

Manual

How to Properly Reduce eMMC Wear

This document explains eMMC lifespan, factors affecting it, and methods to effectively reduce wear.

20251001

How to Properly Reduce eMMC Wear

The lifespan of eMMC depends mainly on the number of Program/Erase (P/E) cycles of its storage cells. Under normal use, lifespan depletion is not excessive. This document explains eMMC lifespan, factors affecting it, and methods to effectively reduce wear.

Lifetime Percentage

The lifetime percentage is automatically calculated by the eMMC chip based on the ratio of used P/E cycles to the maximum defined by the manufacturer.

Formula:

$$\text{Lifetime \%} = (\text{Used P/E cycles} \div \text{Maximum P/E cycles}) \times 100\%$$

Data Explanation:

The lifetime percentage is calculated based on the most worn block (the area with the highest wear).

The used P/E cycles are recorded by the eMMC's internal Wear Leveling Monitor, while the maximum P/E cycles are defined by the eMMC vendor in the product specification.

Maximum P/E cycles = data per block $\times$ total number of blocks

Example: 1,536,000 KB $\times$ 8192 = 12,582,912,000 KB ($\approx$ 12 TB total)

Wear Leveling

Modern eMMC uses wear leveling to distribute P/E cycles evenly across blocks.

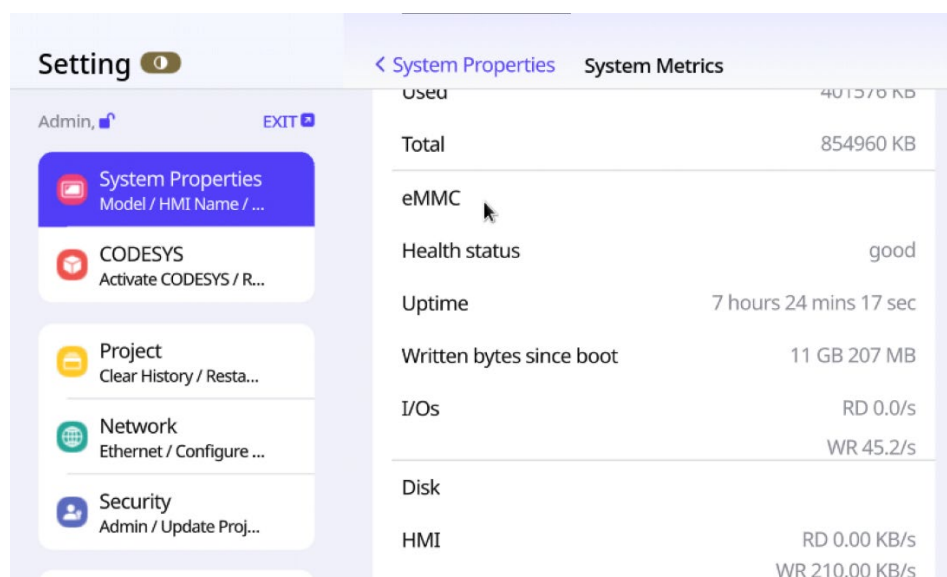
Lifetime Indicators

eMMC provides lifetime indicators in stages (e.g., 0–20%, 20–40%). These are approximate values reflecting wear level.

Extending eMMC Lifespan

Since eMMC has limited write cycles, excessive or frequent historical data logging will shorten its life, potentially causing data loss or startup failure.

Recommendation: Keep the average write speed below 1200 KB/min. This value can be checked under System Setting on the HMI.



Ways to Reduce Read/Write Stress

Data Sampling

- Disable saving historical data if historical records are not needed.
- Use longer sampling intervals.
- Reduce frequency of sync commands (2 or 3) at the control address.
- If using customized file handling, minimize file switching. For periodic auto-sync, set a longer interval.

Event Log

- Disable saving historical data if historical records are not needed.
- Reduce the frequency of high priority level events.
- For conditional actions not requiring alarm history, disable saving historical data or use Action Triggers instead.
- Reduce frequency of sync commands (2 or 3) at the control address.
- Enable Aggregate mode (see Note 2).

