Yacht Devices

User Manual

CAN Log Viewer

Software version

1.70

2023

Contents

1. Introduction

This Manual contains information on how to install, configure and operate the CAN Log Viewer software application (hereinafter *Viewer* or *program*).

CAN Log Viewer software is a viewer, player and converter of CAN (Controller Area Network) logs and viewer of Raymarine SeaTalk NG logs. It can play your CAN recordings on a PC screen in real time and highlight changing data. It can also show and record to a file RAW protocol data from a TCP port or UDP port of Yacht Devices NMEA 2000 Wi-Fi Gateway YDWG-02, NMEA 2000 Wi-Fi Router YDNR-02, NMEA 2000 Etherner Gateway YDEN-02 and from a serial (COM) port of Yacht Devices NMEA 2000 USB Gateway YDNU-02 (here and after the YD gateways).

The program includes viewers for NMEA 2000 and J1939 data, allowing network data to be visualised in a readable form. The viewers also allow you to see what data is and is not available on the network.

The program can list NMEA 2000 devices and display their properties (product and configuration information). If the program is connected to the CAN network via YD gateways, it can also enumerate NMEA 2000 devices, change their network addresses, device and system instances, configuration information (some manufacturers use it to change device settings) and update firmware of supported devices (see Chapter 4 for details).

This product will help you to:

- view live and recorded network data in binary and readable form (using built-in viewers available for the major J1939 and NMEA 2000 data types);
- list, configure and update NMEA 2000 devices (see Chapter 4);
- set up and troubleshoot NMEA 2000 and J1939 devices (more than 2000 J1939 DTC descriptions in the database);
- analyze unknown CAN protocols (see Chapter 7 for a real example);
- download and upload CZone configuration files to network devices;
- convert log files to spreadsheet and text formats for further processing;
- convert data prepared in a spreadsheet or text file for playback on a physical CAN network by Voyage Recorder;
- convert CAN logs containing NMEA 2000 data to the format of the YDVR Converter software (.DAT file);
- send CAN messages to the network.

CAN logs contain network level data and are compatible with any high level protocol, including J1939 and NMEA 2000. This product has been designed as a support tool for various of our hardware products, but all data formats are open and data conversion to and from CSV (Comma Separated Values) is supported, so you can use it with your own log files or add .CAN support to your own products.

Please see Appendix A for the list of products supporting the .CAN file format.

This tool is freeware and you may distribute it in unmodified form without any special permission.

2. Program installation

CAN Log Viewer is supplied free of charge and runs on Microsoft Windows (x86 and x64 versions of operating system), Linux (x64 only) and Mac OS X (OS X 10.7 or later, Intel x64 only).

The program does not require any formal installation. It can be copied from the archive to the computer's hard disk or to a removable USB flash drive. The program archive contains appropriate subfolders with an executable application corresponding to Windows, Linux, and OS X.

The program's archive contains a "Test" folder with examples of log files. You may use them to learn how to use the program.

Special notes:

After copying the "CANView" file in Linux, you will need to set the executable file attribute.

Max OS X folder contains the *CANView.DMG* file. You may open it in Finder and drag the CANView application from it to Applications.

On very old Microsoft Windows versions, the program may require installation of Microsoft Visual C++ 2010 Redistributable Package which contains the MSVCRT.DLL file:

- Download for 32-bit operation systems:
  http://www.microsoft.com/en-us/download/details.aspx?id=5555

- Download for 64-bit operation systems:
  http://www.microsoft.com/en-us/download/details.aspx?id=14632

3. Getting started

The program is supplied with a sample file, *VolvoXC90.can*, with a recording of Volvo's popular crossover. You may load this file using "*Open..*" in a "*File*" menu. To load Raymarine SeaTalk NG log file, switch the type of extension to "Raymarine (*.log)" in the dialog.

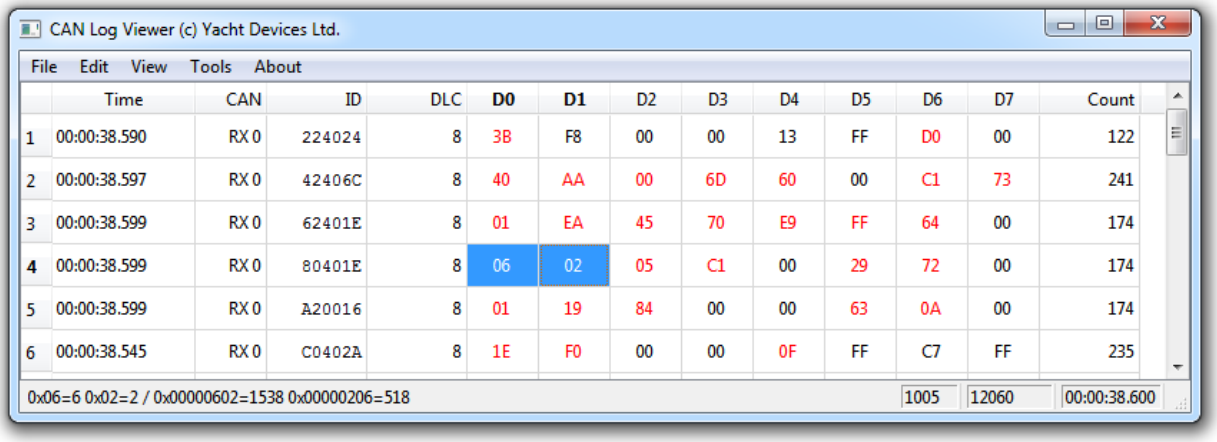


Figure 1. Viewer with a loaded file

Viewer will "play" the file. In the right bottom corner, you'll see the internal time of the recording device. The program will try to play the file in real time, but in case of high network load, it may play the file a bit slower. To other boxes in the status bar are contain the number of messages and number of bytes received in the last second.

The file format allows recording of transmitted (TX) and received (RX) messages from two CAN interfaces (with number 0 and number 1). Messages with the same CAN identifier (ID), received (or transmitted) from the same CAN interface, have their own dedicated row and counter in the table.

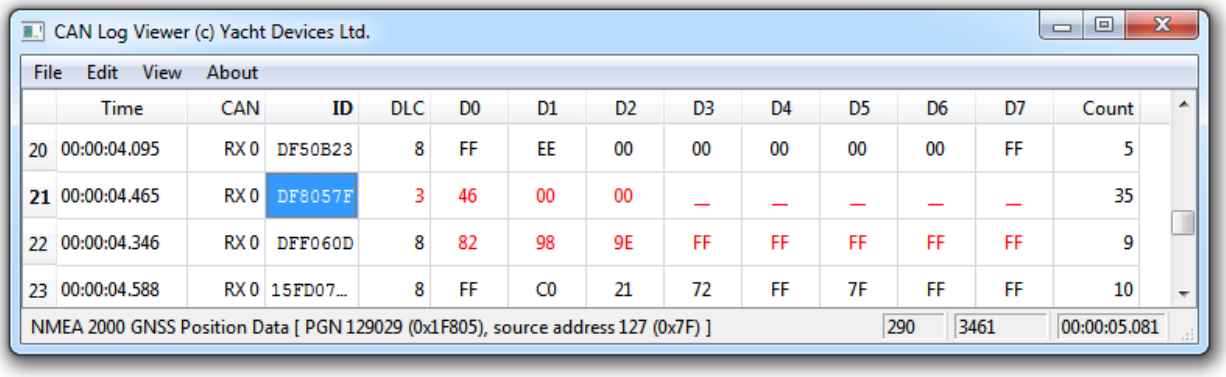


Figure 2. Messages with variable length

Modified bytes are highlighted in red. The message length (DLC column) is also highlighted when changed. If the message length is less than 8 bytes, the cells of the remaining bytes will be empty or will contain a highlighted "__" if the value of that cell was not previously empty.

You may select one or multiple cells with data and get conversion of the hexadecimal cell's values to decimal in the status line. "*Copy Selection*" in the "*Edit*" menu copies your current selection to the clipboard.

With the "*Stop*" and "*Play*" in the "*File*" menu, you may pause and resume file playing. To clear the program's table, click "*Clear Table and Viewers*" in the "*Edit*" menu.

When the file playing is finished or stopped, you may open another file or open the same file again to run from the beginning.

