Yacht Devices

User Manual

Voyage Recorder YDVR-04

also covers models

YDVR-04R, YDVR-04N

Firmware version

1.11

2025

Package Contents

Device	1 pc.
This Manual	1 pc.
MicroSD card	not supplied
Audio cable	not supplied
NMEA 2000 drop cable	not supplied

Note: Device can be connected to the network backbone directly, without an NMEA 2000 drop cable.

Yacht Devices Voyage Recorder YDVR-04 is certified by the National Marine Electronics Association.

Contents

Introduction

The Voyage Recorder YDVR-04 (hereinafter Recorder or Device) is designed to record all data received from CAN buses, for example, from the NMEA 2000 network of the vessel a MicroSD memory card. Absolutely all NMEA 2000 / CAN bus traffic will be recorded, including but not limited to position, course, speed, depth, water temperature, log, wind speed and direction, AIS data of nearby vessels, data from the engine, water and fuel tanks, battery voltage, etc.

Device can record bus data files in two formats, default DAT file format uses compression for «fast-packet» (multi-frame) PGNs listed in Appendix D, and CAN format with no compression, all received CAN frames will be recorded «as is».

In addition to all the features of the previous model (YDVR-03), this model also has a mono line-level (1 Volt RMS) audio input with variable gain that can be used to record audio from line output of any audio equipment, for example from a VHF line out or microphone amplifier output. Audio is recorded into a standard WAV format audio files that are supported by virtually any sound player and editor software. To save card space you can enable audio compression algorithm and also set signal level threshold in order to not record silence.

The YDVR Converter free software available on our site can be used to process recorded files. It is compatible with Microsoft Windows, Mac OS X and Linux and allows recorded data to be exported into various formats for further processing with various software. For example, you can export data into CSV format and then process it with a spreadsheet application to plot the data over time or make a polar diagram. Another notable format is GPX, that contains tracks and waypoints, each waypoint will contain basic data associated with it. GPX files can be viewed in Google Earth, Garmin MapSource, GPXSee and plethora of other charting applications. They can also be loaded into newer models of Garmin and Raymarine chartplotters.

Data files contain internal links to the audio files, and the software places links to audio files at the geographical points in the GPX file where they were recorded. In this way, you can select a point on your track, check what the weather was, and, for example, find the file with the weather forecast recorded from VHF at the same time. Or listen to your VHF conversations with other vessel. This allows reconstruction of your sailing in full detail!

You can also connect a microphone (an amplifier is required for most types) to the input of the Recorder and use audio recording as a «voice log book»; your recordings will be linked to the time and place where they were done.

This software also can generate a spreadsheet file with the data recorded. It can be useful to analyze your boat's behavior in different weather conditions if you are a racer, easily find coordinates with depth extremes if you are fisher, and analyze weather or sailing trends if you are a cruiser.

You can also generate a log book with the collected data automatically and convert it to other formats. Even if you do not have a Recorder yet, you can download the PC software from our web site and play with the test data.

On average, one second of the data recording requires 1000-2500 bytes on the memory card, so the average 16 GB card is enough for 100 days of sailing. Audio recording takes 1.4 MB per minute without compression and 0.35 MB with compression on. Therefore, a 16 GB card can contain up to 32 days of audio data.

Nowadays a 256 GB memory card costs less than USD $25; with it you can record audio and network data non-stop for a full year. But for the most of applications, a 32 GB or 64 GB cards are enough. Automatic deletion of old data means you do not have to worry about running out of space. Plug the Device into your onboard network, insert the card, and you can forget about it until you need the data.

Did you accidentally erase your track from the plotter? Are you writing about a storm that you were caught in? Do you rent out your yacht? Or maybe you need to investigate an incident? There are many instances where only a Recorder can help you get all the details right.

The Device can be supplied with different types of NMEA 2000 connectors. Models containing R in the suffix of model name are equipped with NMEA 2000 connectors and are compatible with Raymarine SeaTalk NG. Models containing N in the suffix are equipped with NMEA 2000 Micro Male connectors.

The Device also has a «player» mode designed for developers and exhibitors. This allows to play back recorded data back to the NMEA 2000 network, reproducing your issue in the lab or showing a demo trip at an exhibition booth. Our free CAN Log Viewer software can be used to create custom CAN files to play and observe played data in real time on a PC, which is useful for diagnostics, debug and reverse-engineering of CAN data traffic. CAN Log Viewer is also free, works on Microsoft Windows, Mac OS X and Linux and can be downloaded from our web site.

We thank you for purchasing our Devices and wish you happy voyages!

Warranty and Technical Support

1. The Device warranty is valid for two years from the date of purchase. If a Device was purchased in a retail store, the sale receipt may be requested when applying for a warranty claim.
2. The Device warranty is terminated in case of violation of the instructions in this Manual, case integrity breach, or repair or modification of the Device without the manufacturer's written permission.
3. If a warranty request is accepted, the defective Device must be sent to the manufacturer.
4. The warranty liabilities include repair and replacement of the goods and do not include the cost of equipment installation and configuration, as well as shipping the defective Device to the manufacturer.
5. Responsibility of the manufacturer in case of any damage as a consequence of the Device's operation or installation is limited to the Device cost.
6. The manufacturer is not responsible for any errors and inaccuracies in guides and instructions of other companies.
7. The Device requires no maintenance. The Device's case is non-dismountable.
8. If the event of a failure, please refer to Appendix A before contacting the technical support.
9. The manufacturer accepts applications under the warranty and provides technical support only via e-mail or from authorized dealers.
10. Contact details of the manufacturer and a list of the authorized dealers are published on our website: https://www.yachtd.com/.

