HOW-TO

How-to Log Data to a USB drive in EMU PRO

Document version: 1.0
Software version: 116.2.1 or later
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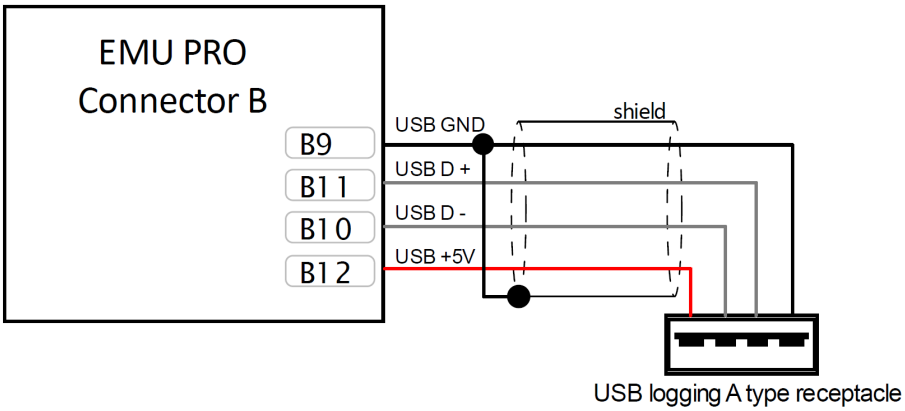
1. Description

The EMU PRO device allows users to log data directly to a connected PC or to an external USB drive, with a frequency of up to 500Hz. For logging without a PC, the USB setup must be properly configured. The logged data can be then analyzed to solve issues or further improve performance. This guide provides step-by-step instructions on how to enable and configure data logging, manage channels, adjust sampling rates, and monitor buffer usage to ensure efficient data recording. By following these steps, users will be able to tailor the system to their specific needs.

1. **Connection Setup**

   Logging on EMU PRO requires proper wiring of the USB cable. Follow the connection diagram and ensure all connections are properly shielded to prevent interference. Logging is possible by connecting a USB female cable to the designated connector. Logged data will be saved directly to this drive. Use a drive formatted with the FAT32 file system, with a recommended size of 32 GB (logging capacity is approximately 11 hours per 1 GB).

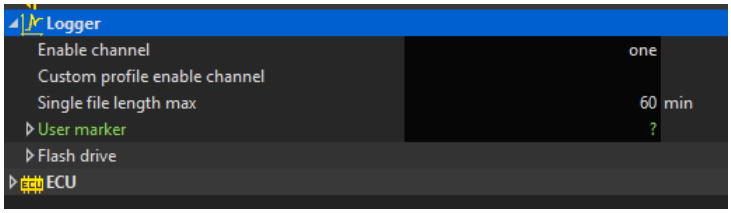
   Connection diagram



2. **Enabling Logging in EMU PRO Client Software**

   In the EMU PRO Client software, navigate to the *Smart Grid* panel and go to the ***Logger*** category. To activate constant data logging, set ***Enable channel*** to '**one**' (this is the default setting).
   For advanced configurations, you can set *Enable channel* to a different channel. However, use this feature carefully, as logging will only be active when the specified channel's value is not zero. For most users, we recommend leaving this set to 'one' to ensure consistent data logging.

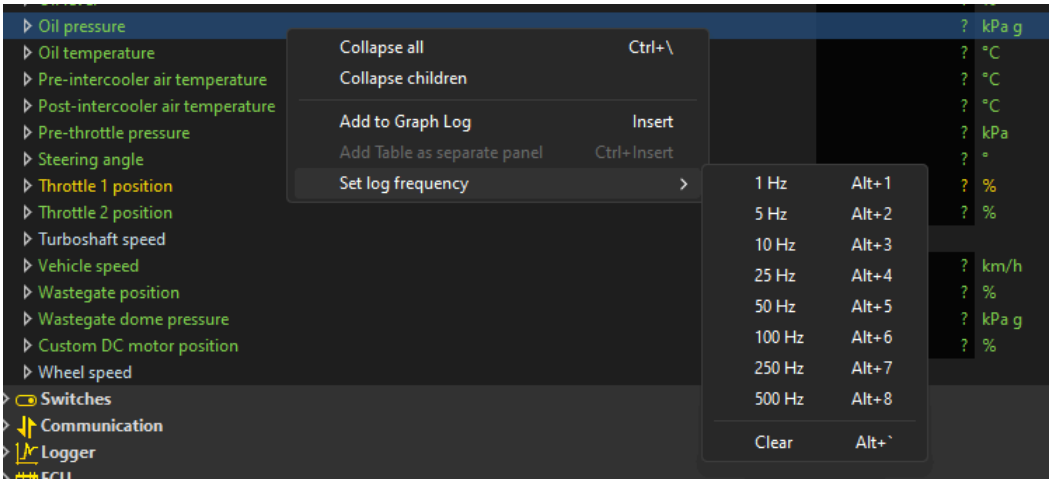
For more control, use the ***Custom profile enable channel*** to define a logging profile — specifying which channels are logged and at what sampling frequency.
Note that the maximum duration for each log file is set by *Single file length max*; after this time, a new file will be automatically created.



3. **Configuring Logged Channels**

The maximum buffer size is 1024 B. Each data channel can be logged at a different sampling rate, which affects how quickly the shared buffer fills. It is essential to carefully select which channels to log and adjust their sampling rates to manage the available buffer capacity effectively. Higher sampling rates (e.g., 500 Hz) generate more data and fill the buffer faster, while lower rates (e.g., 1 Hz or 5 Hz) allow more data to be logged within the same buffer size. Additionally, certain critical channels, such as *Engine RPM*, have a minimum required logging frequency to ensure accurate data capture. Monitor and balance sampling rates to ensure the buffer can handle the total data load.