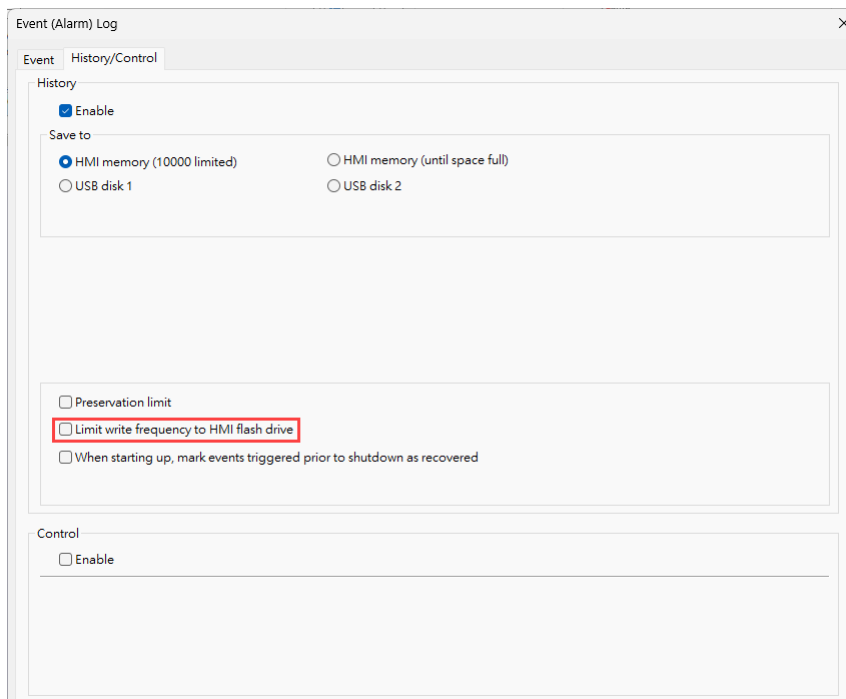
Operation Log

- Reduce sync command frequency.
- Enable Aggregate mode (see Note 2).

Note

1. Before shutting down the HMI, set system register LB-9034 = ON to ensure data is fully written to eMMC.
2. Aggregate mode can be enabled under [Event Log] or [Operation Log] →

[History/Control].



Event (Alarm) Log

Event History/Control

History

☒ Enable

Save to

☒ HMI memory (10000 limited) ☐ HMI memory (until space full)

☐ USB disk 1 ☐ USB disk 2

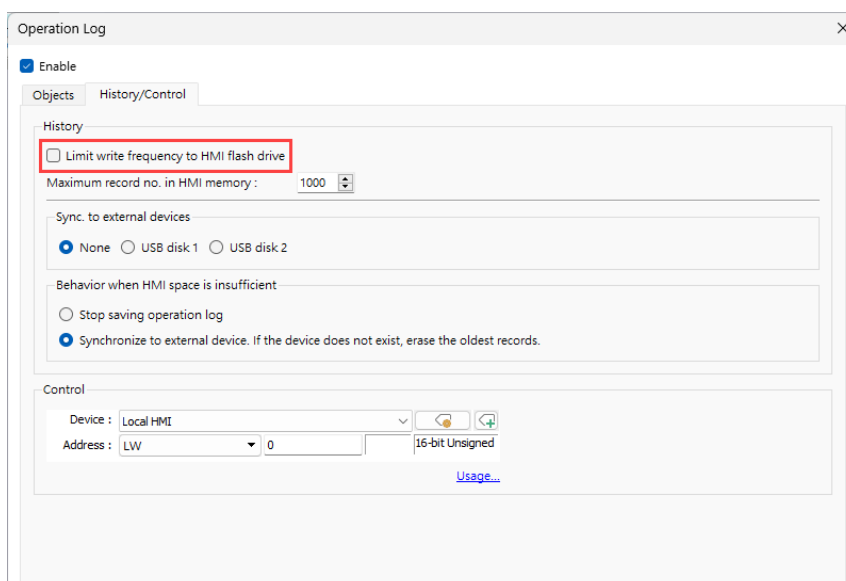
☐ Preservation limit

☐ Limit write frequency to HMI flash drive

☐ When starting up, mark events triggered prior to shutdown as recovered

Control

☐ Enable



Operation Log

☒ Enable

Objects History/Control

History

☐ Limit write frequency to HMI flash drive

Maximum record no. in HMI memory : 1000

Sync. to external devices

☒ None ☐ USB disk 1 ☐ USB disk 2

Behavior when HMI space is insufficient

☐ Stop saving operation log

☒ Synchronize to external device. If the device does not exist, erase the oldest records.

