



Real Time BMS 2.1

Monitor 2.4 TFT and data storage



**User Instruction and the Technical Specifications
Application Manual**

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**GWL
POWER**

<http://www.ev-power.eu>

RT-BMS external monitor unit with a touch display

RT-BMS external data monitor unit with a touch display (for RT-BMS Master unit). Designed to read and display data from all software versions of RT-BMS Master unit starting from HW version 2.0.

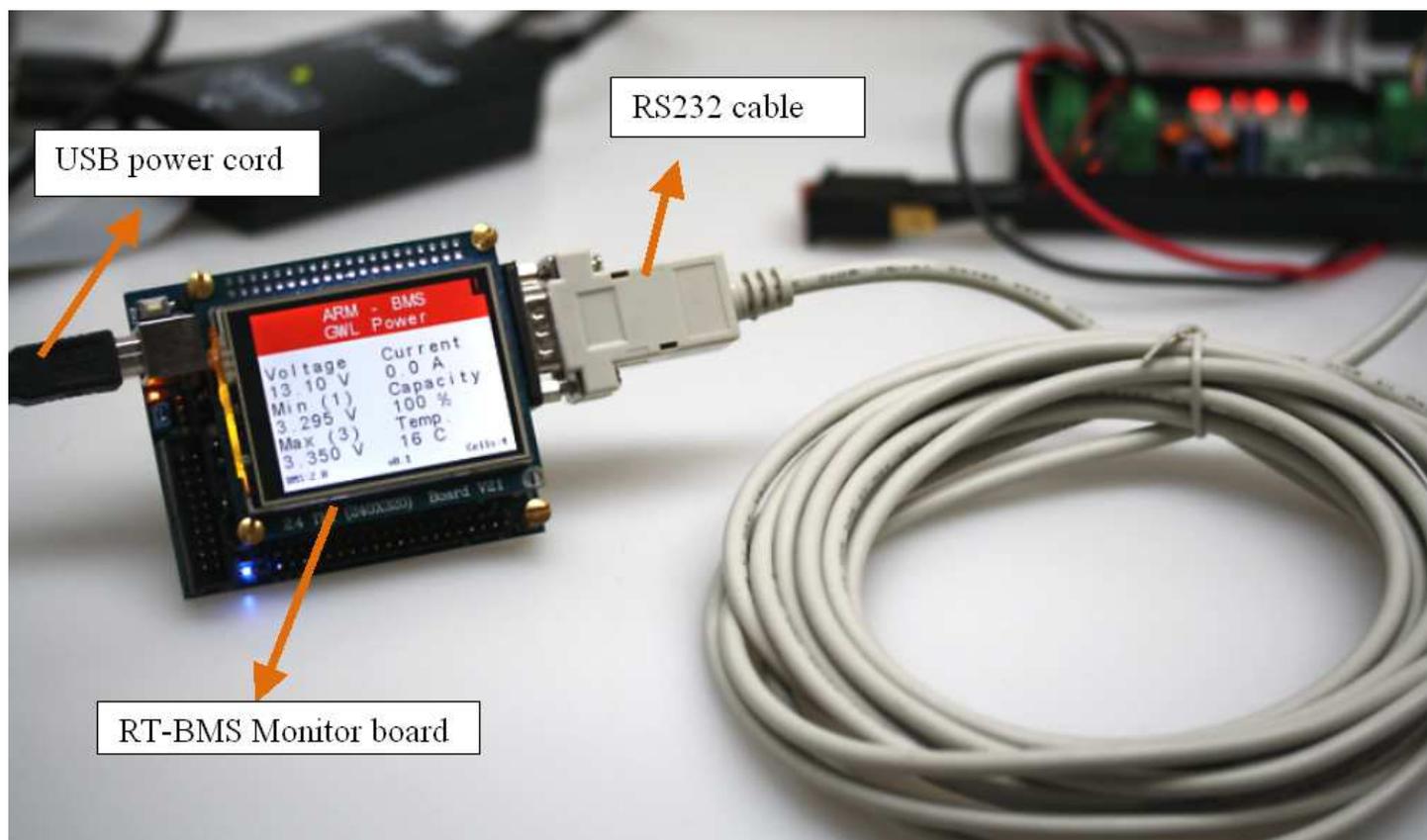
This external computerized display monitor is designed only to read and display the data from the RT-BMS Master unit. The unit cannot make any settings of the RT-BMS Master. The settings must be done using the original BMS software.

The display board is based on an ARM platform STM32F103VET6. It can read and display data from a BMS v2.0 or v2.1. The BMS Master Unit is connected to the board using a special I2C to RS232 cable.

In addition to the display of the data, the monitor can be configured to save gathered data from the BMS to a CSV file to be downloaded to your PC.

