuring cycling the battery at least once every 4 months when not in use and ensuring the battery has a 50% or greater charge when kept in storage. Keeping the battery at less than 15% charge for an extended period of time will damage the battery and will void the warranty. Battery and kits must not be exposed to temperatures greater than 110° fahrenheit or lower than 20° for an extended period (greater than 4 hours) NOTE: Sun Fun Kits BMS system keeps an internal log and Sun Fun Kits technicians can determine if proper



proper maintenance was not done.

Terms, Liabilities & Disputes

LEGAL INFORMATION

Sun Fun Kits LLC DBA Sun Fun Kits offers its products with the terms, conditions and notices as follows: The following terms and conditions apply to all sales and uses. Please review carefully. These terms and conditions include limited warranties and disclaimers of liabilities. Keeping, using or allowing use of Sun Fun Kits products indicates your agreement to these terms. By checking “Agree” on our website at check-out also constitutes your agreement to these terms.

Terms of use

This product is offered to you conditioned upon your acceptance without modification of the terms, conditions, and notices contained herein.

Use limitation

You may not modify, copy, distribute, transmit, display, perform, reproduce, publish, license, create derivative works from, transfer, or sell, any information, software, products or services obtained, from Sun Fun Kits' website or its products.

Level of Risk

Lithium batteries, Inverters, high powered DC/AC devices, and apparatus sold by Sun Fun Kits can be associated with a high level of risk and may pose risk of serious physical injury, burns, disability and/or death. Users of our products choose to do so at their own risk.

Assumption of Risk

By buying, using, or allowing the use of Sun Fun Kits' products, you understand and agree that the nature



SFK-300HP Lithium Iron Phosphate

of high powered devices can be associated with a high level of risk and, to the extent permitted by law, YOU EXPRESSLY AND VOLUNTARILY ASSUME THE RISK OF DEATH OR OTHER PERSONAL INJURY SUSTAINED WHILE USING OUR PRODUCTS, WHETHER OR NOT CAUSED BY THE NEGLIGENCE OR OTHER FAULT OF Sun Fun Kits, including but not limited to equipment malfunction from whatever cause, or any other fault of Sun Fun Kits. Additionally, you agree to indemnify, defend, and hold Sun Fun Kits harmless from any third party claims arising from such High Risk Uses, or any use or misuse of our products.

Limitation Of Liability

As set forth above under the limited warranty provisions, Sun Fun Kits' liability is limited to repair or replacement of its products which are returned to it in the specified period of time. In no event shall Sun Fun Kits; liability exceed the value of the product(s) sold. In no event shall Sun Fun Kits' be liable for any direct, indirect, punitive, incidental, special or consequential damages whatsoever arising out of or connected with the use or misuse of any of its products.

Warning

Use and misuse of products sold by Sun Fun Kits involves serious risks including injury, disability and death. Purchasers assume all risks. Inspect before each use. This product must be inspected for use to ensure it has not been damaged in shipment. If damaged, do not use and immediately return the product to Sun Fun Kits for a replacement.

Entire Obligation

The PRODUCT LIABILITY DISCLAIMER document states the entire obligation of Sun Fun Kits with respect to the products. If any part of this disclaimer is determined to be void, invalid, unenforceable or illegal, including, but not limited to the warranty disclaimers and liability disclaimers and liability limitations set forth above, then the invalid or unenforceable provision will be deemed superseded by a valid, enforceable provision that most closely matches the intent of the original provision and the remainder of the agreement



SFK-300HP Lithium Iron Phosphate

shall remain in full force and effect.

Terms, Liabilities & Disputes

APPLICABLE LAW

Any and all disputes or claims relating in any way while using your Sun Fun Kits products or services will be resolved by arbitration rather than in court by the American Arbitration Association (AAA). Either party Sun Fun Kits or the customer may initiate the claim. Claims may also be asserted in East Baton Rouge Parish Small Claims court if the claim is within small claims court limits.

Arbitration awards are limited, however, an arbitrator can award on an individual basis the same damages and relief as court (including injunctive and declaratory relief or statutory damages). To request arbitration you will need to submit in writing via certified mail to: **Arbitration Request - Sun Fun Kits 11636 Industriplex Blvd, Baton Rouge, LA 70809.**

You will need to accompany your request with a demand letter detailing your complaint. You will then need to contact the AAA by visiting www.adr.org and file the initiation fee. Sun Fun Kits will reimburse these fees to you if the arbitrator(s) finds in your favor, however, if the arbitrator(s) finds in Sun Fun Kits favor then no fees will be reimbursed. Both parties agree that they will be responsible for their own attorney fees regardless of the decision by the arbitration process. All ongoing arbitration fees will be split between the customer and Sun Fun Kits evenly (50% by each party) after the initial filing fee to start arbitration.

The venue of arbitration proceedings shall be within East Baton Rouge Parish; you may also request to have arbitration done via phone conferences or via web/video meeting online. East Baton Rouge Parish Small Claims court awards are limited to \$5,000.00 and do not require an attorney, however, you will be required to file your claim as well as present your case in person for a resolution. If you wish to proceed with a small claims court claim you may contact the East Baton Rouge Parish Small Claims Court by visiting:



sunfunkits.com

SFK-300HP Lithium Iron Phosphate

<https://www.brla.gov/319/Civil-Suit-Interactive-Forms>

Terms, Liabilities & Disputes

MODIFICATIONS TO TERMS

Sun Fun Kits reserves the right to change the terms, conditions, and notices under which its products are offered at any time.



sunfunkits.com

SFK-300HP Lithium Iron Phosphate

Battery Quality Check TEST REPORT & QR CODE

Technician Notes:

Share with us

twitter.com/sunfunkits

Share a photo of you new SFK battery in action!
Tag @sfkbattery and use #sunfunkits



sunfunkits.com

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