Control

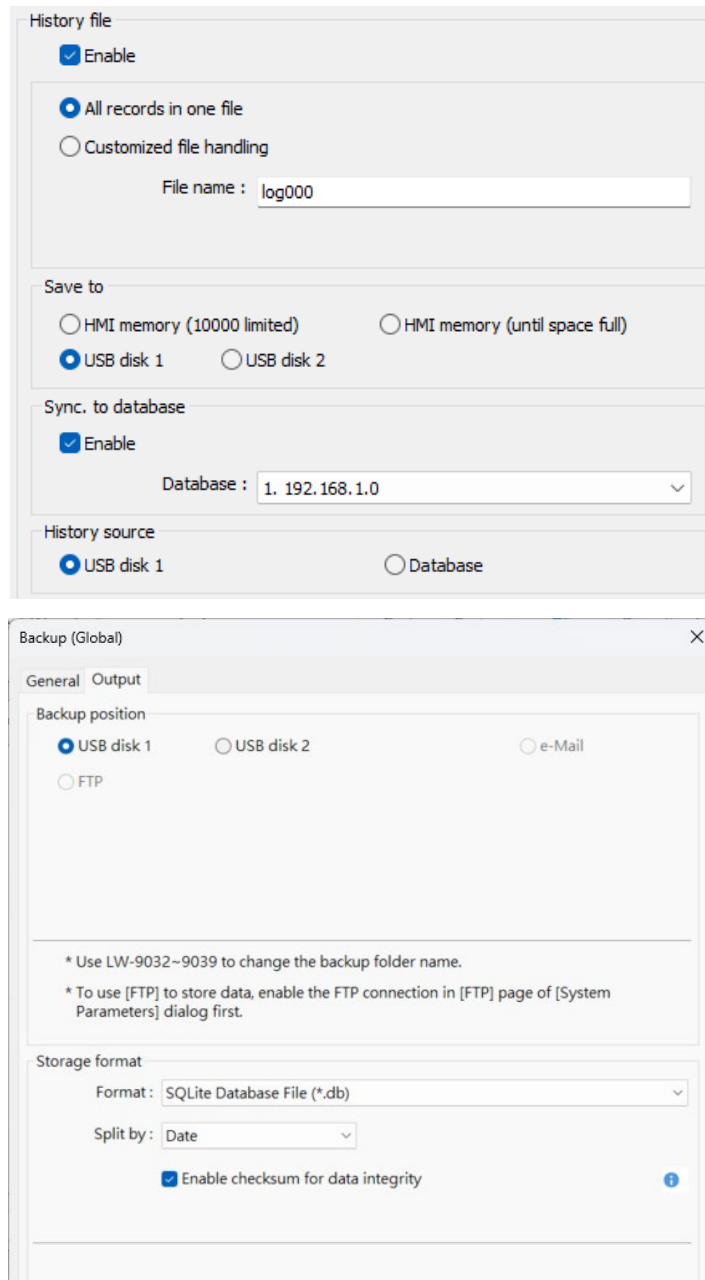
Device : Local HMI

Address : LW 0 16-bit Unsigned

[Usage...](#)

Storing/Backing Up Historical Files to External Devices

To prevent data loss when eMMC space is limited, save or back up historical files to USB drives / SD cards / Database servers.



The image shows two screenshots of a software configuration interface. The top screenshot is the 'History file' settings window, which includes sections for 'History file' (with 'Enable' checked and 'All records in one file' selected), 'Save to' (with 'USB disk 1' selected), 'Sync. to database' (with 'Enable' checked and 'Database' set to '1. 192.168.1.0'), and 'History source' (with 'USB disk 1' selected). The bottom screenshot is the 'Backup (Global)' window, showing 'General' and 'Output' tabs. Under 'Backup position', 'USB disk 1' is selected. A note indicates that LW-9032~9039 can be used to change the backup folder name. Another note states that to use FTP, the FTP connection must be enabled in the 'System Parameters' dialog. Under 'Storage format', the format is set to 'SQLite Database File (*.db)' and 'Split by' is set to 'Date'. The 'Enable checksum for data integrity' checkbox is checked.

Store/Back Up Historical Files on External Devices (Example: Data Sampling)

External Device Recommendations

Like eMMC, USB drives and SD cards also have limited write cycles, which vary by memory type. For frequent historical data logging or long-term file retention, use larger-capacity devices (e.g., 32 GB). Perform off-site backups periodically (e.g., once per year).

Database Server Recommendations

Use RAID for redundancy and perform off-site backups periodically (e.g., once per year).