I. Product Specification

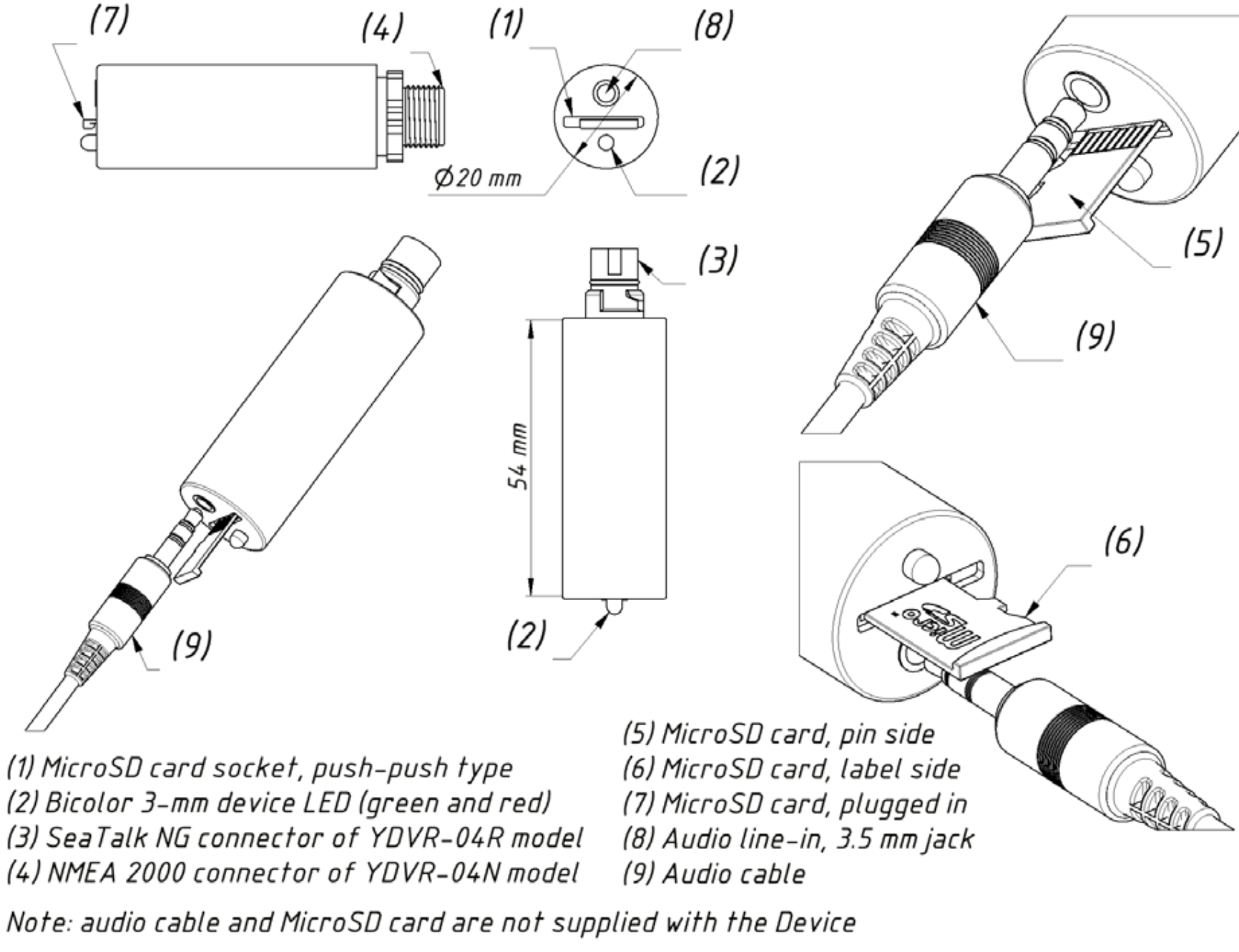

Figure 1. Drawing of YDVR-04R and YDVR-04N models of the Recorder

Device parameter	**Value**	**Unit**
Operating voltage (from an NMEA 2000 network) (1)	10.5..16	V
Average current consumption	23	mA
Load Equivalency Number	1	LEN
Operating temperature range	–25..+85	°C
Weight without MicroSD card	18	g
Recommended MicroSD card class (2)	Class 10	—
Audio input connector type and size (3)	Class	—
Audio input (primary transformer coil) impedance	mini-jack TRS («stereo»), 3.5	mm
Maximum allowed audio input voltage, peak	–15..+15	V
Minimum recommended audio input voltage, peak	–0.2..+0.2	V
Programmable audio gain	–30..+14	dB
Audio frequency range (4)	20..6000	Hz
Galvanic isolation of audio input	1500	V_{RMS}

Note: (1) The Device stops card operation when NMEA 2000 power voltage at the Device connection point drops below 10.5 Volts (refer to Section II.1).

Note: (2) The Device can work with cards of any size and class, but there are requirements concerning the performance of the cards (refer to Section IV).

