# Potential CSB Data Logger Implementations

The following data loggers range from commercially available to experimental (e.g., open hardware, open software) implementations, and include generic CANbus data loggers, which shares the same physical interface specification with NMEA2000, and is mutually intelligible.

## Most Likely Contenders

These are the loggers that are most likely to work immediately, and which most likely have the most reliable support (since they’re from larger manufacturers). They are all hardware-only loggers (i.e., they just plug in to the NMEA 2000 network and start recording), which minimizes the effort required on the part of the volunteer data provider.

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| Yacht Devices YDVR-04 Voyage Data Recorder | |
| * Currently $249 * Small plug-in device with interface specifically for NMEA2000 or SeaTalk NG * Converters for other network types are theoretically available * Records to micro-SD card (which can be swapped out and increased in size) * https://www.yachtd.com/products/recorder.html | |
| Pros | Cons |
| * Records any data on the NMEA2000 bus. * Automatically starts logging as soon as it’s plugged in to the network. * Can record for extended periods of time with sufficiently large SD card. * Automatically deals with power cycles. * Can export to a variety of formats, including XML, CSV, and GPX with free translation software. | * The only way to get the data off the device is to unplug the SD card and transfer to a computer. * Will over-write old data without warning if it runs out of space. |

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| ActiSense WiFi Gateway and Voyage Recorder | |
| * Currently $252 (ish) * Small plug-in device primarily intended to translate NMEA2000 traffic to WiFi for laptops, tablets, and phones (i.e., real-time distribution of data), so that software like Coastal Explorer, OpenCPN, etc., can see the NMEA traffic without a physical interface. * Will write to micro-SD card (which can be swapped out and increased in size). * Can convert output to NMEA0183 if required. * https://www.actisense.com/product/w2k-1/ | |
| Pros | Cons |
| * Picks up UTC time from the NMEA bus and uses this for timestamping the logs. * Logs can be pulled from the device through the WiFi interface. * Company also makes NMEA2000 to NMEA0183 inline gateways, allowing interface to older equipment if required. * Web interface for configuration and manipulation – only browser required. * Positions the volunteer data provider to upgrade navigation instruments now that data is more readily available (i.e., using software on computer, tablet, or phone). | * Input is only NMEA2000 * Puts another WiFi base station or client on the ship’s network. * Configuration is a little more complex than alternatives (but should be a one-shot event at DCDB). |

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| CSS Electronics CL1000 CANbus Data Logger | |
| * Currently $190 (€ 169) * Small plug-in device with generic CANbus logging, powered from bus itself. * Writes to SD card (8GB default, can be updated to 32GB). * https://www.csselectronics.com/screen/product/can-bus-logger-canlogger1000 | |
| Pros | Cons |
| * Records all CAN (NMEA2000) traffic to SD card. * No user configuration. * Data can be downloaded by USB without stopping the system but will look like a memory stick if unplugged from CANbus. * Timestamped to 1ms resolution. * Low power consumption (0.5W). * Can push data to remote FTP site if a network connection exists. * Log files are simple ASCII text. | * Input is only NMEA2000 * Would need a custom cable to convert from DB-9 plug to required network socket. |

## Software/Mixed Implementations

Many of the navigation software applications allow for recording the data that they receive, although the problem is often getting the information to them. In this regard, something like the ActiSense WiFi Gateway (above), Yacht Devices WiFi Gateway (below), or Digital Yacht WiFi Gateway (below) could be used. Thereafter, all that’s required is something like Coastal Explorer, Navionics Boating, OpenCPN, or a manufacturer utility, etc., to record the traffic; other options are provided below. Use of a software-only system might depend strongly on whether the local community typically has laptop/desktop machines on their boats and available, and if they’re willing to change their configuration or install software.

It’s tempting to suggest that if they have a PC available, they’re likely already going to be taking the data and using it with their favourite software, and therefore that adding more is likely not to be possible. With the systems outlined here, however, we would be guaranteed to get the data in a known format irrespective of the preferred software they’re using, and without having to rely on a navigation software manufacturer, which may be advantageous.

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| Yacht Devices YDWG-02 NMEA2000 WiFi Gateway | |
| * Currently $189 * Small plug-in device to translate NMEA2000 traffic to WiFi for laptops, tablets, and phones (i.e., real-time distribution of data), so that software like Coastal Explorer, OpenCPN, etc., can see the NMEA traffic without a physical interface. * Can transmit UDP or TCP data packets in raw CAN (J1939), NMEA2000, or NMEA0183 formats. * https://www.yachtd.com/products/wifi\_gateway.html | |
| Pros | Cons |
| * Web interface for configuration and monitoring. * Raw data output can be recorded as CAN files with free software from manufacturer, then translated into a variety of formats including simple CSV. | * Input is only NMEA2000. * Puts another WiFi base station or client on the ship’s network. |

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| Digital Yacht NavLink2 NMEA2000 WiFi Gateway | |
| * Currently $360 * Small plug-in device to translate NMEA2000 traffic to WiFi for laptops, tablets, and phones (i.e., real-time distribution of data), so that software like Coastal Explorer, OpenCPN, etc., can see the NMEA traffic without a physical interface. * Can transmit UDP or TCP data packets. * https://digitalyachtamerica.com/product/navlink2/ | |
| Pros | Cons |
| * Web interface for configuration and monitoring. | * Input is only NMEA2000. * Puts another WiFi base station or client on the ship’s network. * Limited detail on what sorts of output can be generated, although it is claimed to be compatible with many applications. * No separate logging application. |