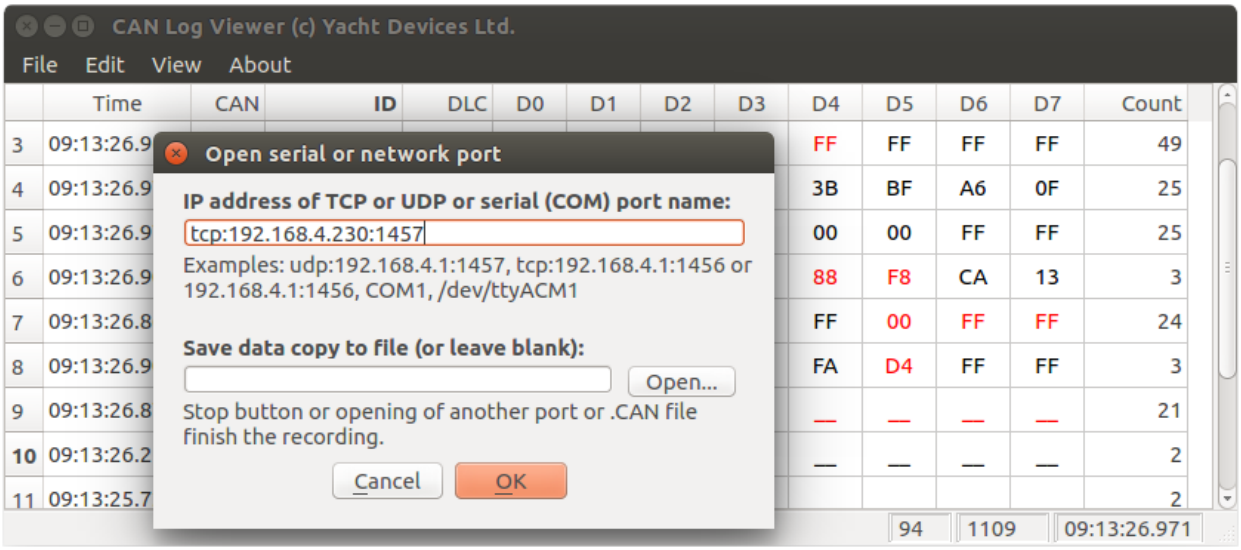


Figure 3. Open port dialog

The "Open Port…" menu item allows you to open the serial (COM) port of Yacht Devices NMEA 2000 USB Gateway YDNU-02 or TCP port or UDP port of Yacht Devices NMEA 2000 Wi-Fi Gateway YDWG-02 or NMEA 2000 Wi-Fi Router YDNR-02. The port should be configured for RAW or AUTO (available In USB Gateway only) protocol.

To open UDP port, prefix "udp:" must be specified, for example: udp:192.168.4.1:1457 (where 192.168.4.1 is gateway's address). In case of opening zero IP address (udp:0.0.0.0:1457) the program will receive packets from all IP addresses and send broadcasted messages in reply. For TCP port, prefix "tcp:" can be omitted: 192.168.4.230:1457.

Note that the "Stop" menu item does not close the serial port or TCP connection; it only skips messages until the "Play" menu item is clicked. To close the port, press the "Stop" and the "Close All" item of the "File" menu or open another file or port.

You can also record port data to a .CAN file. The recording ends when you pressing “Close All” or opening another port or a new .CAN file from the disk.

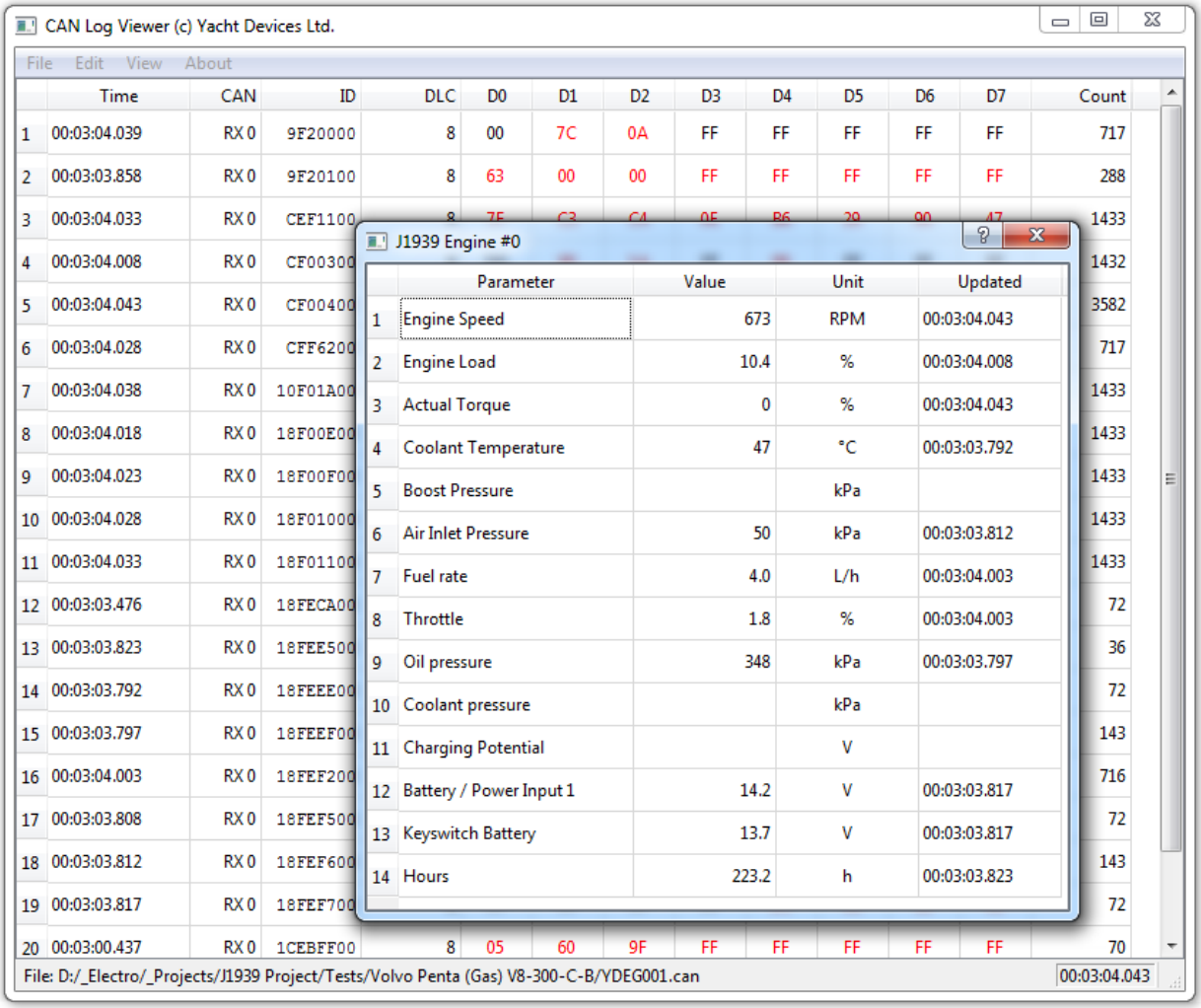


Figure 4. J1939 data viewer

In the View menu of the program, you can open different data viewers, which display actual J1939 and NMEA 2000 data in readable form. With its help, you can easily identify what data are available on the network, and you can even use a viewer as a simple informational display.

At this moment, viewers display major J1939 engine data, J1939 active DTC (diagnostic trouble codes; program has internal database with more than 2000 error descriptions) and all NMEA 2000 engine data (two engines are supported), major navigation data (GPS position, COG/SOG, STW/HDG, depth, etc.) and major environmental data (wind, temperature, atmospheric pressure, humidity). To set preferred units for viewers, click the last item “Unit Settings…” in the “View” menu.

The program also allows displaying the state and control digital switching devices (NMEA 2000 Switch Banks, using standard PGN 127501 “Binary Status Report” and PGN 127502 “Switch Bank Control”).

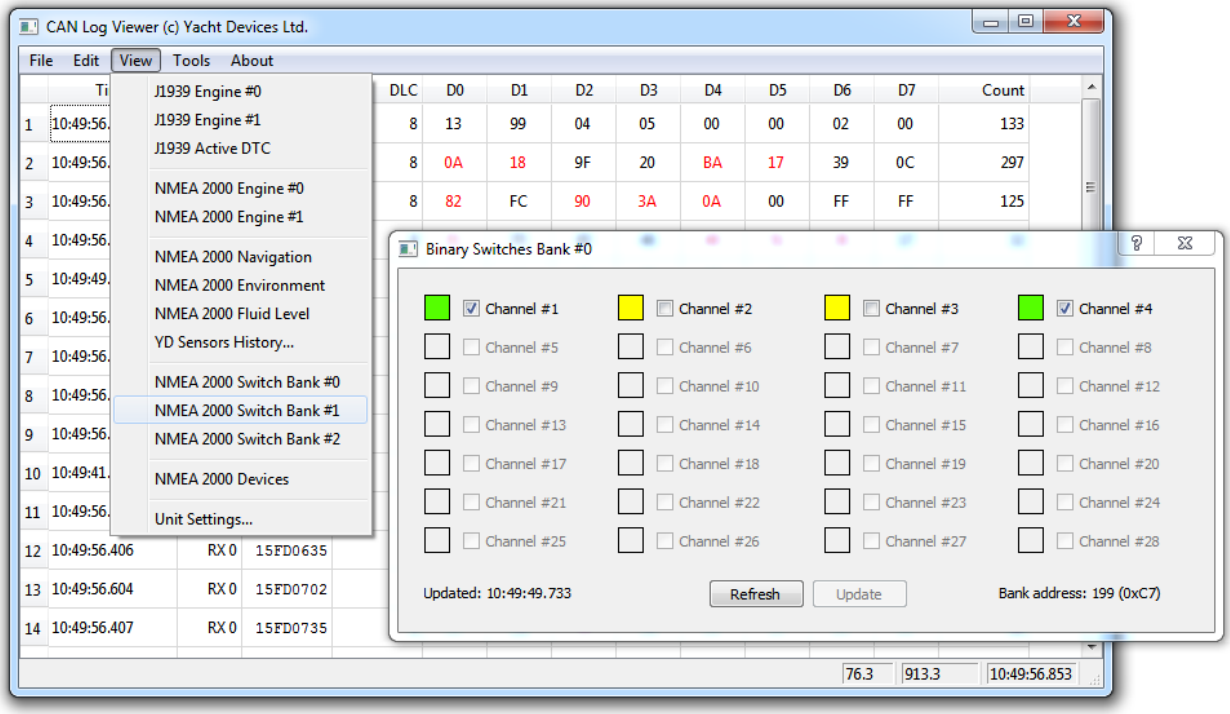


Figure 5. Digital switching loads management

You can manage three devices (banks 0..2), see the “View” menu on Figure 5. “Green” channels are on, “Yellow” are off, “Red” has error state, and “Grey” are not available on this bank. To switch the channel, tick the corresponding check box and press “Update” button.