Note: (3) Though audio connector type is stereo, Device has only one audio channel, Device's min-jack socket Tip and Ring contacts are internally connected. Sleeve, of course, is a ground (refer to Section II.2).

Note: (4) When audio Band-pass filter mode is ON (refer to Section VII, FILTER setting).

CE Yacht Devices Ltd declares that this product is compliant with the essential requirements of EMC directive 2004/108/EC.

Dispose of this product in compliance with the WEEE Directive or local regulations. Do not dispose of it with household or industrial waste.

II. Device Connection, Installation and Testing

All connections should be made when the NMEA 2000 and/or audio source power is completely cut OFF at the circuit breaker.

This will protect against accidental short circuits during installation.

The Device requires no maintenance. When deciding where to install the Device, choose a dry mounting location. Avoid places where the Device can be flooded with water, get wet in rain or be sprayed by water.

1. Connection to NMEA 2000

The Device can be directly connected to the network backbone without a drop cable. Before connecting the Device, turn off the bus power supply. Refer to the manufacturer's documentation if you have any questions regarding the use of connectors:

- SeaTalk NG Reference Manual (81300-1) for Raymarine SeaTalk NG backbone
- Technical Reference for Garmin NMEA 2000 Products (190-00891-00) for standard DeviceNet NMEA 2000 Micro backbone networks

After connecting the Device, close the connector lock to ensure its water resistance and reliability.

The Device is powered from the NMEA 2000 network and has an LED which flashes red or green.

After the NMEA 2000 network power is turned on, the Device LED should indicate its status via that LED, refer to Section III. If you got no LED indication, refer to Appendix A.

NMEA 2000 power voltage considerations.

The Device constantly monitors the NMEA 2000 power voltage. When NMEA 2000 is powered ON, the Device will wait for NMEA 2000 power voltage to become higher than VTRIP HI (default 10.5 Volt) and then will start card operations. When NMEA 2000 is powered OFF, the Device will wait for NMEA 2000 power voltage to become lower than VTRIP LOW (default 10.3 Volt) and then will close all the files and stop all card operations.

Please, note that the Device will still be visible in the NMEA 2000 network (Device List) even if the power voltage is lower than VTRIP LOW.

If there are issues with power distribution along the NMEA 2000 backbone, voltage at the Device's connector may fluctuate between VTRIP LOW and VTRIP HI, in that case you will get a lot of short files on a card, some data will be missing. Therefore, it is recommended to check voltage distribution along the NMEA 2000 network at full electrical load (some NMEA 2000 equipment consumes a lot of power, make sure voltage at the Device connector does not drop below VTRIP LOW.

In mission-critical systems it is recommended to power the Device from an independent power source — so even when NMEA 2000 power fails, Device will still operate and record sound. Use NMEA 2000 power isolator and extra power Tee for that, or splice a NMEA 2000 drop cable. Note that Device's power ground still will needs to be connected to NMEA 2000 backbone ground.

VTRIP LOW and VTRIP HI can also be adjusted if necessary (refer to Section VII.23 and 24). Use with caution, too low voltage may lead to card file system corruption (refer to Section IV).

2. Connection to audio source

The Device can be connected to the speaker output in most cases for VHF, but with great caution. Connection to the speaker output of car audio will damage the Device. Be sure that peak power of speaker output is 5W or less and intended for 4 Ohm speakers.

Refer to Section VII.11

The Device's audio input is a standard 3.5 mm diameter stereo (TRS, Tip-Ring-Sleeve) mini-jack socket, but Device audio input is mono: tip and ring terminals are internally connected, do not use mono (TR, Tip-Ring) mini-jack connector. Use stereo jack instead and apply audio signal out to Tip and/or Ring terminal, ground no Sleeve.

The Device's audio input is an audio transformer with ~110 Ohm primary coil impedance, optimized for standard line-in voltage (0.7 Volt RMS, 1 Volt peak-to-peak). Audio transformer implements galvanic isolation of audio input from the NMEA 2000.

Though Device's audio gain can be adjusted (refer to Section VII, GAIN setting), it can not work directly with passive microphones, use an extra microphone amplifier or an active microphone with built-in amplifier and line-out signal level.

On the other hand, Device's audio input can work with power output of a VHF speaker if connected in parallel with that speaker (up to 3.5 Watts, 5 Watts peak, designed for speakers with 4 Ohms resistance, ~9 Volt peak-to-peak level), but you need to set GAIN setting rather low, recommended value 0.50 (or even 0.15 if you listen to the VHF at full volume). Note that the volume of the recording also depends on the current volume settings on the VHF equipment.

However, most of the audio power amplifiers output voltage is too high and voltage

over 15 V (30 Volt peak-to-peak) may damage the Device. Therefore, we recommend to use a Line Out Converter to lower the audio power amplifier output down to line level. Line Out Converters are widely used in automotive industry, prefer models with adjustable signal attenuation (so you can adjust its output signal to standard line-in voltage levels).

If you need to record multiple audio sources simultaneously, add an audio mixer, feed normalized audio line-level signals to mixer inputs and connect the Device to mixer's line-out audio output.

To avoid picking up noise, use high-grade shielded audio cable.

3. Card installation

To operate properly, the Device requires a MicroSD card formatted with FAT or FAT32 file system. If you are not sure what file system your card uses, reformat it on a personal computer (refer to Section V).

