


# HIGH VOLTAGE



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## THE LATEST DUAL-BATTERY SYSTEMS THAT WON'T LEAVE YOU STRANDED.

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**AS THE DAYS** of pointing our Willys toward the backcountry provisioned only with a Coleman cooler fade into our rear-view mirror, we find ourselves in a landscape of technology and electronic gizmos. We've added fridge-freezers and a host of other accessories, each with an appetite for power. If you are mobile every day, a single battery will probably suffice. But if you set up camp for more than a night, adding an auxiliary battery might be on the horizon. In this review we test the latest management systems, mounts, and batteries that won't leave you on the side of the trail with a cooler of warm coldies.

The principle behind a management system is that it charges an auxiliary battery when power is available and disconnects, or "unlinks," when voltage reaches a predetermined level. Options are full manual, voltage sensitive relays (VSR), and programmed relays. We'll dive into batteries in a future installment, but the most common are flooded lead-acid (wet), absorbent glass mat (AGM), and lithium iron phosphate (LiFePO4). The former two are available in standard or deep cycle. Deep cycles are generally used as auxiliaries, as conventional batteries can be damaged if fully discharged. Lithium offers premium performance but at significant cost and should not be mounted in an engine compartment. Regardless of type, a battery needs proper care to maximize its lifespan.

Our install platforms were a 2015 JK and Gen III Tacoma, and we selected systems from National Luna, Intelligent Battery Systems (IBS), REDARC, CTEK, and Blue Sea. Mounting trays are Mountain Off-road Enterprises, Off-Grid Engineering, and Genesis (the latter two offer turnkey kits). Batteries include AGMs from Odyssey and Optima. While a few systems are nearly bolt-in, some require a more technical hand.

To evaluate systems in a controlled environment, we set up a bench test. Current was supplied by an MCP DC power supply, and load was provided via a 2,000-watt inverter powering an ARB fridge, battery charger, and studio lighting. Voltage and amperage were recorded with a Powerwerx DC power analyzer. Each system was run for several hours to experience multiple charge/discharge cycles while we evaluated its attributes: link/unlink voltage, low/high cutoffs, under/overcurrent alarms, etc. Goal Zero solar panels provided power to units that accommodated wind or solar, and proper function was confirmed.

Other considerations were manual-link options, single-battery function, IP ratings, completeness of kit, accessories, ease of operation, and quality of instructions. Newer vehicles have variable-output alternators (VOA), which reduce voltage based on a variety of conditions. Two systems reviewed accommodate this technology.

Lastly, winches can draw upwards of 400 amps during heavy pulls, and a single battery and alternator will not keep up with demand. With the exception of one system, an old-school manual switch would be required to draw this level of current from both banks. Without further ado, we present some of the best dual-battery systems on the market. We hope you get a charge out of them.



## REDARC BCDC1225D, GAUGE, AND FUSE KIT

**REDARC HAS** 40 years of experience providing mobile electrical components for the Australian Outback. The award-winning BCDC1225D offers an array of advanced options, including multi-phase charging algorithms and solar/wind input compatibility, and it plays well with VOAs. It is sold à la carte, so you'll need to source cable, lugs, fuse kits, and hardware. We added their remote dual-voltage gauge.

**DURING INSTALLATION** we wired it for profile "A," specific to AGM batteries. Each algorithm has specific charge cycle (boost, absorption, and float) to ensure maximum service from your batteries. A "test mode" evaluates input/output levels and presence of an auxiliary battery, and error codes are identified via a series of LED lights. It features an MPPT regulator and leads for solar input, and Green Power Priority directs that energy to the house battery before charging the main. With an IP65 rating, it can be mounted in the engine bay or on the chassis, but should be away from high-heat sources, as its thermal protection kicks in at 175°F. Unfortunately, its 25-amp capacity does not allow jumping a dead start battery, and there is no manual link.

**INSTRUCTIONS ARE** excellent, but setup is a bit technical, and if you have a VOA, you will need to locate your ignition circuit. During testing, the BCDC1225D did exactly as claimed; it kept both batteries healthy and managed solar input as intended. Made in Australia, with a two-year warranty.

**\$381/\$186/\$57**

**redarcelectronics.com**

### PROS

Waterproof, multi-stage charging, built-in solar controller, rugged construction

### CONS

Low amperage rating, lacks manual link, cost



## INTELLIGENT BATTERY SYSTEMS IBS-DBS EM

**IBS WAS FORMED** in 1996 after Beat Wyss, its founder, became stranded in Western Australia with a flat battery. After returning to Switzerland, he developed the DBS, or Dual Battery System. We sourced one from its U.S. distributor, Extreme Outback Products, and it arrived with all components needed for installation, including the solenoid, battery terminals, control panel and harness, and cables.