The program is compatible with the Yacht Devices Circuit Control YDCC-04 and should be compatible with standard NMEA 2000 digital switchers. It does not support CZone or EmpirBus devices because these companies use proprietary messages to switch channels.

However, in the Tools menu you'll find "Upload ZCF File..." and "Download ZCF File..." to upload the configuration file to CZone devices and CZone compatible plotters, and to make a backup of your configuration file. Please note that CAN Log Viewer is not certified by CZone and you use it at your own risk. The download/upload progress is displayed in the status bar of the main window.

All our sensors (Barometer, Thermometer, Exhaust Gas Sensor, Humidity Sensor) with firmware 1.50 or later, store historical data (up to 48 hours) in the RAM. These data can be retrieved by CAN Log Viewer. You can open up to ten windows with historical data (Figure 6) to view the data from different devices or with different resolution simultaneously. History download protocol is open and described in manuals of sensors.

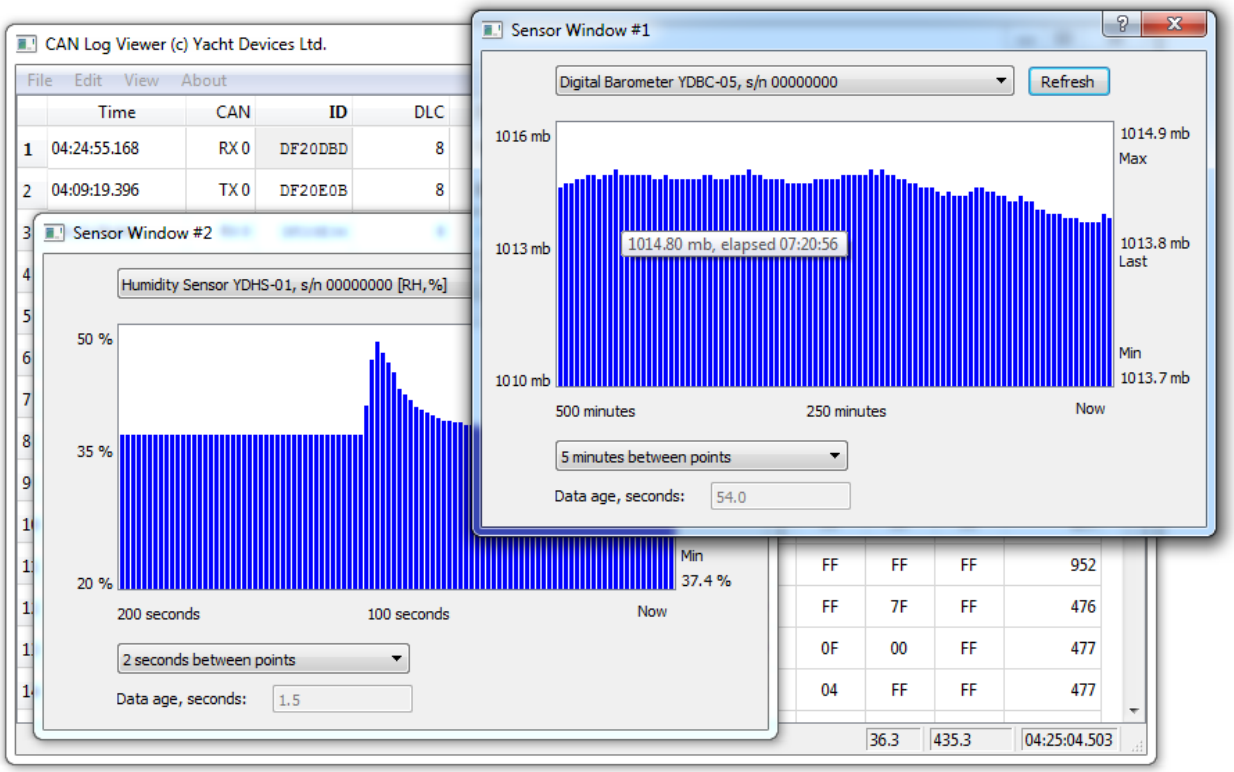


Figure 6. History windows

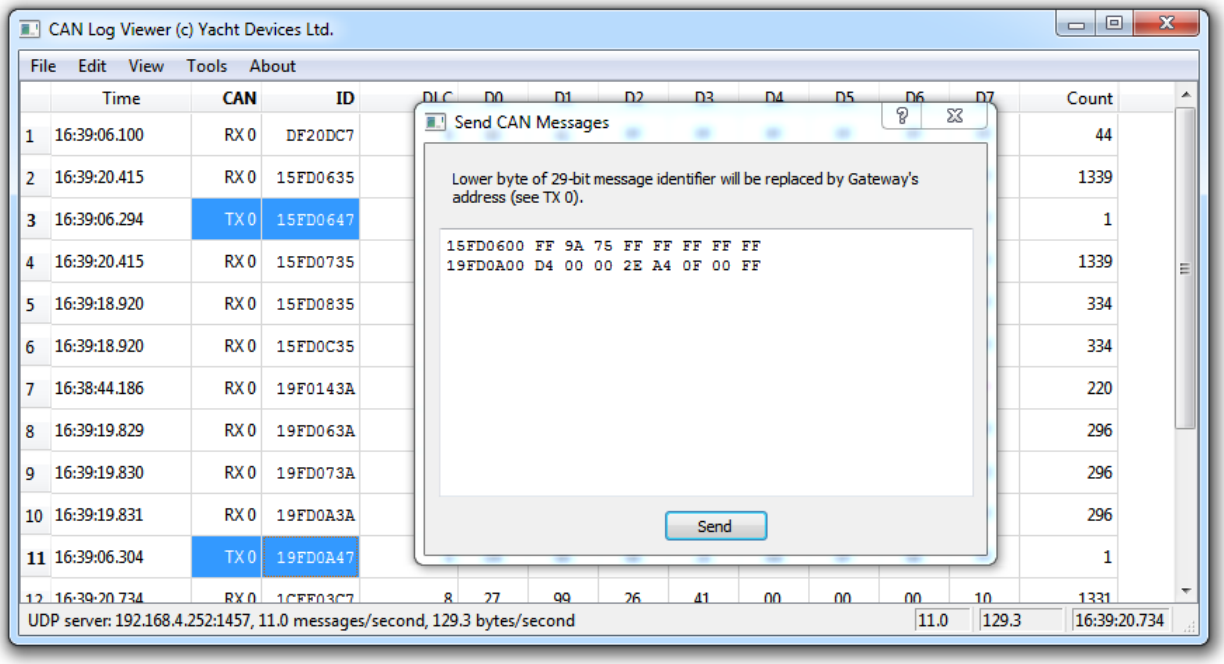


Figure 7. "Send CAN Messages" window

The program allows to send CAN frames with 29-bit identifier and from 1 to 8 data bytes to the CAN network (see Figure 7). The corresponding window is accessible from “Tools” menu when program is connected to CAN network with one from YD gateways.

The “Send” button displays message box if entered text contains misprints or errors. Otherwise, it sends messages without any confirmation message box, it allows to press the button multiple times quickly to send entered messages multiple times.

When messages are successfully transmitted by the gateway to the CAN network, the CAN Log Viewer displays messages in the list with “TX 0” in the “CAN” column of main window (see lines 3 and 11 at Figure 7).

Please note, that lowest byte of 29-bit message identifier will be replaced by gateway’s CAN address according NMEA 2000 Standard, that’s why the message with identifier 15FD0600 in the “Send CAN Message” window is displayed as 15FD0647 in the main window on the Figure 7.