Carefully place the card into the Device's slot and carefully push the card inward until it clicks in place. Slowly withdraw your finger. To remove the card, push inward until a click is heard and then withdraw your finger (see also Figure 1).

III. LED Signals

Table 1. Signals during normal operation

Signal	Meaning
One second long GREEN flash on power up or card insertion	The Device has created a file on the MicroSD card and is ready to record data.
Three short (500 ms) GREEN flashes after power-up	The Device has received the first message from the CAN bus. Indicates that the Device successfully receives data from NMEA 2000 network.
Constant short (500 ms) RED flashes.	MicroSD card is missing or can not be red.
Constant very short (200 ms) RED flashes	NMEA 2000 power voltage is lower than $V_{TRIP\ LOW}$, Device have stopped card operations but is ready to resume recording when NMEA 2000 power voltage raises above $V_{TRIP\ HIGH}$.
Constant long (1 second) RED flashes	Device failed to create files on a card: wrong file system, bad card or recording of both data and audio is disabled in Device's settings.

Table continued

Constant GREEN flashes of varying length	Normal mode: recording is in progress, no audio clipping detected. Amount and length of flashes depends on bus load and audio signal presence.
Constant RED flashes of varying length	Same as above, but audio clipping is detected. Adjust audio signal level or lower Device's GAIN setting.
Short RED flash on power down	Device successfully closed files and stopped card operation.
Constant very short (250 ms) RED flashes	Power voltage too low (detected below $V_{TRIP\ LOW}$). Device is in idle state (no card operations) and waits for power voltage to raise above $V_{TRIP\ HI}$.

LED signals in the player mode are described in Section X. Signals during firmware update are described in the Section IX.

IV. Choice of MicroSD Cards and Working with Cards

We ask that you to familiarize yourself closely with this section. By observing these simple rules, you can be confident that your data is saved and safe.

1. MicroSD cards have a limited number of data rewrites, so do not use old cards. It is highly recommended not to use cards that have been used in smartphones.

2. Use MicroSD cards from a known manufacturer and purchase from a reputable retailer. Some well-known manufacturers offer their own cards with a lifetime warranty. For an additional level of assurance, use cards made with SLC technology, as they allow ten times the number of data rewrites of regular cards. Use server-grade or industrial-grade cards in mission-critical setups.

3. A MicroSD card is a complex electronic device. Keep cards away from static electrical fields and try not to touch the contacts of the card. Do not deform or bend the cards or leave them exposed to sunlight. We do not recommend removing the card when the Recorder is powered on – this could result in a logic error in the file system.

4. The internal controller of MicroSD cards has a complex algorithm for caching, maintaining data integrity and replacing corrupted memory blocks with reserved blocks on the fly. The Recorder works with the card in such a way as to avoid premature deterioration. A 16 GB card fills up over the course of 100-200 days of sailing. A regular MicroSD card generally claims to function for 10,000 data rewrites, which means that a single card is adequate for a few decades of uninterrupted work. For this reason, we generally recommend regular MicroSD cards.

5. Winter storage of the card and Device can be on board the vessel. Note the temperature tolerance of the card – most have a range of −40 to +85 °C, and a working temperature range of −25 to +85 °C.

6. The Recorder is sensitive to the response time and write time, so cards of MicroSD Class 10 or higher are recommended for use with the Device. The Device has an embedded capacitor, the power from which is used to shut down the file system safely after the power from the network is turned off. If a card of lower than Class 10 is used, the Device might not be able to finish all file system operations correctly. When the network power is turned off, the long RED LED flash confirms that file system was closed correctly.

7. During system shutdown, the Device tries to minimize the work with the file system, indicating the correct file size, but without releasing the cluster chain reserved for it. This behavior is correct, but some disc checkers will try to correct this by increasing the file size to the end of the cluster chain. This will result in ‘garbage’ at the end of the file. The Recorder’s software can handle such ‘corrections’, but it is not desirable.

8. At the first sign of hardware problems such as extended time needed for reading the data from the card or read errors, do not try to ‘fix’ the card, but replace it immediately. The probability is very high that such cards will soon stop functioning altogether, resulting in loss of all data on the card.

In conclusion, new cards from reputable manufacturers are extremely reliable, and with proper care you can be confident that your voyage data is safe and sound.

V. Formatting MicroSD Cards

The Device supports MicroSD memory cards of all sizes and classes, but has performance requirements for cards (see IV.6). The MicroSD card must be formatted on a personal computer before use in the Recorder. The Recorder supports the following file systems: FAT (FAT12, FAT16, MS-DOS) and FAT32. It does not support exFAT, NTFS, or any other file systems.

When formatting, use a cluster size of 65,536 bytes (64K) or the maximum available for your card. This will improve the performance of the Recorder and extend the life of the card. During operation, the Recorder produces data files of up to 80 clusters, which totals 5.2MB with a cluster size of 64K. Such files typically hold 30..40 minutes of data recording. If a smaller cluster size is used, the Recorder will have to create new files more often, increasing the number of calls to the file system. Audio file length is up to 120 clusters or 7.6 MB with a 64K cluster or up to 22 minutes of audio recording when compression is on.

The FAT32 file system can be used on disks up to 2048 GB. Microsoft Windows, Linux and Mac OS X do not restrict work with files on memory cards of any size with the FAT32 file system.

