



Integration Manual
eSTBATS12V68-31-01

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Revision Record

Revision	ECN	Description	Revised By	Date
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1 Introduction

The CSI 12V Sodium-Ion Group 31 Starter Battery is a direct replacement for conventional Group 31 lead-acid and AGM starter batteries used in heavy-duty trucks, RVs, generators, marine vessels, and industrial vehicles. It provides extremely high cold-cranking performance, reduced weight, extended cycle life, and integrated battery management functionality.

The battery features a standard Group 31 footprint with dual 3/8"-16 UNC threaded stud terminals (positive and negative), an integrated top carrying handle, and a sealed enclosure. A round On/Off push-button is located on the top cover near the terminals.


2 Technical Specifications

Parameter	CSI 12V Sodium-Ion
Nominal Voltage	12.5 V
Capacity	67.5 Ah
Cold Cranking Amps (0 °F)	1500 A
Continuous Discharge	100 A
Reserve Capacity	150 min @ 25 A
Starting Cycles	>70,000 @ 25 °C
Self-Discharge	~2%/month
Operating Temp	-30 °C to 70 °C
Terminal Type	3/8"-16 UNC studs
Weight	23.5 lbs
Dimensions	~13.0" (L) × 6.8" (W) × 9.4" (H) (330 × 173 × 240 mm).
Enclosure	IP67
Certifications	DOT/UN 38.3 transport safety standards
BMS Features	OVP, UVP, OCP, short, temp cutoffs, cell balance

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3 Installation Guide

Proper installation is critical to safe operation and optimal performance. Follow the steps below when installing the battery.

3.1 Preparation and Safety

- Confirm the vehicle requires a 12 V Group 31 battery. This battery is a direct mechanical and electrical replacement for Group 31 lead-acid batteries.
- Turn off the engine, remove the ignition key, switch off all accessories, and disable any master battery disconnect.
- Safety glasses and gloves are recommended. Although the battery contains no acid, high current capability presents short-circuit risk.
- You will need a wrench or socket suitable for 3/8"-16 terminal hardware (typically 1/2" or 9/16"), flat washers (and lock washers if required), and optional lifting strap.
- Perform installation in a well-ventilated area. Avoid sparks, smoking, or open flames.

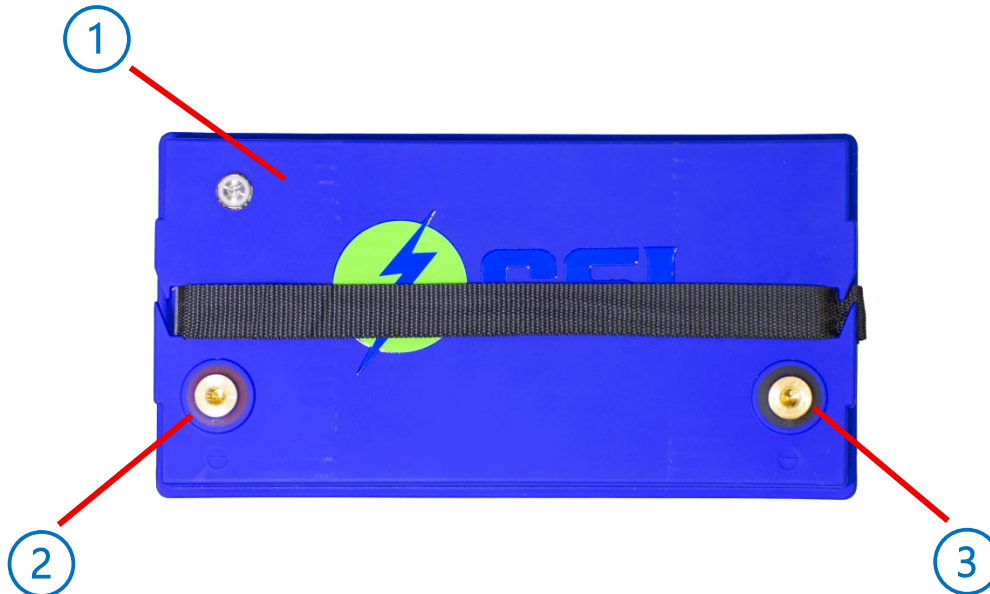
3.2 Removal of Existing Battery (If Applicable)

- Disconnect the negative (-) cable first.
- Disconnect the positive (+) cable.
- Remove any hold-down brackets or clamps and carefully lift out the old battery.
- Inspect and clean the battery tray. Neutralize any acid residue from previous lead-acid batteries and allow the area to dry.