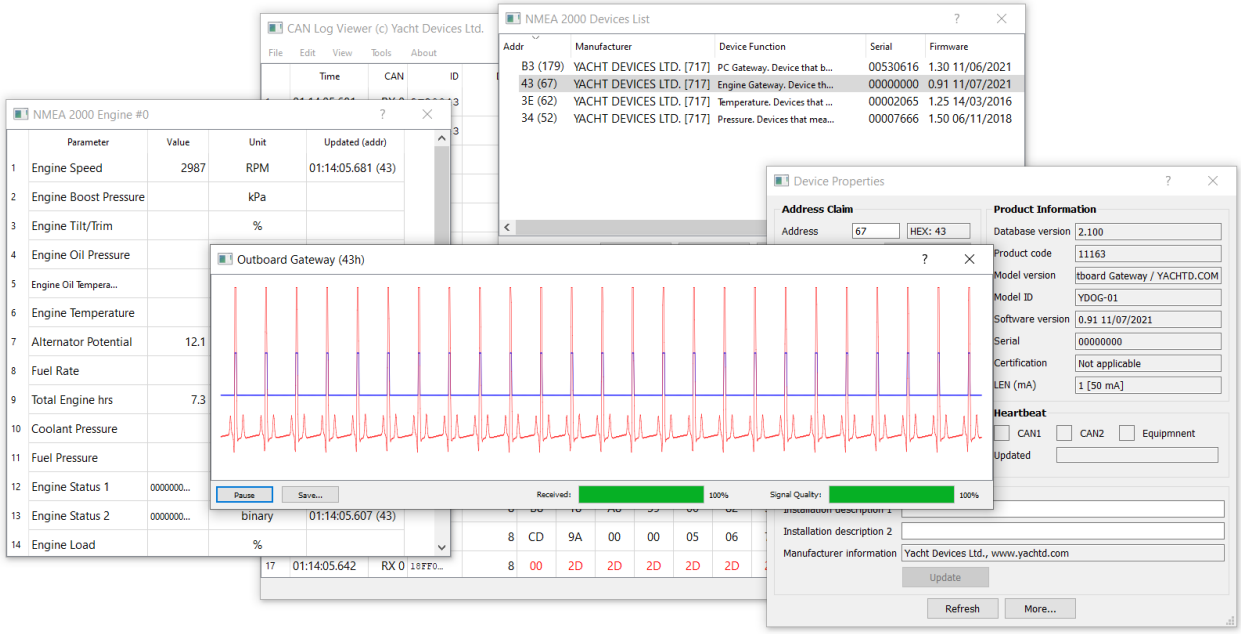


Figure 8. Input signal of Outboard Gateway

The CAN Log Viewer also allows you to view the input signal of the Outboard Gateway in real time (it counts spark plug signals to count engine revolutions, see Figure 8). To open this window, select the gateway in the "Device List", open "Device Properties" and click on "More...". The red line shows the signal as seen by the Outboard Gateway, the blue line shows the pulses detected by the gateway. The 'Signal Quality' in the bottom right corner is the Gateway's AI rating (good values are in the range of 60-100%). The "Received" progress bar shows how many points of the current oscillogram have been received by the CAN Log Viewer from the device.

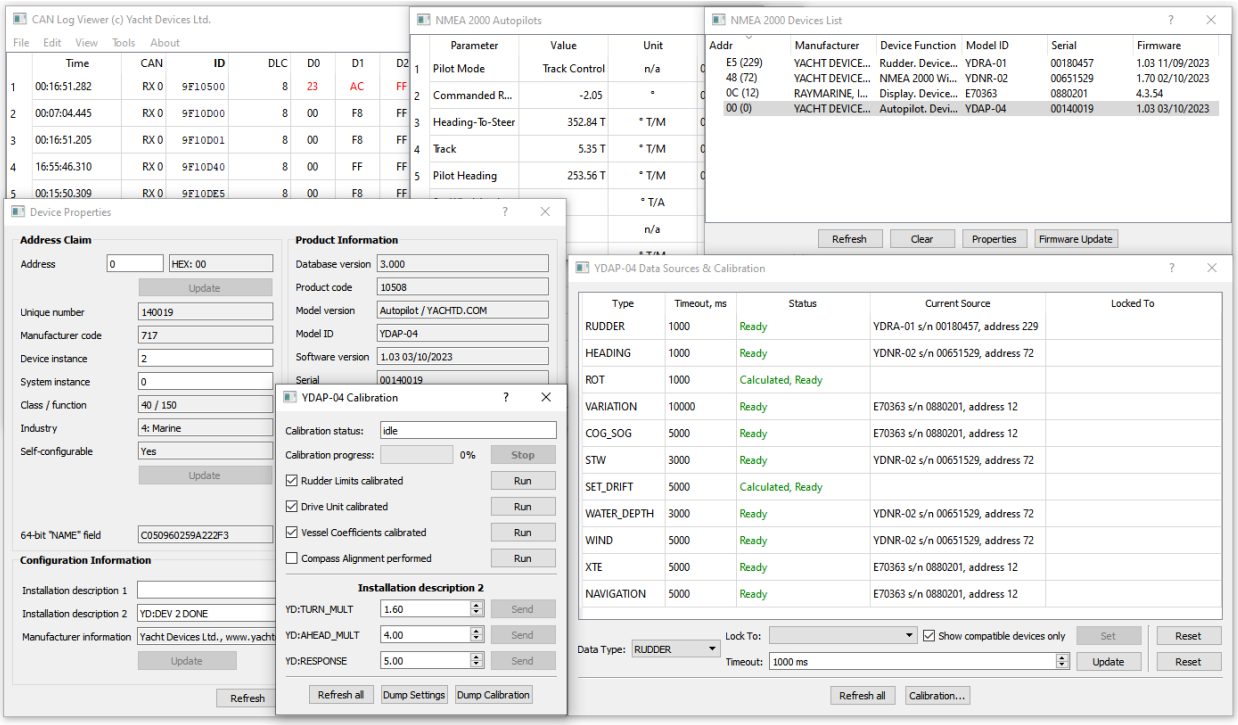


Figure 9. Commissioning of YD Autopilot

The Viewer also provides tools for commissioning and troubleshooting the YD Autopilot, which can also be accessed via the "More..." button in the "Device Properties". And viewers for autopilot mode, course and other data with the “NMEA 2000 Autopilots” window, accessible from the View menu. Please, see “Installation and Commissioning Manual” of YD Autopilot for more details.

4. List of NMEA 2000 devices

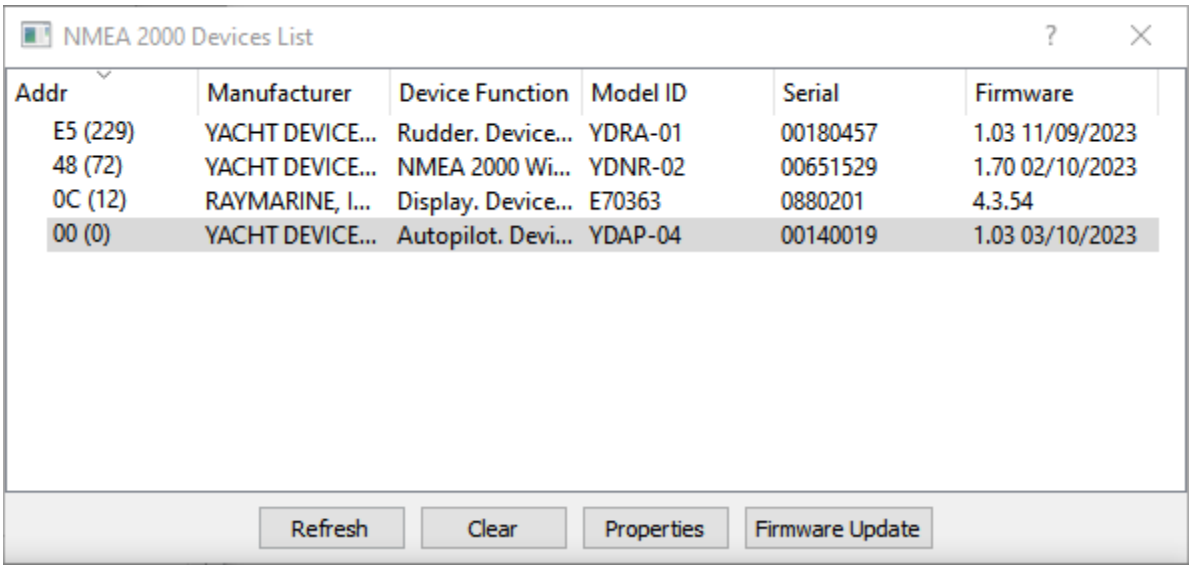


Figure 10. List of NMEA 2000 devices

Press the "NMEA 2000 Devices" item in the "View" menu to open the list shown in Figure 10. This window will contain data about devices that have sent an ISO Address Claim, Product Information, Heartbeat or Configuration Information messages (PGN 60928, 126998, 126996, 126993) since the window was first opened. You can clear this list using the "Clear" button.

If the program is connected to one from YD gateways, the "Refresh" button is enabled. This button clears the current list and send requests to NMEA 2000 network to enumerate online devices; you may see the list of sent requests in the main window of the program.