However, in Microsoft Windows, there is an artificial restriction, so you cannot select the FAT32 file system for memory cards of 64 GB or more in the formatting program supplied with the operating system. This limitation is the consequence of Microsoft's promotion of its new exFAT file system. So, to format large cards in Windows, you will need to use a third-party freeware formatting program, like the one supplied by Ridgecrop Consultants Ltd:

http://www.ridgecrop.demon.co.uk/guiformat.htm

In Linux or Mac OS X operating systems, there is no such limitation, and you can use the OS utility to format cards of any size.

VI. Files and Folders on the Card

To store files, the Recorder creates folders named «YDVRdddd» in the root directory, where dddd is the serial number of the folder from 0001 to 9999. In the folder, the Recorder creates files named «ddddnnnn.DAT» and «ddddnnnn.WAV», where dddd is the folder number where the file is stored, and nnnn is the file sequence number in the folder, from 0001 to 0300.

The Recorder tries not to store more than 100 files in a single folder, and never stores more than 300 files together. The Recorder never creates more than 500 folders on the card. The exact number of folders used and the maximum number of files in a folder depends on the size of the card.

If the number of the last file in the folder exceeds the maximum number of files in a folder for this card, the Recorder creates a new folder with the next serial number.

The Recorder erases the folder with the lowest serial number and its contents, if:

- the number of folders created by the Recorder has reached the maximum value for the card;
- the free space available on the card is not enough for 20 Recorder files.

After completing data collection in a folder named YDVR9999, the Recorder renames all folders on the card, giving them new numbers starting with 1. The files inside the folder are not renamed.

In this way, you do not have to worry about the amount of space left on the card, as the Recorder will automatically delete the oldest recordings when more space is needed (see the description for the parameter DELETE at the next Section).

We recommend that you use a separate memory card for the Recorder, and do not store other data on it.

VII. Device Configuration with a MicroSD Card

To configure the Device, a text file with the configuration should be created and named YDVR.TXT in the root folder of the MicroSD card. Note that the previous model (YDVR-03) uses the file named YDVR.CFG. A sample configuration file with factory settings is in Appendix A. The file contents must conform to these rules:

- ASCII plain text format should be used;
- line endings should be of Windows (CR LF) or Unix (LF) and not of Macintosh (CR) format;
- the same setting should not be used more than once in a file (if so, only the setting/value that comes last in a file will be applied);
- parameters and their values must be entered in UPPER CASE;
- each parameter must be on a separate line;
- commentary lines must start with the # symbol.

To get the current settings, create a blank YDVR.TXT file and insert the card into the Device. Wait until the Device LED responds with a 3-flash sequence and eject the card; current settings will be saved to the file YDVRSAVE.TXT.

Each time the Device's input voltage raises above $V_{TRIP\ HIGH}$ (refer to Section II.1), the Device checks if YDVR.TXT file is present on a card, and if so, settings from the YDVR.TXT file will be applied. Thus all settings present in the YDVR.TXT file will override settings stored in Device's non-volatile memory.

If there is no YDVR.TXT file, device will load settings saved in its non-volatile storage. You can permanently save settings into device non-volatile memory using CFGSAVE keyword (see below). After that, you can delete YDVR.TXT file from a card — to speed

up the device boot process a bit.

Note that device supports «incremental» configuration — put only those settings that you need to change into YDVR.TXT file, all other settings will be left intact.

1. *CFGSAVE*

This is the only keyword (it has no value, see example in the Appendix A) and can be placed anywhere in the file. If this keyword is present in the YDVR.TXT file, all settings from that file will be saved into Device's non-volatile memory.

2. *NMEA2000=ON|OFF*

Enables or disables CAN bus data recording. Set to OFF to turn the Device into a simple audio audio recorder.

Factory default: ON (recording of CAN bus data enabled).

3. *FORMAT=DAT|CAN*

Selects CAN bus data file format.

DAT format is used by default, it will compress «fast-packet» NMEA 2000 PGNs listed in Appendix D. Note that malformed «fast-packet» NMEA 2000 PGNs will not be recorded. CAN format, on the other hand, will record all CAN frames «as is», frame-by-frame.

DAT file format is open and is given in Appendix D. You can use our YDVR Converter software (see the next Section) to decode and extract data and/or convert DAT files into other CAN formats, for example into our CAN format. You can also use your own custom software decoder or third-party decoder, for example, CANBoatJS ydvr-file utility.

Use DAT format if you are mainly interested in recording and reconstructing/ analyzing your vessel trip data already correctly available on the NMEA 2000 network.

Use CAN format if you want to record more comprehensive data, for example, to capture malformed «fast-packet» and detect «fast-packet» loss issues, this mode is recommended if you use the Device as a black box for incident investigation. Also use CAN format if you are recording data from a non-NMEA 2000 CAN bus, for example, J1939 bus, CAN bus with non-250 kpbs baud rate or CAN-A bus with 11-bit frame identifiers.

4. *AIS=ON|OFF*

Enables recording of NMEA 2000 AIS data PGNs. In areas of intense navigation, the majority of messages in the onboard network can come from AIS, thus taking too much card space. Set to OFF to disable recording AIS data.

Factory default: ON (record AIS data).

5. *DELETE=YES|NO*

Enables or disables automatic data deletion on card space exhaustion. If set to NO, Device will not erase and rename files and will stop when no space is left on a card. If set to YES, device will rotate files instead, refer to Section VI fro details.