3.3 Installing the CSI Sodium-Ion Battery

- Lower the battery into the tray in the same orientation as the original battery. Ensure cables reach without strain.
- Install the hold-down clamp or bracket. The battery must be firmly secured to prevent vibration or movement.
- Attach the positive cable to the positive stud. Verify polarity carefully.
- Tighten to 10–15 ft-lb (14–20 N·m). Do not overtighten.
- Connect Negative (-) Cable Last: Attach and torque to the same specification.
- Verify cable routing, terminal tightness, protective covers, and secure mounting.

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- 1 On/Off button
- 2 Positive Terminal
- 3 Negative Terminal

3.4 Initial Power-Up and Verification

- Press the On/Off button and the button stays at depressed position (ON position).
- Verify system voltage (~12.8 V nominal) and accessory operation.
- Start the engine and confirm normal cranking performance.
- With the engine running, confirm alternator charging voltage (~14.0–14.4 V).

3.5 Multi-Battery Systems

- Use only identical CSI sodium-ion batteries in parallel or series systems.

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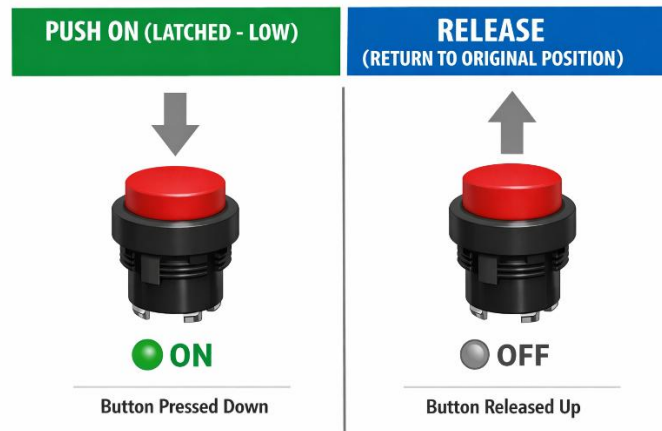


- Do not mix sodium-ion with lead-acid batteries.
- Ensure correct polarity and wiring for 12 V parallel or 24 V series configurations.
- Power ON each battery after installation.

4 Power Operation and User Interface

4.1 On/Off Button

- Power ON: Press On/Off button to the depressed “down” position (ON position).
- Power OFF: Press On/Off button to return to the original “up” position (Off position).



When OFF, the internal contactor opens and the terminals are electrically isolated.

4.2 Jump Start Feature

The battery is equipped with an integrated Battery Management System (BMS) containing software that continuously monitors the battery’s state of health. If the battery is discharged to approximately 10% remaining capacity, the BMS will protect the battery by shutting it off.


In most cases, this condition results from operator error. For example, vehicle lights left on after the key is removed, or the key is partially engaged to turn on the 12v system, causing a parasitic load while the engine is off for an extended period.

When this occurs, the operator can simply press the On/Off button again to reset the BMS. Just press the On/off button once to return to the Off position (button at original “up” position), and then press the button again to the On position (button at depressed “down” position). This action of unique “Jump Start” feature restores access to the remaining ~10% of battery capacity, allowing the vehicle to be

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started. Once the engine is running, the vehicle’s alternator will begin recharging the battery during normal operation. This feature eliminates the need for jumper cables or battery chargers.


5 Safety Instructions

Although the battery includes multiple protective features, adherence to standard battery safety practices and specific precautions for sodium-ion technology is essential.