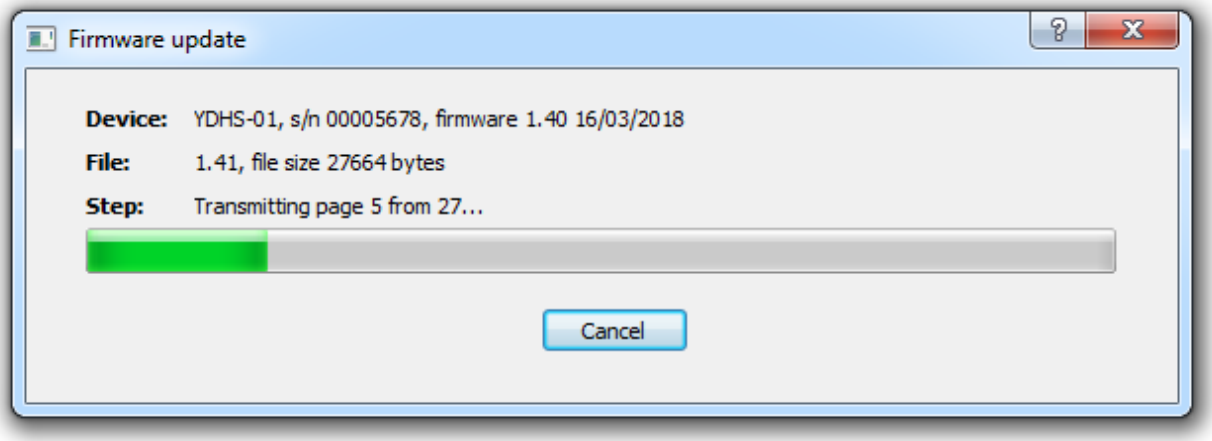


Figure 11. Firmware update window

The “Firmware Update” button is enabled when the program is connected to the gateway and the selected device is supported (see the list in the Appendix B). You will need to choose the update binary file (with .BIN extension) on the disk and wait while firmware is uploading (Figure 11).

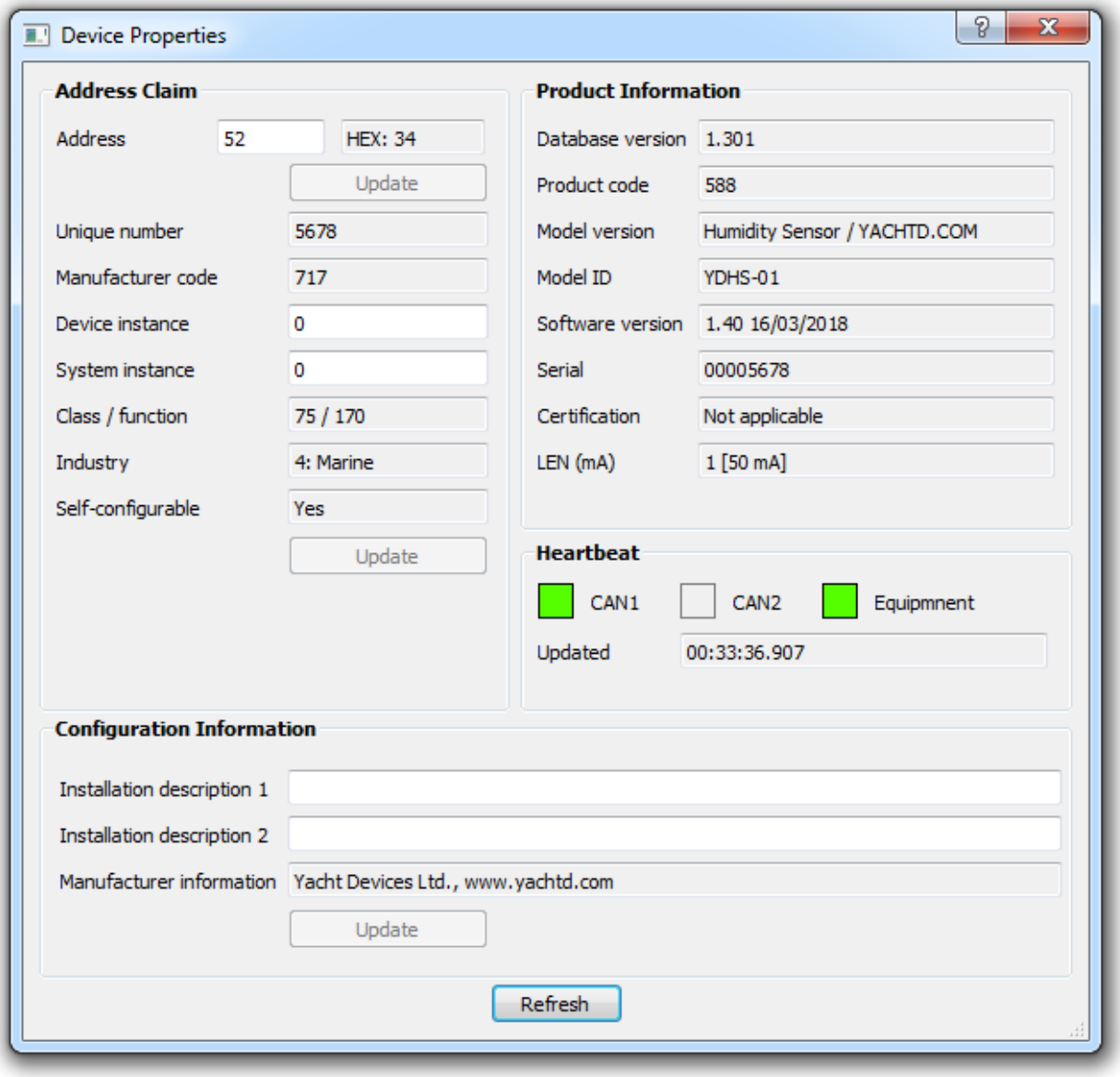


Figure 12. Device properties window

Double click on the device in the list or “Properties” button are opening the window shown at Figure 12. The “Refresh” button is enabled when the program is connected to the gateway and allows to request the data from this device only.

“Update” buttons are allows to modify editable (white on Figure 12) fields. Buttons are enabled when the value entered is valid, differ from reported by the device, and the program is connected to YD gateway. Do not press the “Enter” button after the

modifying of the field, since that can cause (depending on the operating system) the action of another button on the window; press the button using a mouse or activate it with the “Tab” button first.

To modify the device address, the program use the “ISO Commanded Address” message (PGN 65240, enveloped to PGNs 60160 and 60416), which must be supported by modern NMEA 2000 certified devices. To modify other fields the “NMEA Group Function” (PGN 126208) is used.

Configuration information is intended to contain a description of installation (the location of device, etc.). But many manufacturers use these fields to enter commands to devices, for example see the chapter “VI. Programming with Installation Description String” of Yacht Devices Humidity Sensor manual (www.yachtd.com).

The “Heartbeat” section of the properties window displays the device’s state. According the standard, modern NMEA 2000 devices must report their presence once per minute. Green indicating that device is healthy, yellow that is has an errors, and red indicates critical error. A non-colored indicator means that device does not set the value for the indicator.

5. Program's command line

Run program with /? key in the command line to see available command line options. Command line effect on file's playing and conversion both.

Key	*Description*	*Example*
/F:filename	Load specified file on program's start or open TCP, UDP or serial port	/F:C:/files/my.dat /F:tcp:10.1.1.1:1456
/E:id1[;...]	List of message identifiers specified by hexadecimal numbers and separated by semicolon to exclude from playing and conversion	/E:1A2;1A4;18EA2001
/M:filter1;mask1[;...]	List of permissive hexadecimal filter / mask pairs. Filter specifies bits for comparison and mask specify which bit comparison result is significant. If this key is specified, the program will show/convert only messages with matched identifiers.	/M:18EA2000;1FFFF F00;0DF10200;1FFFF F00
/C:number	Show/convert messages from specified CAN interface (0 or 1) only.	/C:0
/D:direction	Show/convert messages with specified direction (TX or RX) only.	/D:TX

The following command line causes filtering of messages as it shown at Figure 13 below:

```
CANView.exe /F:VolvoXC90.can /M:1E;FF;20;FF /E:1000020;62401E /C:0 /D:RX
```

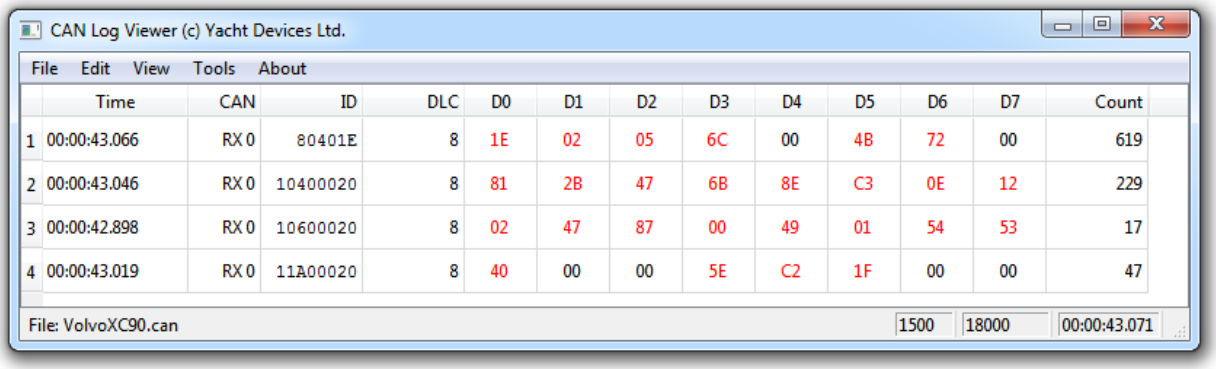


Figure 13. Loading of file with parameters

Using of command line helps to decrease the volume of displayed data. Specified keys also effect file conversion (see next chapter) and remain active while program is running.