Factory default: YES (automatic file deletion and file names rotation is enabled).

Enables or disables CAN bus data recording. Set to OFF to turn the Device into a simple audio audio recorder.

Factory default: ON (recording of CAN bus data enabled).

6. FILTERTYPE=BLACK|WHITE

Defines the type of filter for received CAN messages. BLACK — blocking filter, messages that match filter settings below will not be recorded.

WHITE — pass filter, only those messages that match filter settings below will be recorded.

Factory default filter settings are BLACK with empty filter settings (block none or record everything).

See the next three parameters for filter rules definitions.

Note: starting from firmware version 1.10, new settings 6..9 replace an old settings IGNOREPGN, IGNOREADDR, IGNORE.

If you update the Device firmware, when those settings were in non-default values, they all will be converted to equivalent BLACK filter settings.

7. FILTERPGN=[pgn [...]]

The list of PGNs to block (when FILTERTYPE=BLACK) or to record only (when FILTERTYPE=WHITE) separated by comma. List can contain decimal or hexadecimal values (starting with an 0x prefix). Up to 32 PGNs can be listed.

Factory default: empty string (with default FILTERTYPE=BLACK means «record all PGNs»).

8. FILTERADDR=[address [...]]

The list of device CAN bus addresses / NMEA 2000 «Device Addresses», to block (when FILTERTYPE=BLACK) or to record only (when FILTERTYPE=WHITE) separated by comma.

List can contain decimal or hexadecimal values (start with an 0x prefix). Up to 32 addresses can be listed.

Factory default: empty string (with default FILTERTYPE=BLACK means «record from all addresses»).

9. *FILTERMASK=[msgid1 mask1 [,msgid2 mask2 [,...]]]*

Allows blocking of specific CAN messages from specific CAN devices.

Each setting entry contains a pair of CAN frame ID and a bitmask, separated by space, and each pair is separated from another pair by comma.

29-bit identifier of a CAN frame (CAN ID) contains the message priority, PGN, the sender's address and (in some cases) the recipient's address.

Bitmask selects which bits are significant for comparison.

Formal match comparison expression is:

```
if ( ( CAN_FRAME_ID AND mask ) == filter ) then MATCH else NO_MATCH
```

All CAN messages with ID that MATCH, will trigger action defined by FILTERTYPE.

You can use decimal or hexadecimal values (start with an 0x prefix). Up to 32 pairs of message IDs and masks can be listed.

For example, to not record PGN 130310 «Environmental parameters» (0x1FD06) sent from address 1 and PGN 130311 «Environmental parameters» (0x1FD07) sent from addresses 0, 1, 2 or 3, use the following setting:

```
FILTERTYPE=BLACK
```

```
FILTERMASK=0x1FD0601 0x1FFFFFF,
0x1FD0700 0x1FFFFFC
```

For example, to record only from device with address 0x12, use the following setting

```
FILTERTYPE=WHITE
FILTERADDR=0x12
```

10. AUDIO=ON|OFF

Enables or disables audio recording feature.

Factory default: ON (audio recording enabled).

11. COMPRESSION=ON|OFF

Enables or disables ADPCM audio compression. One minute of compressed audio takes 0.35 MB on the card, and uncompressed audio takes 1.4 MB. Uncompressed audio has better quality. In both cases, the Recorder produces 12 kHz 16-bit mono audio files with WAV extension.

12. GAIN=x

Where: x – the decimal number from 0.03 to 5.00, factory default: is 2.70

If the audio signal is too strong or the gain is set too high, the signal will be clipped-off (distorted in the loud parts) and the LED flash red chaotically during the audio recording. In case of a weak signal, the recording will be too quiet. However, it is better to have a quiet recording than an over-amplified one, because the waveform will not be distorted and part of the signal will not be lost (see Figure 2).

