Remote firmware update for BMS-Can batteries via VRM

1. Introduction

This manual describes how to remotely update firmware on third-party BMS-Can managed batteries via the VRM Portal. This functionality is limited to select manufacturers, and requires the battery to be connected to a GX device (Cerbo GX, or other) via BMS-Can set to 500 kbps.

Features:

1. Remotely update BMS-Can battery firmware straight from the VRM Portal
2. No need to install any software
3. Works from laptop, tablet & phone
4. Update single or multiple batteries on one CAN bus
5. Progress monitoring via VRM

1.1 Scope and exclusions

This document covers:

- BMS-Can managed batteries only
- Connection path: VRM → GX device → BMS-Can (500 kbps) → Supported battery BMS
- Updates initiated and monitored via VRM Portal

This document does **not** cover:

- Non-battery devices
- Non-BMS CAN profiles
- VE.Direct, Ethernet, RS485, serial or USB connected devices
- VE.Can at speeds other than 500 kbps
- Local-only update tools or procedures

2. Requirements

2.1 System requirements

- System must be connected to the internet and communicating to the VRM Portal. On the GX device, check Settings > VRM Portal, and then scroll down to see the connection status (Last contact menu entry).
- The `Full` access setting, which is on the GX device menu → Settings → VRM Online Portal → VRM Portal must be enabled.
- GX device firmware version **[TBD: minimum version]** or later
- VE.Can bus configured at **500 kbps**

2.2 Battery requirements

Before initiating an update, ensure:

- Battery state of charge (SOC) is **50%** or higher
- Battery is powered and communicating normally
- No active alarms or fault conditions
- Battery temperature is within normal operating range

3. Supported products

3.1 Eligibility

Third-party batteries are eligible for remote firmware updates when:

- The battery correctly implements the BMS-Can protocol, and has passed all required compliance tests
- The battery manufacturer has met all Victron requirements for firmware update code review
- The current battery firmware supports over-the-air updates via the CAN bus

Functionality is enabled automatically by the VRM Portal based on device identification, firmware versions and vendor support. However, seeing the battery listed in the device list is not a guarantee that all requirements are met.

4. How it works

The remote firmware update process follows these steps:

1. Installer obtains the required firmware file from their battery manufacturer (usually .bin format), Victron does not provide this file
2. Installer initiates remote firmware update request via the VRM Portal device list for the site
3. VRM Portal uploads the firmware package to the GX device
4. GX device begins transfer to the target battery BMS via BMS-Can.
5. Battery BMS validates the complete firmware image (signature/checksum)
6. Battery BMS applies the update and restarts
7. GX device confirms successful update and reports status to VRM Portal

This two-stage process (VRM → GX, then GX → battery) ensures that intermittent internet connectivity does not interrupt the critical firmware transfer to the battery.

5. Firmware source

The VRM Portal does not maintain a 3rd party battery firmware library. Approved firmware files for

supported third-party battery products must be obtained via the battery manufacturer, or their dealer.

6. Update process

6.1 Step by step instructions

Step 1. Navigate to Firmware updates on the VRM Portal

Log in to VRM Portal and navigate to the installation containing the battery to be updated.

Go to the firmware update page via the Device List menu.

If supported, the BMS-Can battery will show a button to upload the firmware file.

Step 2. Upload custom firmware file

1. Click the three dots (⋮) next to the battery device line
2. Select **Upload firmware file**
3. Choose the firmware package file from your computer
4. Proceed with update as described above

Ensure the firmware package is obtained from the official battery manufacturer and meets all specifications.

Upload the firmware file, and click the **Update** button

Step 3. Monitor progress

The update process will display:

- **Uploading to GX device** - firmware transferring from VRM to GX device
- **Transferring to battery** - GX device sending firmware to BMS via VE.Can
- **Installing** - battery BMS applying the update
- **Restarting** - battery restarting with new firmware
- **Verifying** - confirming successful update

Expected duration: Once the firmware file has been delivered to the battery via VRM, the battery itself may take some time before applying it. This varies between manufacturers. In some instances the BMS will incrementally update whent there are multiple batteries connected together via the same BMS.

Step 4. Completion

Upon successful completion:

- New firmware version is displayed - Version number may not always appear as expected due to hexidecimal encoding differences.
- Battery returns to normal operation and communication - though there is normally no downtime during the update process.

7. Multi-battery behavior

If there are multiple BMS-Can batteries:

- VRM Portal lists only the entry for the battery BMS
- Any support for updating multiple batteries connected together via a single BMS needs to be implemented and supported by the battery BMS

8. Limitations

8.1 CAN-Bus bandwidth constraints

- BMS-Can operates at 500 kbps
- Firmware transfer shares bandwidth with normal battery communication
- Large firmware files may take some time to transfer

9. Failure handling

If an update fails:

- Battery BMS will **not** apply incomplete or unverified firmware
- Battery should return to operation with previous firmware version
- Update can be retried immediately or after resolving the underlying issue

9.1 Recovery

In the event of update failure:

- **Expected behavior:** Battery reverts to previous working firmware and restarts normally
- If battery cannot be recovered remotely, contact the battery manufacturer for support or RMA

Battery manufacturers are responsible for ensuring their BMS firmware includes robust update failure recovery mechanisms.

10. Monitoring and logs

10.1 VRM Portal visibility

During and after the update process, VRM displays:

- Current update state (uploading, transferring, installing, complete, failed)
- Upload progress percentage
- Firmware version before and after update in the event log
- Error codes if update fails
- Timestamp of update initiation

10.2 Diagnostic data for support

When troubleshooting failed updates, collect the following information:

- VRM installation ID
- Battery manufacturer, model, and serial number
- Current and target firmware versions
- Complete error message and error code from VRM
- GX device firmware version
- Battery state (SOC, voltage, temperature, alarms) at time of failure

Provide this information to the battery manufacturer or Victron support as appropriate.

11. Troubleshooting

Error Verification failed

Firmware package signature or checksum verification failed.

Resolution:

- If using uploaded firmware file, obtain a new copy from the manufacturer
- Contact battery manufacturer if problem persists

12. Notes and warnings

12.1 Battery safety

WARNING: Do not disconnect battery power or VE.Can communication during a firmware update. Interrupting the update process may result in battery malfunction.

IMPORTANT: Ensure the battery system has adequate backup capacity before updating. Be prepared

in case the batteries temporarily disconnect, stop charging, or reduce output during the update process.

12.2 When not to update

Do **not** perform firmware updates:

- During critical system operation or backup power events
- When battery SOC is low
- When active alarms or faults are present
- During extreme temperature conditions
- When internet or VE.Can communication is unstable
- On a running system unless necessary to resolve specific issues
- If the site is not physically accessible in case on-site recovery is necessary

12.3 Best practices

- Review firmware change logs before updating
- Update during planned maintenance windows
- Monitor the update process to completion
- Verify battery operation after update completes
- Keep records of firmware versions and update history

12.4 General firmware update guidance

- Newer is not always better
- Don't break it if it works

Use this feature with care. Our main advice is to not update a running system, unless there are problems with it or the manufacturer recommends the update.

Change logs should be obtained from the battery manufacturer.

13. Appendix: Information for third-party manufacturers

Remote firmware updates for 3rd party batteries are only available to existing BMS-Can compliant battery manufacturers who have successfully completed the Victron testing protocol.

13.1 Support responsibilities

Third-party battery manufacturers are responsible for:

- Providing firmware files
- Customer support for firmware update related issues

- Change logs and release documentation