**THIS SYSTEM** allows for full control of functions, as well as monitoring battery voltage levels, from the driver's seat. The bidirectional relay automatically closes the circuit when the main bank reaches 13.1 volts and opens at about 12.5 volts (as tested). It allows single-battery operation via its "trailer recognition" feature, has an audible over/under current alarm, and is compatible with all 12-volt cells—though it must be preprogrammed for LiFePO4s. Vehicles with VOAs will require their Mini ATO compensator or IBS's new Dual Battery Manager.

**MANUAL-LINK START** is accessed from the control panel, and with a 200-amp capacity (500-amp surge), it will easily jump your main and assist with moderate winch loads. Mounting location should not be subjected to submersion, as this unit is not waterproof. On the bench, everything functioned as prescribed, installation was painless, and instructions were clear. This is a very functional product at an affordable price and thus receives our **"BEST BUY AWARD."** Made in Switzerland, with a one-year warranty.

**\$378**

**extremeoutback.com**

### PROS

Comprehensive kit, In-cab control panel, simple installation

### CONS

Not waterproof, not VOA compatible, lacks solar regulator





## CTEK D250SE, SMARTPASS 120S

**THE CTEK D250SE** also lands in the high-tech category and totes award-winning Swedish technology. It will service an auxiliary bank up to 400Ah and all 12-volt battery types. There are separate charging algorithms for AGM and lithium cells, and selection is made during installation.

**IT EFFICIENTLY** manages solar input via an internal MPPT regulator, and when the auxiliary bank is topped off, power is directed to the primary battery. A unique feature of the D250SE is its thermal sensor, which signals the mothership if temperatures reach damaging levels. It is also IP65 rated for dust and water protection, making this a suitable option for variable weather and trail conditions. The 20-amp maximum does not accommodate a manual link for jump-starting, but combined with CTEK's Smartpass 120S, capacity rises to 140 amps.

**INSTALLATION IN OUR** 2018 Tacoma was simple, and the instruction booklet offers plenty of detail. The two units mount side by side, so you'll need to confirm you have the real estate available if you plan to add the Smartpass. We opted for the D250SE and will add the Smartpass if needed. In the lab, the D250SE was flawless. The unit directed current from our solar panels to the house bank, then automatically transferred the charge to the start battery. Made in China, with a two-year warranty.

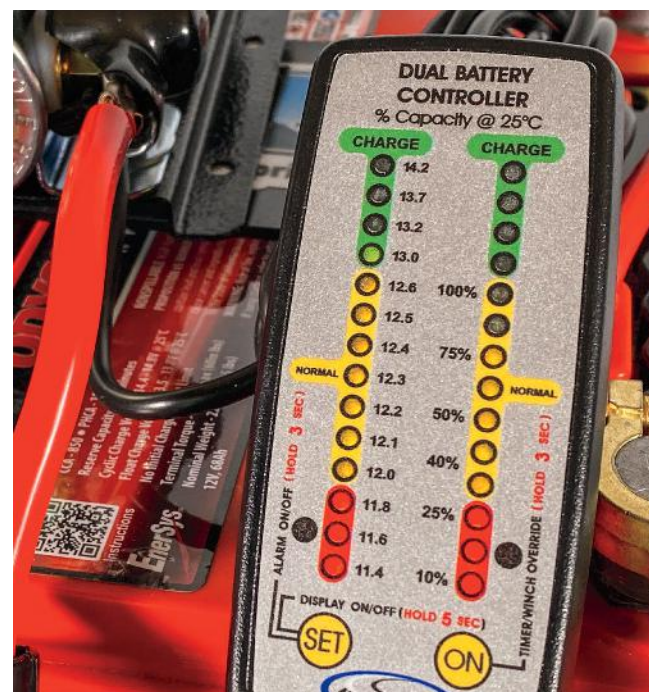
**\$457/\$482**  
**ctek.com**

### PROS

Water and dustproof, VOA friendly, built-in solar controller

### CONS

Low maximum amperage, cost, lacks voltage meter



## NATIONAL LUNA BATTERY MANAGER

**NATIONAL LUNA** (NL) originally developed power options for solar-powered vaccine refrigerators for remote regions of Africa. The application was perfect for the overland crowd, and NL has become a household name. Similar to the IBS, it is a split charging system, and all functions are monitored via a dash-mounted panel. The kit includes everything needed for installation: terminals, lugs, fuses, hardware, harnesses, and cables.