Note: Before you decide to purchase the Real Time BMS 2.1 Monitor display to co-operate with your BMS system, please study all details about the RT-BMS and the system setup. This way you avoid waiting for requests for additional technical support. All important information is described in the documentation and the FAQ sections.

The basic setup of the RT-BMS Monitor display system



Warning – Important: The RT-BMS system including this external display monitor requires a professional installation from persons knowledgeable in battery technology installation and operation. There is no responsibility of the supplier and producer of the RT-BMS for damages to batteries or other equipment resulting from the failure of the operation of the RT-BMS or any related components. We always recommend installing multiple monitoring and protection components to prevent from failure or accident in case of a components defect or malfunctions.

The detailed photo of the Monitor display main unit



Note: the Monitor display main unit is provided “as it is”, with no housing or external case provided. It is purposed to be integrated to the final solution by the customer.

The monitor is powered by the 5V voltage over the USB port. To make the installation easier the unit is supplied with a 12V/24V to 5V automotive adapter to power over USB.

The operation of the internal disk, logging and USB

The Monitor display main unit has a 2 MB internal disk that is used for storing gathered data from the BMS. The file with the data is **data.csv**. The data is stored even after the power from the display unit is disconnected. When the disk is full a warning "disk" message is displayed.

You can access files on the disk inside Monitor display main unit via USB port. The communication over USB is enabled automatically after the display startup. The first screen is for the communication over USB, until you switch (by touching the display) to the next screen. The communication is enabled when you stay on the first screen named '**Settings <-> USB**'. After few seconds the application will automatically create an USB connection that will appear in your PC as a new drive. To disconnect the USB drive and resume to the display operation, use the touch screen, or restart the board by unplugging the power cable.

The internal disk contains another file named **settings.ini** where application settings are stored.

Configuration file settings.ini

The configuration is stored in a simple text format file settings.ini. If this file does not exist during application startup or if it contains invalid data, it will be replaced with a new file containing the default values.

The default values are

```
[Log]
Enable = 1
Minutes = 10
Seconds = 0
```

```
[ScreenUpdate]
Minutes = 0
Seconds = 10
```

```
[DateTime]
#dd.mm.yyyy hh:mm:ss
DateTime = 01.01.2012 00:00:00"
```

Explanation of the values in the settings.ini

[Log]

The section Log can be used for enabling (Enable = 1) or disabling (Enable = 0) logging. You can also change an interval of logging.

Example

```
[Log]
Enable = 0
Minutes = 0
Seconds = 0
```

No data will be logged to the data.csv file.

Example

```
[Log]
Enable = 1
Minutes = 0
Seconds = 30
```

Data will be logged to the data.csv file every 30 seconds.

Example

```
[Log]
Enable = 1
Minutes = 2
Seconds = 0
```

Data will be logged to the data.csv file every 2 minutes.

Note: you need to keep in mind **the limitations of the internal storage of 2 MB internal disk**. If you have a large battery system, there is a large amount of data to be stored. If you set the interval too short the memory will be full very fast. You also need to keep in mind the computing limitations of the Monitor display main unit. With large BMS system (with many cells) a considerable time is needed to read the data from the BMS Master, to process the data and to record the data to the disk. By setting a very short interval for data logging, the operation of the Monitor will become overloaded. For large systems we suggest a minimal logging interval in 30 seconds and more.

[ScreenUpdate]

The section ScreenUpdate is used for adjusting screen update interval with values from a BMS.

Example

```
[ScreenUpdate]
Minutes = 0
Seconds = 10
```

The screen will be updated every 10 seconds.

Note: you need to keep in mind the limitations the computing limitations of the Monitor display main unit. If you set a too short displaying interval the operation of the Monitor will become overloaded. For large systems we suggest a minimal logging interval in 30 seconds and more.

[DateTime]

The DateTime section is used for setting the internal clock of the board to your local time (this time is then saved to the log file). Note that the date and time has to be in a special format, otherwise the board clock won't be adjusted.

If you try save invalid values, the default values will be used instead. The values from the configuration file will be loaded after restarting the board or switching to the next screen.

Comments in the settings.ini

You can add your own comments to the **settings.ini** file. Comments start with # character.

The setting of the **settings.ini** file can be changed after connection the board to your PC over the USB connection.

The display screens and a status bar

Use the touch screen to switch between individual screens to display the information about the RT-BMS values.