6. Data export and conversion

Data export and conversion commands are available in the "*Edit*" menu. When the command's menu item is clicked, you will be prompted to select a source file and after that you will be prompted to select an output file.

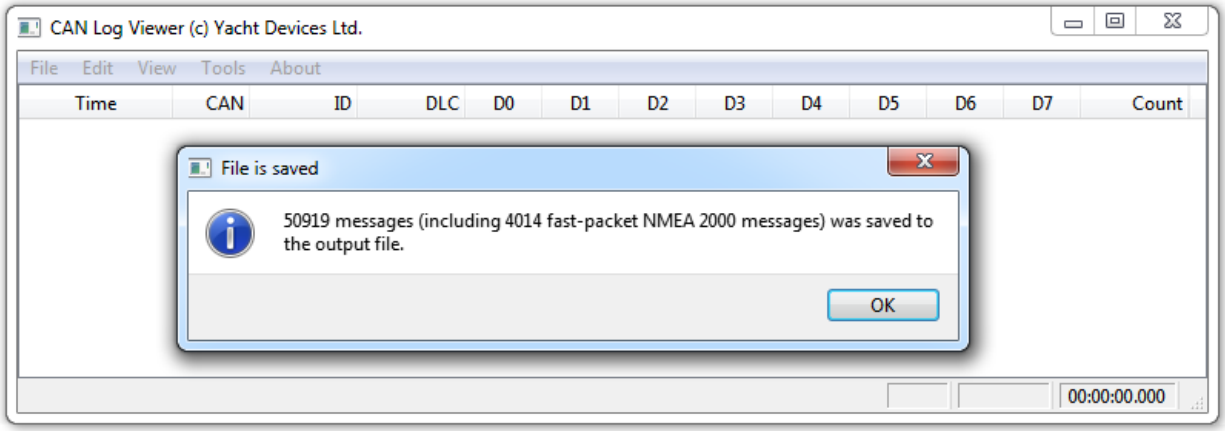


Figure 14. File conversion message

Export and conversion work very fast, so immediately after output file selection, a message box with the conversion result appears.

Note that the command line keys effect file conversion. For example, if the program is started with the /E:80401E key, the output file will not contain messages with the 80401E identifier.

Conversion to CSV format allows exporting of messages to spreadsheet format. You may open a CSV file with Microsoft Excel, LibreOffice Calc or any other spreadsheet processor for data analysis. You may also open this file in a text editor.

In case of conversion from CSV format, be sure that you have the same column order and that the values in the CSV file are separated by commas.

CSV format is one option to get data into an editable form. For example, you may modify data in CSV format, convert it back to .CAN format and "play" this file on a physical CAN bus with Voyage Recorder.

Export to text format is an option to get an easily readable file for a text editor, but text format files can't be converted back to .CAN format.

.DAT is a special format for NMEA 2000 networks used in Voyage Recorder to record data and supported in the free YDVR Converter software. With YDVR Converter software, you may convert .DAT files to .CAN format. The .DAT file format is described in the manual of Voyage Recorder.

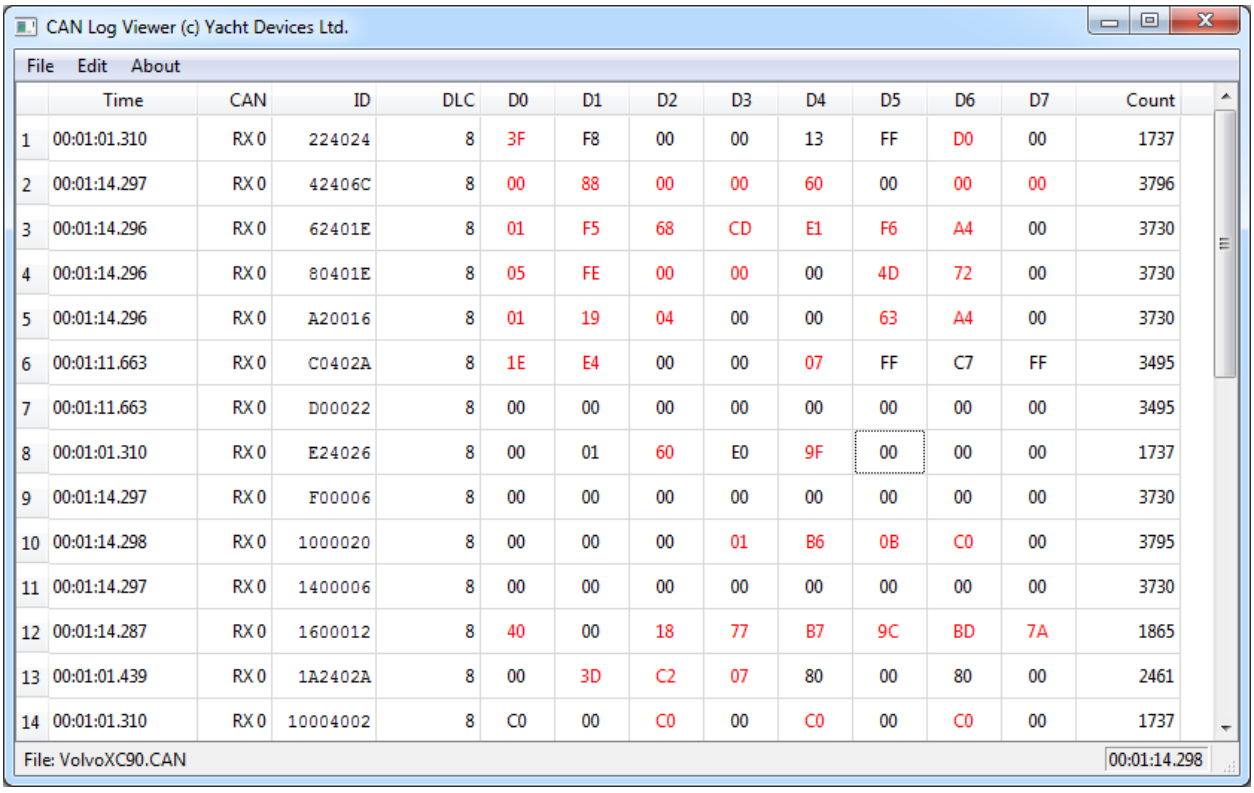
7. Example of protocol analysis

In this example, we will show a practical example of the CAN protocol analysis. Car protocols usually are not documented, including the protocol of the popular Volvo XC90 crossover.

The program is supplied with a sample file named *VolvoXC90.can*. In this recording, (started at 00:36), a driver turns on the ignition and runs the engine (initially, engine revolutions are between 1400-1600 to warm up the engine), waits until the engine revolutions decrease to normal values (about 950 rpm) and then turns off the engine. After about 10 more seconds, the recording was finished (at 01:14).

Our goal is to find data with engine revolutions. We know that it is a two-byte value at least and it should be zero (or about zero) at the beginning and at the end of recording. We don't know how the value is encoded (1 bit/rpm or 4 bits/rpm like in J1939 protocol), but we know that the car's tachometer has a scale of 0 – 8000 rpm, so the recorded value is in the first half of the range.

We also know that this value changes very often, because when engine's controller is trying to set 1300 rpm, revolutions float between 1250 and 1350 rpm.



	Time	CAN	ID	DLC	D0	D1	D2	D3	D4	D5	D6	D7	Count
1	00:01:01.310	RX 0	224024	8	3F	F8	00	00	13	FF	D0	00	1737
2	00:01:14.297	RX 0	42406C	8	00	88	00	00	60	00	00	00	3796
3	00:01:14.296	RX 0	62401E	8	01	F5	68	CD	E1	F6	A4	00	3730
4	00:01:14.296	RX 0	80401E	8	05	FE	00	00	00	4D	72	00	3730
5	00:01:14.296	RX 0	A20016	8	01	19	04	00	00	63	A4	00	3730
6	00:01:11.663	RX 0	C0402A	8	1E	E4	00	00	07	FF	C7	FF	3495
7	00:01:11.663	RX 0	D00022	8	00	00	00	00	00	00	00	00	3495
8	00:01:01.310	RX 0	E24026	8	00	01	60	E0	9F	00	00	00	1737
9	00:01:14.297	RX 0	F00006	8	00	00	00	00	00	00	00	00	3730
10	00:01:14.298	RX 0	1000020	8	00	00	00	01	B6	0B	C0	00	3795
11	00:01:14.297	RX 0	1400006	8	00	00	00	00	00	00	00	00	3730
12	00:01:14.287	RX 0	1600012	8	40	00	18	77	B7	9C	BD	7A	1865
13	00:01:01.439	RX 0	1A2402A	8	00	3D	C2	07	80	00	80	00	2461
14	00:01:01.310	RX 0	10004002	8	C0	00	C0	00	C0	00	C0	00	1737