5.1 General Handling & Installation

- **Avoid Short Circuits:** Keep tools and conductive objects away from terminals. A short may cause sparks, heat, or damage.
- **Correct Polarity:** Always connect positive to positive, negative to negative. Reversing polarity can damage electronics and the battery. Confirm markings before connection.
- **Secure Mounting:** Use proper hold-down clamps or brackets to prevent movement, vibration damage, or cable strain.
- **Use Proper Hardware:** Only use included 3/8" -16 nuts/bolts, torqued ~10 – 15 ft-lb. Recheck after a few days of operation.
- **Personal Protective Equipment:** Wear eye protection and gloves when handling.
- **No Flames or Smoking:** Avoid open flames and sparks. Sodium-ion batteries do not vent hydrogen, but standard precautions apply.
- **Metal Objects & Jewelry:** Remove rings, bracelets, and watches; use insulated tools.
- **Children & Pets:** Prevent access to the battery, especially the On/Off button.

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5.2 Operational Safety

- **Temperature:**
 - Operating: $-30\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$ (discharge); Charging: $0\text{ }^{\circ}\text{C}$ to $45\text{ }^{\circ}\text{C}$ recommended.
 - Cold ($< -25\text{ }^{\circ}\text{C}$): Charging may be disabled by BMS due to extreme cold, discharging (using) the battery is still allowed, be aware of the battery state of charge before temperature is warming up for the battery to start charging.
 - Hot ($>70\text{ }^{\circ}\text{C}$): Avoid direct engine heat; BMS may limit operation.
- **Shock & Vibration:** Robust casing resists vibration; inspect after impacts.
- **Water & Dust:** IP66-rated; avoid submersion or high-pressure sprays. Apply dielectric grease to terminals in corrosive environments.
- **BMS Protections:** Includes over/under-voltage, over-current, short-circuit, over/under-temperature, and cell balancing. Never bypass or tamper.
- **Avoid Over-Discharge:** Keep SOC $>20\%$ when possible; BMS low-energy lock-off prevents damage.

5.3 Storage & Long-Term Inactivity

- Turn off battery for storage >2 weeks.
- Store at 50–80% SOC in $-20\text{ }^{\circ}\text{C}$ to $+45\text{ }^{\circ}\text{C}$, cool and dry.
- Periodically check voltage every 6 months.
- Keep battery isolated from metal and cover terminals.

6 Maintenance

The CSI sodium-ion battery is maintenance-free. Recommended periodic checks:

- **Visual Inspection:** Ensure terminals are clean and tight; apply dielectric grease if needed.
- **Fittings & Hold-Down:** Confirm battery remains secure.
- **Cables:** Inspect for frays or loose crimps; replace if necessary.

6.1 Charging & Performance

- **Alternator/Charging System:** Maintain $\sim 14.2 \pm 0.2\text{ V}$. Avoid prolonged overvoltage ($>14.8\text{ V}$).
- **External Charging:** Use multi-stage chargers suitable for AGM/LiFePO₄. Max voltage $\sim 14.4\text{ V}$; float 13.6–13.8 V. Limit charge current in cold conditions ($<0\text{ }^{\circ}\text{C}$).
- **Equalization & Balancing:** BMS handles automatically; no manual equalization needed.
- **Capacity Check:** Use app or simple load tests; expect gradual capacity decline over years, significantly slower than lead-acid.

6.2 Cleaning & Care

- Wipe top free of grime; avoid solvents.
- Ensure ventilation to dissipate minor heat.

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- Firmware updates (if available) should be applied when battery is idle with sufficient charge.
- Do not open the battery; internal servicing is prohibited.

7 Troubleshooting

Issue	Possible Cause	Solution
Vehicle has no power	Battery off	Press On/Off button
Engine cranks weakly	Low SOC	Recharge battery; jump-start if needed
Battery won't fully charge	Alternator voltage low or high self-consumption	Use proper charger; turn off accessories; check alternator
Battery turns off in vehicle	Low-energy lock-off or short	Press button to jump start; check for shorts
Alternator warning light	Battery off during start or smart alternator conflict	Ensure battery on before starting; check alternator voltage and wiring
Battery swollen or venting	Overcharge or internal failure	Disconnect immediately; move to ventilated area; contact CSI support; use Class D extinguisher if fire

8 Summary

The CSI 12V sodium-ion Group 31 starter battery offers high CCA, long life, minimal maintenance, and broad temperature tolerance. By following proper installation, operation, and storage guidelines, users can expect years of reliable service with minimal intervention. Safety, correct charging, and regular inspection of terminals and cables are key to maximizing performance.