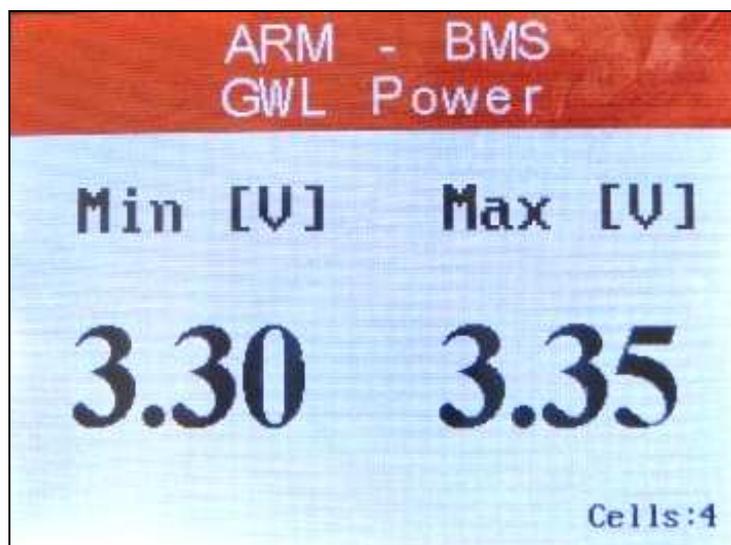
Screen 1 - Application settings - the first screen displays application settings which you might need to review and change if needed.

Screen 2 - USB connection status – selecting this screen will change the function of the Monitor unit to to enable USB connection with PC (see the above sections about the internal disk).

Screen 3 - BMS identification - the application waits for a BMS to be connected and then tries to identify it – the progress can be seen on this screen

Screen 4 to Screen 9 – BMS data display - after connecting a BMS to the board and successful initialization, data from BMS are gathered, displayed and saved.

An example of the screen



Note: the touch screen is not sensitive to touch when the Monitor is processing data. You may need to learn “to feel the touch” to navigate the screen. There is no need to press the touch screen with force!

There are **three different screen indicators** that warn you about a specific event. All of them are displayed on the top part of the screen.

The indicators are

- low disk** - battery capacity is lower than 10% (as reported by the BMS)
- the disk is full (if this happens, then logging will be disabled till you free more space, by deleting the data from the CSV file)
- ! (exclamation mark) - the monitor cannot connect to a BMS, or the connection has been lost

Status bar information

After monitor startup and the BMS identification, additional information will be displayed in the status bar (the area at the bottom of the screen) - connected BMS version, version of this application and a number of battery cells (only for BMS v2.0).

Information about the data logging CSV file

The following information are stored in the csv file data.csv

time	real time from the startup of the Monitor
voltage [V]	total voltage of the pack
minimal voltage [V]	the minimal voltage of the lowest cell
maximum voltage [V]	the maximal voltage of the highest cell
current [V]	charge or discharge current (at the moment of the data logging)
capacity [%]	the pack capacity as referred by the BMS
temperature [°C]	the highest temperature reported by the BMS

A semicolon is used as a field separator.

RT-BMS Monitor display package content

The package contains the following items



The unit is powered over USB cable with 5V DC voltage. The unit can be powered from a PC USB port or from the 5V vehicle power supply (USB charger).

RT-BMS Monitor display system setup

The recommended way of setting up the system operation is as follows.

The first setup with PC

1. Connect the power cord (USB cable) to the RT-BMS Monitor board and the other end to your PC/notebook
2. The board should boot up and display the application settings
3. After few seconds the application should initialize its USB drive (with the configuration file). A new USB drive will appear on your PC.
4. You can work with the files on this USB drive directly. Edit the files as needed (eg. enable or disable logging, set time, etc.) and then use the touch screen to restart the board (the new settings should be loaded)

Connecting the board to the BMS

1. Turn off the RT-BMS Master completely – disconnect from the 12V power of the BMS Master
2. Connect the RS232 cable to the RT-BMS display and the other end (I2C) to the RT-BMS Master
3. Turn on the RT-BMS Master
4. Connect the power cord (USB cable) to the RT-BMS Monitor board (USB port) and the other end to your PC/notebook or use the vehicle charger
5. The RT-BMS Monitor board should boot-up and start operation.
6. Verify the settings on the first screen and then use the touch screen to go to the next screens
7. The application will try to detect the connected BMS and read the data
8. Values gathered from the BMS will be displayed – use the touch screen to move between the screens.

Note: the touch screen is not sensitive to touch when the Monitor is processing data and refreshing the screen. You may need to press the screen at the right time to move to the next screen.

Downloading the data file to PC

1. Connect the power cord (USB cable) to the RT-BMS Monitor board and the other end to your PC/notebook
2. The monitor board will boot up and display the application settings
3. After few seconds you will see another USB drive in your PC. You can download the data from this drive. (data.csv file)

FAQ

Q: What BMS versions are supported?

A: The ARM – BMS application supports v2.0 and v2.1.

Q: The monitor cannot detect my BMS.

A: Check the I2C to RS232 cable is properly connected and restart the board.

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