

ELECTRICAL & SAFETY DISCLAIMER

The information and resources provided by DCS USA are not a substitute for having a trained, professional electrical installer work on your power system. If you have any doubts about performing do-it-yourself electrical work we highly recommend you hire a professional, such as one of our highly qualified dealers, to perform the work for you.

The DCS USA Warranty does not cover damages or harm resulting or assumed to be the result of improper installation or use of our batteries, loose terminal connections, under-sized cabling, incorrect parallel connections, reverse polarity connections or water damage including submersion or any kind of damage to the battery as a direct or indirect result of neglect to follow recommended handling and maintenance procedures.

BATTERY INSTALLATION LOCATIONS

DCS Batteries that are in a sealed traditional style battery case are IP rated 54 unless otherwise specified. As there is a considerable amount of electronics inside the battery cases, it is important that these batteries are protected from the ingress of particles and water. IP54 means that there is partial protection against dust & similar particles & protection against splashing water from any direction for a minimum of 10 minutes.

IP54 DOES NOT MEAN THE BATTERY ENCLOSURES ARE WATERPROOF!

DCS batteries should be installed and operated in a location that will not exceed the specified operating temperatures.

DO NOT:

- Install DCS batteries underneath a vehicle or caravan, or any other external location that is exposed to the atmosphere unless it is fully contained inside a suitable battery housing that will prevent the ingress of particles & or water. Also, sufficient mechanical and structural protection is needed to prevent damage from rocks and debris during recreational vehicle travel.
 - Pressure wash or hose your batteries. You can wipe them down with a damp cloth if needed.
 - Submerge your batteries in any fluids.
 - Install DCS batteries near high heat sources, e.g. exhaust manifolds or turbo chargers.
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OPERATING TEMPERATURES

Each battery has a designated operating temperature range depending on the cell type used. Please refer to the most up-to-date operating temperature recommendations of your particular battery in the specifications sections on the product page of the [DCS USA website](#).

At the time of writing, all products are using cylindrical cells except the 180Ah auxiliary battery have a *Charge Temperature Range* of +25°F to +149°F and a *Discharge Temperature Range* of -13°F to +176°F. Do not operate the battery outside of the Discharge Temperature Range.

The 180Ah auxiliary battery does not use cylindrical cells so it will only discharge up to +149°F. The BMS of the will not allow this battery to operate above 140°F, is exceeded.

The BMS will also not allow a battery with an internal temperature below 32°F (0°C) to be charged. Charge will only be allowed when the ambient temperature of the battery cell is back above 32°F. Discontinue the use of a battery immediately if the battery becomes excessively warm whilst in a standby state.

SECURING YOUR BATTERY

Your battery must be secured to prevent movement. Restraints must prevent any movement under a pulling force of twice the battery weight. The recommended hold-down bracket torque is 3.5 lb-ft (4 Nm).

DO NOT OVER-TIGHTEN THE HOLDING CLAMPS!

Care has to be taken to prevent the battery lid seal/gasket from deforming when securing the battery, which could affect the IP rating of the battery.

BATTERY CHARGING

Use only approved Lithium-Iron Phosphate specific chargers for your battery's nominal voltage, chemistry and maximum charge rate with the correct charging stage voltages.

DO NOT USE A LEAD ACID CHARGER ON A LITHIUM BATTERY!

Be aware that some chargers have fixed charging voltages and cannot be adjusted. Also be aware that some chargers labeled Lithium compatible do not have the firmware to wake up a DCS LFP Battery if Cell Protection Mode has been triggered. See *Fully Discharged Battery* section below. Check the charger specifications for charging voltage levels & charging profiles before purchasing. The [Victron Blue Smart Charger](#) is one of the chargers on the market that has the capability to wake an LFP battery from cell protection mode.

All DCS 12V cylindrical cell packs to be charged at:

14.4V Bulk
13.5V Float

The DCS 12V 180ah auxiliary prismatic cell pack (SKU: DCS-12V-180ah) to be charged at:

14.2V Bulk
13.5V Float

ALTERNATOR CHARGING

Our under-bonnet Dual Battery Systems, 80ah Extreme & Slimline range, can be charged directly from the vehicle's alternator, providing that they are the only battery chemistry being charged.

For example, you cannot parallel a Lithium battery to a lead acid battery and charge from the alternator. This type of set up has to be separated by using a DC-DC Charger.

If you are parallel connecting batteries together, they must have the same chemistry, nominal voltage, capacity and age. Each battery has a maximum charge current listed in the specifications table that should not be exceeded; otherwise, permanent damage could be done to the battery.

When the batteries are parallel connected together, this doubles the amount of current the batteries can be charged at.

For example, our DCS 180ah (2 x 90ah) dual battery system. The maximum charge current is 80 Amps per battery. So $2 \times 80A = 160$ Amps. This means you can charge these batteries provided your alternator's maximum output does not exceed 160 Amps.

Before choosing a battery, check the maximum output current your alternator can produce and also find out the Cold Cranking Amps (CCA) needed to start your vehicle.

Your factory alternator is generally the best alternator to use, and there is no need for high output aftermarket alternators when using them to charge your under bonnet LFP Battery.

Check the specifications table on the DCS website for the particular battery you are interested in, and look for Lithium Cranking Amps (LCA). If the LCA meets or exceeds the CCA for your particular vehicle, then the battery is suitable for your vehicle.

THE DCS AUTOMATIC HEATING SYSTEM (10A-AHS)

The DCS 10A-AHS feature a fully variable input that ranges from 2 Amps to 10 Amps. The heating system is only active when the battery receives a charging current AND the ambient temperature is below 32F (0C).

When the charging current exceeds 2 Amps, the heating system will activate and it will increase in power until maximum heating power has been reached around 10 Amps.