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| OpenCPN Voyage Data Logger Module | |
| * Free (open source software) * Records all of the data sent to OpenCPN to disc for replay. * https://opencpn.org/OpenCPN/plugins/vdr.html | |
| Pros | Cons |
| * No extra configuration required over OpenCPN base. * Known output format with open source transparency. | * User must be running OpenCPN for this to work. * Module has to be downloaded separately. * Logging has to be turned on manually. |

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| AGG Software Advanced NMEA Data Logger | |
| * Standard $85, Enterprise $180 * Records data from multiple input ports simultaneously. * Supports from Windows 2000 to Windows 10. * https://www.aggsoft.com/nmea-data-logger.htm | |
| Pros | Cons |
| * Separate data logger limits impact on other software running. * Can run as a Windows Service (i.e., running in background) to avoid impacting user interface, and can auto-start when powered. * Can output data into database format as well as simple logs. | * Only supports NMEA 0183 (suggests ActiSense NGW-1 gateway for NMEA2000). * Appears to only support COM ports, rather than UDP/TCP packets from a network source (may impact other users, needs serial/USB ports). |

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| OpenSkipper | |
| * Open source software. * Records from serial port (NMEA0183), network data (UDP/TCP), or USB (e.g., NMEA2000 from a gateway). * Written in C#, so mostly supported on Windows, with some support via emulator/middleware on other OS. * https://openskipper.org/openskipperwordpress/ | |
| Pros | Cons |
| * Free, and open source (GPL V3 license), giving data handling transparency. * Can run on a machine in the background collecting data via UDP without disturbing other use. | * Does not appear to be actively developing (last commit early in 2018, or late 2017?). |

## Other Hardware Loggers

The hardware loggers below are significantly more expensive, or less friendly, than the alternatives above, typically because they’re intended for a more professional audience, or need to meet legal requirements.

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| Maretron Voyage Data Recorder VDR-100 | |
| * Currently $795. * Larger device plugging into NMEA2000 * Records to external USB stick. * https://www.maretron.com/products/vdr100.php | |
| Pros | Cons |
| * Simple interface with minimal configuration – designed for formal (commercial) data recording. * Picks up time from GPS devices on NMEA2000 network. * USB flash drive can be large, giving long-term recording. * A pair of USB flash drives can be cycled to continue recording while getting old data. * Data can be transferred using Ethernet while working. | * Proprietary file format (with free converter to CSV). * Implements a ring-buffer, so old data is deleted automatically if it runs out of space. * Requires a network time source to operate. * Only qualified with certain USB sticks, to maximum of 256GB (claimed to be good enough for a year). |

## Experimental Systems

There are a surprising number of home-brew and hobbyist implementations of both NMEA2000 data monitoring and recording, and generic CANbus recording and monitoring. Although these are not necessarily the most stable implementations, they are generally cheaper than the commercial alternatives, and therefore might be very interesting from a “quantity has a quality all of its own” sense.

There are also a number of sources of CANbus hardware that could be used to construct specialist data loggers; for example, an Arduino Due ($37.40) and Seeed CANbus add-on ($15), or an Arduino-compatible CANbus controller at SparkFun ($45). These would of course need more development (e.g., using the NMEA2000 library below to build a specific application to do logging and/or gateway activities).

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| KBox NMEA Data Recorder | |
| * Open hardware & open source project; can be bought assembled at $279. * Based on Arduino Teensy 3, with custom interfaces. * Supports NMEA2000, two NMEA 0183 inputs, WiFi and two NMEA 0183 outputs. * Records to SD card. * https://hackaday.io/project/11055-kbox * https://github.com/sarfata/kbox-firmware * https://www.tindie.com/products/sarfata/kbox-open-source-boat-gateway/ | |
| Pros | Cons |
| * Hardware design and source code all available from GitHub (GPL V3). * Supports SignalK output format (http://signalk.org, basically JSON). * Has built-in Bosch MEMS 9-dof IMU and barometer, can digitize up to three other analog inputs. * Can do real-time translation to WiFi of the NMEA data, so essentially provides gateway services and logging. * Reasonably active updating of software (active commits 2018-09). | * Only manufactured in small batches on a hobbyist basis, so many not scale to large orders. * Single developer, may not be able to provide support. |

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| NMEA2000 Arduino Library | |
| * C++ library for NMEA2000, mainly for use in Arduino implementations, but also supports AVR processors, MBED boards, and Raspberry Pi. * Can be configured for different CAN controllers depending on implementation board. * Appears to be a follow-on/extension of OpenSkipper, but for embedded systems. * https://github.com/ttlappalainen/NMEA2000 | |
| Pros | Cons |
| * Very flexible implementation for library, can be used to build many different hardware converters. * Very actively developed. * Open source project (has custom, but very flexible license), giving transparency. * Allows for multiple different behaviours to be built (i.e., toolbox for custom logger). | * Does not have a standard configuration, so some hardware/software development would be required. |

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| CAN Bus Logger | |
| * Currently $29 (bare board, needs case, SD card, etc.). * Open hardware and open software via GitHub. * Bare-board generic CANbus data logger (logs to SD card up to 32GB). * https://github.com/akpc806a/CAN\_Logger * https://www.tindie.com/products/akpc806a/can-bus-logger-with-sd-card/ | |
| Pros | Cons |
| * Very cheap solution for most basic requirements of a logger. * Open source project gives transparency (GPL 3). * Log files are simple CSV in known format. * Timestamp to 1ms resolution (internal clock, but based on real-time OS). | * Only manufactured in small batches on a hobbyist basis, so may not scale to large orders. * Single developer, may not be able to provide support. * Needs separate power supply. * Log files would need a custom parser. |