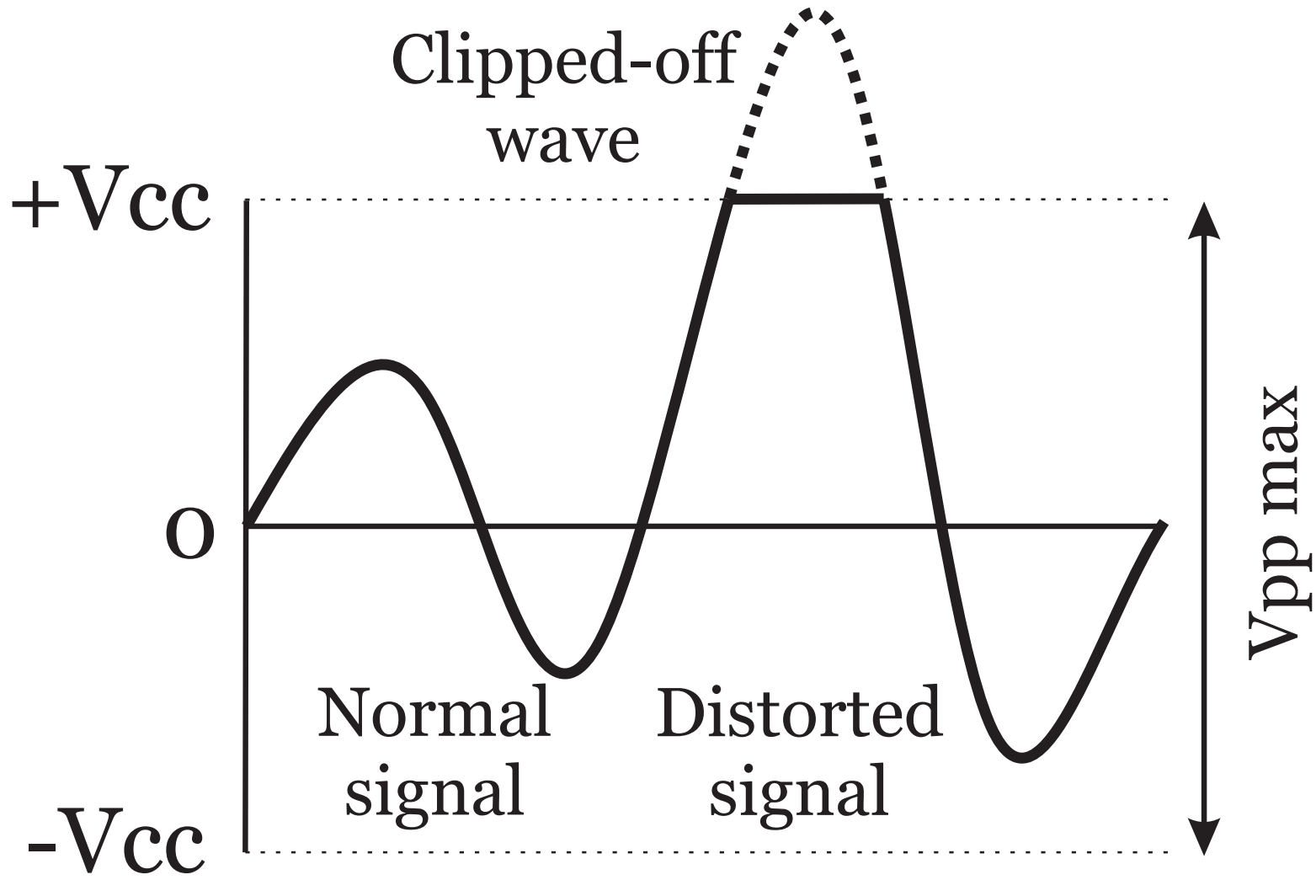

Figure 2. Normal and over amplified signal

The factory gain setting of 2.70 corresponds to the normal level of audio line-in signal, 0.894 Vpp (peak-to-peak amplitude, Volts) used in consumer audio. The gain value is a multiplication, 0.894 Vpp will be amplified 2.7 times to 2.4 Vpp. The maximal peak-to-peak voltage of the amplified signal should not exceed 3 V (or the signal will be clipped), the best recording quality is attained when the amplified signal is about 70 – 80% of the maximal internal Vpp.

Note, that some VHFs (for example, Raymarine Ray218E) has powerful output for a fog horn (30W or above). Connection to this output may damage the Device.