Figure 15. VolvoXC90.can playing is finished

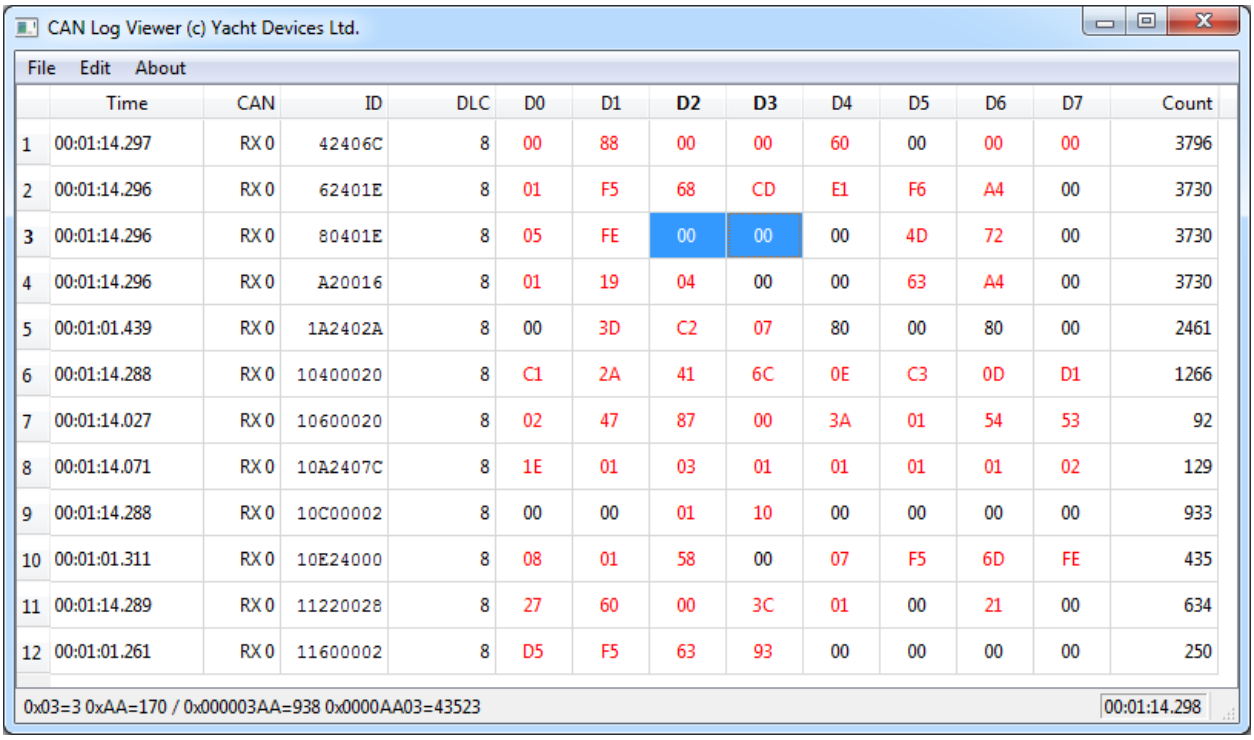
At first, play the file in the program. We'll find that we have messages with 29 different identifiers on the bus. We'll also find that messages with ID 0xD00022, 0xF00006 and 0x1400006 have static data (see Figure 15). Such messages cannot contains RPM value, so we can create a list of messages to exclude from future analysis and add these messages to this list.

We can also find that data bytes in some messages (e.g. with ID 0xC0402A) change only rarely. We can add such messages to the exclusion list too. Play the file a few times, and half of messages will be in your exclusion list just after a quick look at how the data in these messages changes.

Restart the program with the exclusion list, and you will see only a dynamic data in the program's table (these should be typed in a single line):

```
CANView.exe /E:224024;C0402A;D00022;E24026;F00006;1000020;1400006;
1600012;10004002;1020000A;10800006;11000022;11100024;11420006;11800002;
11A00020;11C00002
```

Now we have only 12 messages on the screen (see Figure 16). But what values start from zero and end with zero?

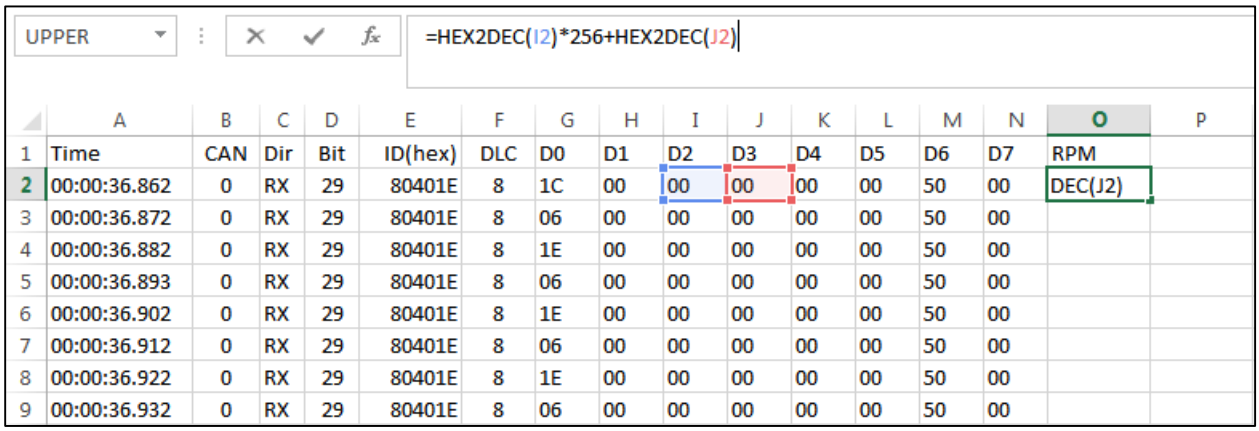


	Time	CAN	ID	DLC	D0	D1	D2	D3	D4	D5	D6	D7	Count
1	00:01:14.297	RX 0	42406C	8	00	88	00	00	60	00	00	00	3796
2	00:01:14.296	RX 0	62401E	8	01	F5	68	CD	E1	F6	A4	00	3730
3	00:01:14.296	RX 0	80401E	8	05	FE	00	00	00	4D	72	00	3730
4	00:01:14.296	RX 0	A20016	8	01	19	04	00	00	63	A4	00	3730
5	00:01:01.439	RX 0	1A2402A	8	00	3D	C2	07	80	00	80	00	2461
6	00:01:14.288	RX 0	10400020	8	C1	2A	41	6C	0E	C3	0D	D1	1266
7	00:01:14.027	RX 0	10600020	8	02	47	87	00	3A	01	54	53	92
8	00:01:14.071	RX 0	10A2407C	8	1E	01	03	01	01	01	01	02	129
9	00:01:14.288	RX 0	10C00002	8	00	00	01	10	00	00	00	00	933
10	00:01:01.311	RX 0	10E24000	8	08	01	58	00	07	F5	6D	FE	435
11	00:01:14.289	RX 0	11220028	8	27	60	00	3C	01	00	21	00	634
12	00:01:01.261	RX 0	11600002	8	D5	F5	63	93	00	00	00	00	250

Figure 16. Program with filters

D2:D3 of the message with ID 0x80401E seems correct and most of other digits have non-zero final values. We can replay files a few times and monitor the value in D2:D3. We find that the value is about 1450 at 00:40 and about 920 at 01:00. It looks like engine revolutions!

To verify our theory, let's run the program with /M:80401E;FFFFFF as the key (to leave only this message in the output files), then convert the file to CSV and open it in Microsoft Excel.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Time	CAN	Dir	Bit	ID(hex)	DLC	D0	D1	D2	D3	D4	D5	D6	D7	RPM	
2	00:00:36.862	0	RX	29	80401E	8	1C	00	00	00	00	00	50	00	DEC(J2)	
3	00:00:36.872	0	RX	29	80401E	8	06	00	00	00	00	00	50	00		
4	00:00:36.882	0	RX	29	80401E	8	1E	00	00	00	00	00	50	00		
5	00:00:36.893	0	RX	29	80401E	8	06	00	00	00	00	00	50	00		
6	00:00:36.902	0	RX	29	80401E	8	1E	00	00	00	00	00	50	00		
7	00:00:36.912	0	RX	29	80401E	8	06	00	00	00	00	00	50	00		
8	00:00:36.922	0	RX	29	80401E	8	1E	00	00	00	00	00	50	00		
9	00:00:36.932	0	RX	29	80401E	8	06	00	00	00	00	00	50	00		

Figure 17. CSV file in Microsoft Excel

Add a new column called RPM and add a formula to calculate engine's revolutions to this column:

```
=HEX2DEC(I2)*256+HEX2DEC(J2)
```

Scroll the page, and you'll find that data in the RPM column seems relevant, but occasionally the higher bit of D2 is set and this causes strange results in the RPM column, like 34141 when the nearest values are about 1370 (see Figure 18 at the next page).

As we can't find any pattern there, let's modify the formula to exclude the highest bit of D2 from calculation:

```
=IF(HEX2DEC(I2)>=128;HEX2DEC(I2)-128;HEX2DEC(I2))*256+HEX2DEC(J2)
```

And to see all our digits together, let's add a simple chart (see Figure 19 at next page). This chart shows that we have found the RPM value and that the task is solved.