It is important to note that when these batteries are deployed in sub 32F temperatures, the charging current must be able to supply a minimum of 2X that of the 10A-AHS.

For example: A single 12V 180Ah battery needs a minimum charging current of at least 20 Amps (2 x 10A) and two 12V 180Ah batteries in parallel (2 x 180Ah = 360Ah) would need a minimum charging current of at least 40 Amps (2 x 20A).

Failure to supply adequate charging current, whether its coming from an MPPT Charger, a DC-DC charger or a 120V AC lithium battery charger may result in the heating system not being able to sufficiently heat the cell pack(s) as intended.

HOW TO CONNECT BATTERIES IN PARALLEL

Step 1: Connect the positive terminal of Battery A to the positive terminal of Battery B.

Step 2: Connect the negative terminal of Battery A to the negative terminal of Battery B.

Please note that the negative battery cable in Step 2 is extremely important as some vehicles use the chassis as a negative link, which is prone to failing due to corrosion, which causes a high resistance.

THE IMPORTANCE OF IN-BALANCE WIRING

When you have batteries that are wired in parallel, as described above, it is good practice to wire your loads and inputs in balance.

What this means, for example, is to connect loads & inputs to the positive terminal on the first battery (Battery A) and connect the negative loads & inputs to the last parallel connected battery (Battery B).

This is particularly important when using an inverter or a winch that will have a high current draw in order for them to draw evenly from all the parallel connected batteries.

BATTERY STORAGE

If you are not going to be using the battery for two weeks or longer, proceed with the following steps:

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1. Charge the battery fully to a 100% state of charge using the correct charging profile and voltages.
 2. Disconnect everything off the battery terminals. It can be left in this state for up to 3 months.
 3. After 3 months, cycle the battery; fully discharge the battery (11.5 volts), then fully charge the battery, and the battery can then be left in this state for another 3 months.
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BATTERY MONITOR SETTINGS

If you are using an external battery monitor, such as the Victron Connect App, the following settings should be used:

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- Charged voltage: 14.0V
 - Tail current: 4%
 - Charged detection time: 1min
 - Peukert: 1.05
 - Charge efficiency: 98%
 - Current threshold: 0.1A
 - C-Rate: refer to the battery pack capacity
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THE DCS LFP APP

Every DCS LFP battery pack comes standard with detailed battery monitoring information via Bluetooth (BLE 4.0 Technology). The app can be downloaded to Android or iOS devices that are Bluetooth enabled.

Comprehensive battery monitoring information for DCS LFP batteries include:

- SOC%. (State Of Charge)
 - Battery pack voltage, Current & Power
 - Time Remaining
 - Individual Cell Voltage Status
 - Battery Management MOSFET temperature
 - Connectivity distance up to 10 metres.
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HOW TO RENAME YOUR BATTERIES IN THE DCS LFP APP

1. Open the DCS LFP app and connect to the battery.
2. Tap on the three horizontal lines on the top right hand corner of the screen.
3. Input Password: 736263 > OK
4. Name > OK
5. Refresh the battery list by tapping the circular arrow.
6. Select custom and your battery will now appear in this section.

MODIFICATIONS

Do not attempt to alter, modify or repair any part of the battery.
Any modifications to the battery will void your warranty.

FULLY DISCHARGED BATTERY

No battery system should be designed to allow an LFP battery to go flat.

If the Voltage drops below 11.5V on a battery that is being discharged, the BMS will emergency open the circuit of the battery terminals to protect the cells (Cell Protection Mode).

Typically, you will see 3 - 4V across the battery terminals when using a multimeter. The BMS needs a 12V supply with at least 1 Amp of current to release and wake up from this Cell Emergency Protection State.

Most mains chargers with a lithium profile are capable of doing a slow recovery charge, as will most solar regulators. Some chargers on the market today that are advertised as 'lithium' compatible still don't have the firmware to do a slow recovery charge to release the BMS.

If you have a charger that will not wake up the BMS, the easiest way to wake it up is to connect an unregulated solar panel directly to the battery terminals; however, ensure all loads are disconnected before you do this. Having said that, every system should have a suitable low cut-off voltage device (Load Disconnect) to shutdown loads/accessories so that the batteries are not fully drained such as the [Victron Smart Battery Protect](#).

Batteries cannot be left in a completely flat state. If the low voltage cut-off is triggered, the battery pack should be fully charged as soon as possible. If access to a suitable charger is not possible, disconnect all loads from the battery terminals.

THE WARRANTY WILL BE VOID IF THE BATTERY PACK HAS BEEN LEFT IN A LOW VOLTAGE CUT-OFF STATE FOR LONGER THAN 14 DAYS!

The most important thing is to isolate everything from the battery terminals, as cables (loads) connected to the terminals cause more power drain as the FET gates have to remain closed to cull the accessory standby loads connected to the battery pack and offset BMS standby power consumption.

WHY YOU CANNOT JUMP START AN LFP BATTERY

No battery system should be designed to allow an LFP battery to go flat which is why we stress the importance of including a *Load Disconnect* into the design of your system.

Another way of preventing an LFP Battery from going flat is to add Solar Panels to the battery system.

If an LFP battery has been allowed to go flat it can only be released from Cell Protection Mode by a low current charge from a Lithium Compatible Charger. See *Battery Charging Section*.

ATTEMPTS TO JUMP START AN LFP BATTERY, LIKE YOU WOULD A LEAD ACID BATTERY
COULD CREATE AN UNCONTROLLABLE SURGER THAT MAY DAMAGE THE BMS!

TECHNICAL SUPPORT

If you have technical questions about the Product, please contact the place of purchase or DCS USA directly at +1 503-208-6793 (PST) or email us at support@deepcyclesystems.us