**SHORTLY AFTER** start-up, the solenoid links both banks, and they stay connected until voltage drops below 12.7 volts, even after the engine is off. An LED Christmas tree on the monitor keeps you apprised of voltage levels and if there is a problem. The "set" and "on" buttons perform several functions, including a timer override and manual linking. You can jump the main from the house battery, but due to its 100-amp fuse, it is suggested you let charge levels equalize for a few minutes first. Also, if the auxiliary battery is removed the system will throw an error code unless you disconnect a ground wire.

**INSTRUCTIONS** are thorough and set up was easy, but with an IP40 rating, it should not be subjected to excessive water. Bench evaluation revealed flawless operation with the exception of the 11.4-volt failure alarm, which we did not test. Made in South Africa, with a three-year warranty.

**\$350**  
**equipt1.com**

### PROS

Easy installation, comprehensive kit, in-cab monitor

### CONS

Low amperage capacity, lacks solar regulator, not waterproof, lacks VOA compatibility



## OFF-GRID ENGINEERING MOUNT & BLUE SEA ML-ARC

**WE CALLED OK4WD** to source Off-Grid's dual-battery system and were immediately impressed with the beautiful CNC-milled aluminum mounting bracket. This comprehensive kit includes hardware, a plug-n-play braided harness, terminal ends, precut cables, and Blue Sea ML-ARC isolator. Blue Sea, purveyors of battery management systems for the marine industry, has earned a stellar reputation, and their products have made the natural crossover to overland applications.

**THE ML-ARC** lacks fancy LED arrays, but it gets the job done with simplicity and rugged components. After starting the engine, the magnetic-latching relay links batteries when voltage reaches 13.5, then "unlatches" if voltage drops to 12.75 for 30 seconds. If any battery exceeds 16.2 or drops below 9.6 volts, the system enters lockout mode to protect components.

**ITS 500-AMP** capacity and manual link easily accommodate jump-starting and extended winching operations. The dash-mounted toggle will link batteries, isolate banks, or turn the system off, and a dial on the base unit allows you to latch or lockout the system. Its IP66 rating is best-in-class, and it performed flawlessly in the lab.

**WE KNEW** Off-Grid's Gen III Tacoma mount required fabricating a riser plate, which we did, but they say their new design will be bolt-in. The ML-ARC does not accommodate VOAs, so we substituted the REDARC (available from Off-Grid). As for ML-ARC, its new home will be on my '82 Hilux. Made in the USA (mount) and Mexico (ML-ARC) with a lifetime warranty.

**\$599**

**ok4wd.com**

### PROS

Best-in-class waterproof and amperage rating, lifetime warranty

### CONS

Lacks solar regulator and voltage meter, not VOA compatible, mount required fab work



## GENESIS OFFROAD JK DUAL BATTERY SYSTEM

**WHEN GENESIS OFFROAD** owners Shane and Amy Smith didn't find a suitable dual-battery system for their Jeep, they built one. Their goal was bulletproof plug-n-play systems, and they now offer options for Jeep Wranglers, most Toyotas, and Polaris UTVs. This is another no-frills kit (no solar or VOAs), just solid components that do the job.

**WHEN THE** start battery is fully charged, the 200-amp Cole Hersee isolator links the auxiliary unit, and it remains linked until the start unit drops to 12.7 volts. Pressing the "boost" switch links both banks for 60 seconds for a jump-start. Power and ground bus bars make accessory connections an easy process, while OE systems remain connected to the start battery with the stock terminal. Genesis offers an in-cab monitor (\$270), but we'll probably source a basic dual-voltage gauge.

**INSTALLING** the mount on our 2015 JK took about two hours. It required modifying the factory tray and a few vacuum lines, but none of it is technical and the instruction manual is excellent. The beauty of this system is that the Genesis tray fit the OE bolts perfectly, electronic components are premounted, and wires are cut, lugged, and shrink-wrapped. Torque five mount bolts, install the top plate, hook up the terminals, and you are done! In the lab, the system functioned without a hitch. This is a well-thought-out product, and because we love simplicity and rugged components that work, the Genesis system receives our **"EDITOR'S CHOICE AWARD."** Made in the USA.

**\$529**

**genesisoffroad.com**

### PROS

Quality construction, comprehensive kit, prewired to bolt in

### CONS

Lacks solar regulator, Not VOA compatible, lacks voltage meter **W**