CAN analysis is not hard but requires some practice and patience; knowledge of data encoding in J1939 and J1979 also be useful.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
946	00:00:46.340	0	RX	29	80401E	8	1E	01	05	5D	00	4A	72	00	1373
947	00:00:46.350	0	RX	29	80401E	8	06	01	05	5D	00	4A	72	00	1373
948	00:00:46.359	0	RX	29	80401E	8	1E	01	05	5A	00	4A	72	00	1370
949	00:00:46.370	0	RX	29	80401E	8	06	00	05	5A	00	4A	72	00	1370
950	00:00:46.380	0	RX	29	80401E	8	1E	00	85	5D	00	4B	72	00	34141
951	00:00:46.390	0	RX	29	80401E	8	06	01	05	5D	00	4B	72	00	1373
952	00:00:46.399	0	RX	29	80401E	8	1E	01	05	5D	00	4B	72	00	1373
953	00:00:46.410	0	RX	29	80401E	8	06	01	05	60	00	4B	72	00	1376
954	00:00:46.420	0	RX	29	80401E	8	1E	01	05	60	00	4B	72	00	1376
955	00:00:46.430	0	RX	29	80401E	8	06	01	05	5F	00	4B	72	00	1375
956	00:00:46.440	0	RX	29	80401E	8	1E	01	05	5F	00	4B	72	00	1375
957	00:00:46.450	0	RX	29	80401E	8	05	FE	05	55	00	4B	72	00	1365
958	00:00:46.460	0	RX	29	80401E	8	1D	FE	05	58	00	4B	72	00	1368
959	00:00:46.470	0	RX	29	80401E	8	05	FF	05	58	00	4B	72	00	1368
960	00:00:46.480	0	RX	29	80401E	8	1D	FF	05	5D	00	4B	72	00	1373
961	00:00:46.490	0	RX	29	80401E	8	06	01	05	5D	00	4B	72	00	1373
962	00:00:46.500	0	RX	29	80401E	8	1E	01	05	5A	00	4B	72	00	1370
963	00:00:46.511	0	RX	29	80401E	8	06	00	05	5A	00	4B	72	00	1370

Figure 18. Strange value (line 950)

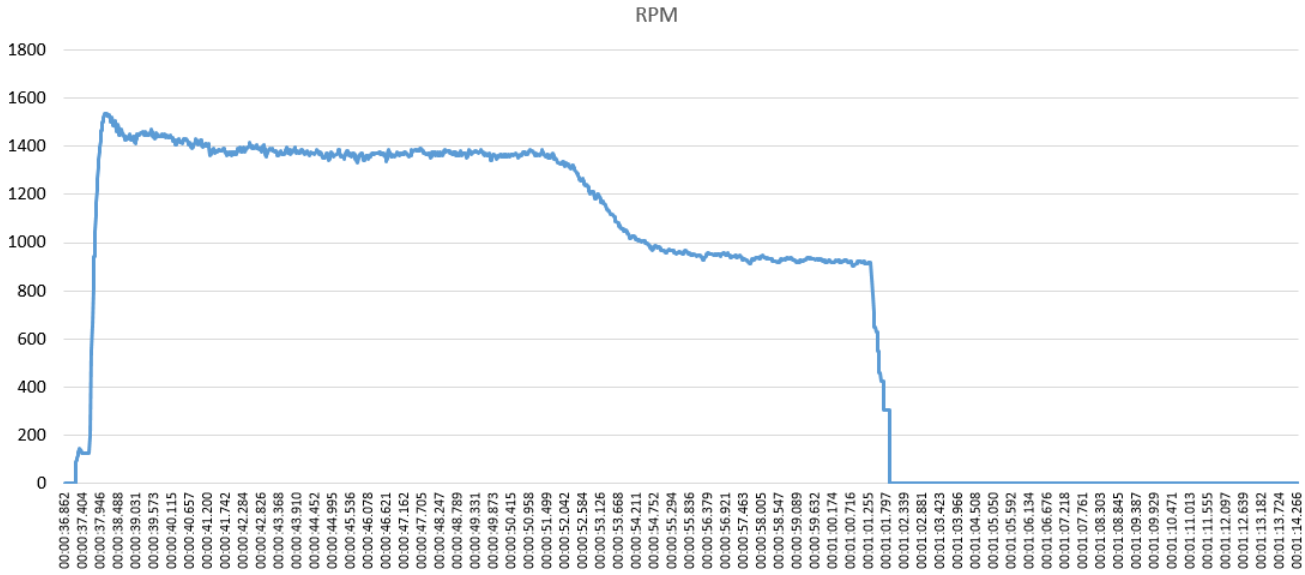


Figure 19. RPM graph in Microsoft Excel

8. Description of .CAN file format

The file format is very simple and allows CAN messages from two CAN interfaces to be stored. It also allows you to store messages received and sent by the recorder.

The CAN file contains a set of records 16 bytes long. All records have the following format:

Position from the start of the record	Length (in bytes)	Description
0	2	Bit 16: 0 – record has a 29-bit message identifier or it is a service record; 1 – record has an 11-bit identifier. Bit 15: 0 – message was received by recording device; 1 – message was transmitted by recording device, or it is a service record. Bits 12–14: message's data length, values 0—7 correspond to 1..8 data length (messages without data are not allowed). Bit 11: 0 - first CAN interface, 1 – second CAN interface. Bits 1–10: time of record in minutes (0..1023).
2	2	Time of record in milliseconds (0..60000)
4	4	Message identifier or 0xFFFFFFFF for service records. Unused bits of message identifier must be zero.
8	8	CAN message's data or service record data. If the data length is smaller than 8 bytes, recommended to set unused bytes to 0xFF.

The file always starts with a service record containing the string "YDVR v05" in the data field.

A service record starting with 'Y' and 'I' in the first two data bytes contains the CAN bus speed in the third byte. The four lowest bits are the speed of the CAN #0 interface and the four highest bits contain the speed of the CAN #1 interface: 1 - 50 kbps, 2 - 125 kbps, 3 - 250 kbps, 4 - 500 kbps, 5 - 1000 kbps, 15 - interface not available. Other values are reserved, other bytes in the message are reserved and set to 255 (0xFF).

Time of record is the internal time of the recording device and can start from any value in the file. Note that the time of record is reset to zero every 1024 hours.

3rd party applications can add their own service records to the file. Yacht Devices reserves all service records with 'Y' in the first data byte for future file format extensions.

APPENDIX A. Support of .CAN format

The following hardware and software products support .CAN format. Please, contact us (http://www.yachtd.com/support/) to add your own products to this table.

Product	Version	Description
Yacht Devices CAN Log Viewer	1.00	Viewer, player and converter for CAN files. Allows converting .CAN files to/from .CSV format and export to text and Voyage Recorder's .DAT files.
Yacht Devices YDVR Converter	1.20	This program exports Voyage Recorder's .DAT with NMEA 2000 data to GPX tracks, spreadsheets and other formats, including .CAN format.
Yacht Devices NMEA 2000 Bridge	1.01	Allows recording to .CAN files from two CAN interfaces (supported speed is 250 only).
Yacht Devices Voyage Recorder YDVR-03	1.20	This product saves data from NMEA 2000 networks to .DAT files and can "play" .CAN files content to the physical CAN network.
Yacht Devices Voyage Recorder YDVR-04	1.04	All features of YDVR-03, support of recording to .CAN format and support of 50, 125, 250, 5000 and 1000 kbps CAN networks.
Yacht Devices Engine Gateway YDEG-04	1.03	Allows recording to .CAN files on 250 and 500 kbps speed.
Yacht Devices NMEA 2000 USB Gateway	1.00	The CAN Log Viewer allows viewing and recording of data to a .CAN file from serial port of the device (must be configured to RAW or AUTO protocols).
Yacht Devices NMEA 2000 Wi-Fi Gateway YDWG-02	1.00	The CAN Log Viewer allows viewing and recording of data to a .CAN file from a TCP or UDP port of the device (must be configured to RAW protocol).
Yacht Devices NMEA 2000 Wi-Fi Router YDNR-02	1.00	The CAN Log Viewer allows viewing and recording of data to a .CAN file from a TCP or UDP port of the device (must be configured to RAW protocol).
Yacht Devices NMEA 2000 Ethernet Gateway YDEN-02	1.00	The CAN Log Viewer allows viewing and recording of data to a .CAN file from a TCP or UDP port of the device (must be configured to RAW protocol).
Yacht Devices NMEA 0183 Gateway YDNG-03	1.00	Allows recording to .CAN files on 250 kbps speed.

APPENDIX B. Firmware updates support

The following hardware can be updated using CAN Log Viewer (see Chapter 4). Please, contact us (http://www.yachtd.com/support/) to add your own products to this table.

Product	Date or version
Yacht Devices Digital Thermometer YDTC-13	Firmware 1.40 (Q2/2018)
Yacht Devices Humidity Sensor YDHS-01	Firmware 1.40 (Q2/2018)
Yacht Devices Digital Barometer YDBC-05	Firmware 1.40 (Q2/2018)
Yacht Devices Exhaust Gas Sensor YDGS-01	Any firmware, Q3/2018
Yacht Devices Circuit Control YDCC-04	Any firmware, Q4/2018
Yacht Devices Switch Control YDSC-04	Any firmware, Q4/2018
Yacht Devices Alarm Button YDAB-01	Any firmware
Yacht Devices NMEA 2000 Run Indicator YDRI-04	Any firmware
Yacht Devices Tank Adapter YDTA-04	Any firmware
Yacht Devices Outboard Gateway YDOG-01	Any firmware
Yacht Devices Autopilot YDAP-04	Any firmware (Q3/2023)