To change a channel's sampling rate, right-click on the channel and select ***Set log frequency*** from the context menu in any panel displaying channels (such as *Logged Channels*, *Graph Log*, or *Smart Grid*).

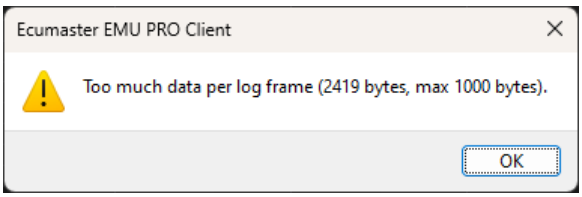


Regardless of the panel in which the change is made, the selected channel's sampling rate will be updated, and this change will be reflected in the ***Logged Channels*** panel, where the logging frequencies for each channel are displayed.

Alternatively, use the following keyboard shortcuts:
Alt+1 for 1 Hz,
Alt+2 for 5 Hz,
Alt+3 for 10 Hz,
Alt+4 for 25 Hz,
Alt+5 for 50 Hz,
Alt+6 for 100 Hz,
Alt+7 for 250 Hz,
Alt+8 for 500 Hz,
Alt+` to turn logging off.

At the bottom of the *Logged Channels* panel, you can monitor the buffer usage, which shows the percentage of total buffer capacity used for both the Base Profile and Custom Profile. It also displays the number of logged parts and their size in bytes.
For Custom Profile configurations, users can define specific parameters that determine when logging should occur, allowing for more advanced control of the logging process. These profiles are particularly useful for conditional logging based on dynamic parameters.

If the buffer usage approaches the maximum limit, the software will prevent the configuration from exceeding it and display a warning message.



For more detailed information on the *Logged Channels* panel, refer to https://www.ecumaster.com/files/EMU_PRO/EMU_PRO_Software_Guide.pdf in the *Logged Channels* chapter.

The EMU PRO Client software includes a status bar at the bottom of the main window, which provides quick access to real-time information about various system components, including the **USB logger state** and **USB buffer usage**. This allows users to monitor the condition of the connected USB drive and ensure logging operations are functioning properly without having to navigate to specific panels or sections.

4. **Setting the Real-Time Clock (RTC)**

   To ensure logs saved to the USB drive have correct and meaningful names, the device must have the correct date and time configured. This setting does not update automatically, it requires manual configuration in specific situations:

   - **Initial Setup:** When configuring the device for the first time.
   - **Time Zone Changes:** After moving the device to a different time zone.
   - **Daylight Saving Adjustments:** When transitioning between standard time and daylight saving time.
   - **Long-Term Power Disconnection:** If the device has been without power or battery backup for an extended period (e.g., over six months), the clock settings may need to be reconfigured.

   Once set, EMU PRO maintains the date and time using its internal power supply, ensuring the settings persist under normal operating conditions.

   Connect to the ECU using the EMU PRO Client software. From the top menu, navigate to ***Devices / Set Real Time Clock***.

   Without setting the RTC, log files saved to the USB drive may display incorrect dates and times, making it harder to organize and locate specific logs.

This setup allows efficient and controlled logging of data on EMU PRO, stored in organized, manageable log files.

2. Troubleshooting

If logs are not being created, or if the logs are incomplete, it's important to first check the *Logger Flash Drive State* channel in the **EMU PRO Client** software. This channel provides valuable information about potential logging issues. To check the status:

1. **Connect the device** to your PC.
2. **Insert the USB drive** to the USB receptacle wired to the EMU PRO.
3. **Monitor the value** of the *Logger Flash Drive State* channel.

This channel will provide a code that can help identify the specific issue with the logging process. Based on the status, you can then proceed with the appropriate troubleshooting steps

0: Disconnected

- **USB Wiring**: Ensure the USB drive is properly connected to the designated port on the device. Pay special attention to the D+ and D- wires, as it is easy to accidentally swap them; make sure they are correctly connected. Additionally, verify that proper shielding is in place to prevent interference.

-1: Unrecognized file system

- **File System**: Verify that the USB drive is formatted to the FAT32 file system. Other formats are not supported.

-2: Memory is full

- **Drive Health:** Confirm that the USB drive has sufficient free space. If the drive is full, delete unnecessary files to free up space.
- Use high-quality USB drives from reputable manufacturers (e.g., SanDisk, Kingston) to ensure reliable performance.

-3: Memory too slow

- **Drive Health:** Ensure the USB drive has adequate read/write speeds. Slower drives may cause logging interruptions. Use high-quality drives from reputable brands to avoid this issue.

If the *Logger Flash Drive State* channel does not indicate a specific problem but logs are still not being created:

- **Enable Logging**: In the EMU PRO Client software, make sure logging is enabled. Navigate to the *Smart Grid* panel, go to the *Logger* category, and confirm that *Enable Channel* is set to 'one' (or to the appropriate channel for conditional logging).
- **Power Supply**: Verify that the device has a stable power supply. Power fluctuations or interruptions can disrupt the logging process. Use a reliable power source to avoid these issues.
- **Ensure Proper Shielding:** Proper shielding of all connections is crucial to prevent electromagnetic interference, which can disrupt the data logging process. Use shielded cables, particularly for the USB connection, and verify that the shielding is properly grounded. Poor shielding can lead to gaps or incomplete logs by allowing noise to interfere with data transmission.
- **Use a Short USB Drive:** Physically small USB drives are less prone to connection interruptions caused by vibrations. Larger USB drives may experience occasional disconnections due to their size and weight under vibration or movement conditions.

By addressing these issues, you can ensure reliable and consistent data logging on your EMU PRO device.

3. Document history

Version	Date	Changes
1.0	2024.12.17	Initial release