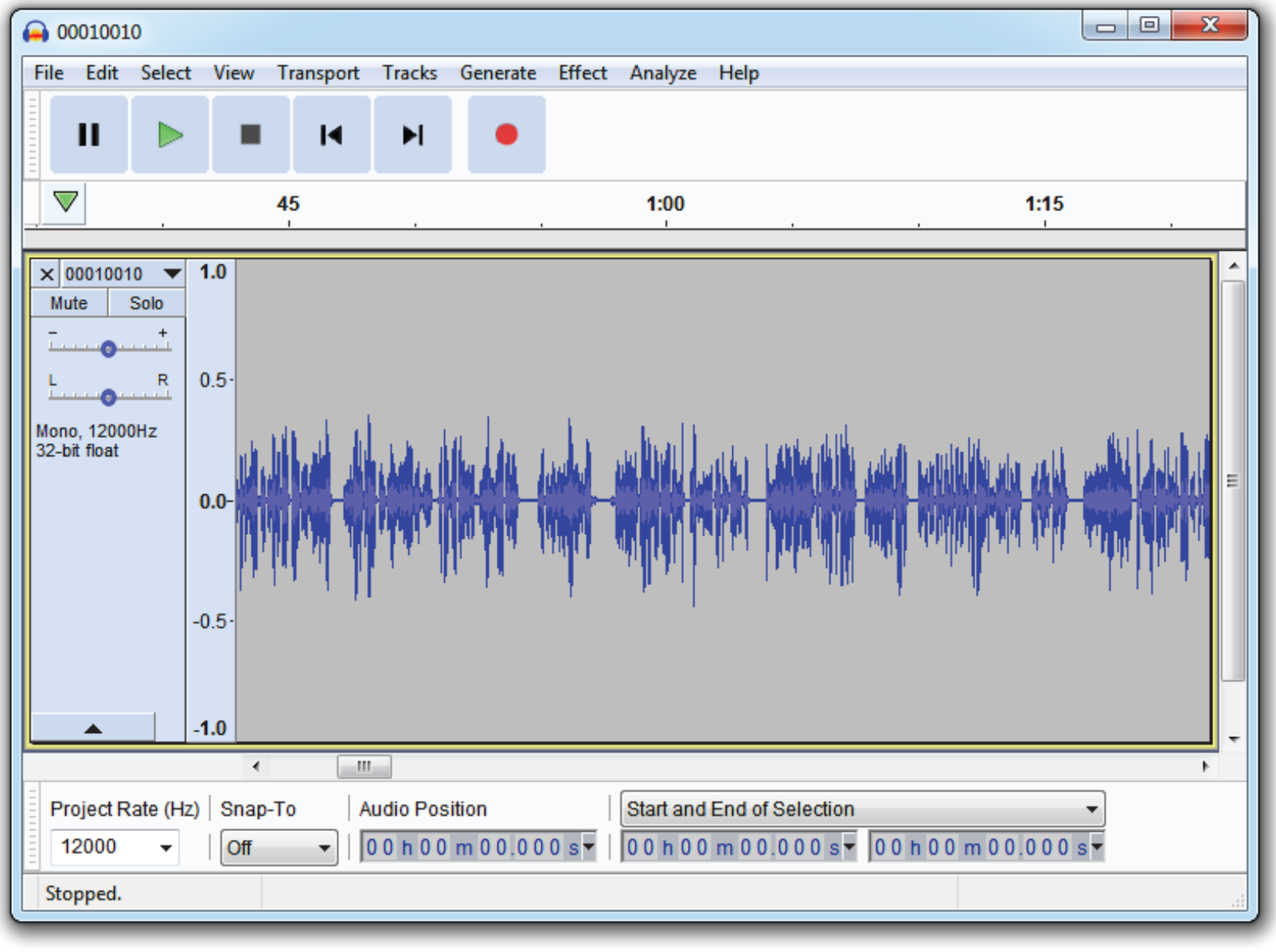

Figure 3. Check recorded audio signal amplitude in Audacity software.

To check if GAIN setting is fine, open the recorded audio in the software, where you can visually check the recording level. We can recommend Audacity free software; it runs on Microsoft Windows, Mac OS X and Linux (https://www.audacityteam.org/). On Figure 3 you can see that GAIN is too small (only 50% of maximal amplitude, when 70–80 is recommended).

Some online services also offer visualization of audio files, for example TwistedWave Online (https://twistedwave.com/online).

13. *DELAY=x*

Where x – decimal number from 0.50 to 16000.00, factory setting 30.0

The silence interval in seconds, after which the audio file is closed. The tail of the audio file with the silence is cut off upon closing. During VHF conversations, and especially when the vessel is calling, pauses are usual. If you are using an audio input for VHF recordings, you can enlarge the interval to avoid creating multiple audio files for the same conversation. If you are using it as an «audio log book», you can set smaller intervals.

14. *FILTER=ON|OFF*

Enables or disables audio signal band-pass filter which reduces noise (but passes fundamental frequencies used in the spoken language, 200...3000 Hz).

Factory default: ON (filter enabled, audio recording optimized for speech).

15. *THRESHOLD=x*

Where x – decimal number from 0 to 50, factory setting 2.50

Sets audio recording activation level as a percentage of the maximum level.

It is typical for there to be a significant amount of silence in VHF and crew communications. Therefore, the Device can be configured to record audio only when the signal level exceeds the set threshold value for a minimum of several milliseconds.

It is recommended that you adjust this setting to suit your requirements by experimenting with the value until you achieve the desired result.

A value of zero will disable this feature, which will result in audio being recorded constantly. Conversely, a value that is too low may result in an excessive number of recordings being comprised of just noise. A value that is too high may result in the first ten or so milliseconds of audio signal recordings being cut off or may prevent the recording of conversations that are too quiet.

16. PLAYER=ON|OFF

The «ON» value activates the «player» mode intended for marine installers and developers. The Device will play the contents of the PLAYNOW.CAN or PLAY.CAN files on the network if these files are present in the root folder of the MicroSD card. Please see Section X for details. No data will be recorded when the player mode is activated.

If the SPEED is set to AUTO (see VII.18), the Recorder will set the CAN bus speed according to the setting saved in service record of CAN file. If the service record is absent, the Recorder will use 250 kbps as the default speed.

17. LOOP=ON|OFF

This setting acts when the player mode is ON. When this setting is ON, the Recorder will play the file again and again until power off or until new MicroSD card is inserted. Otherwise, the file will be played only once.

18. SILENT=ON|OFF

Factory setting: OFF. For the DAT file format (see VII.3), this setting blocks the sending of Device information (NMEA 2000 message with PGN 126996). The Device will not appear in the list of devices on the chartplotter (see Section IX). This setting is designed for covert installation.

For the CAN format, this setting totally blocks sending of messages to the CAN network, the Recorder will not send or answer on network messages, it will only read the CAN bus messages.

19. SPEED=50K|125K|250K|500K|1M|AUTO

The factory setting is 250K. This parameter is ignored when the DAT file format is selected (see VII.3); it only acts when the CAN file format is used for recording or in the player mode (see VII.15). It sets the CAN bus speed, from 50 kbps to 1 mbps (NMEA 2000 and J1939 networks use 250 kbps speed). If a speed other than 250K is selected, the Recorder does not send or reply on any NMEA 2000 messages, it only reads the CAN bus messages. For 250K speed, see section VII.17.

In case of AUTO setting, the Recorder detects the CAN bus speed automatically, but note that the first few CAN messages may be skipped and not recorded. When speed detection is in progress, the Recorder is invisible to other devices. It does not confirm received messages; it does not generate bus errors for invalid messages.

20. STATUS=OFF|ON|x

Where x – decimal number from 0 to 60, PGN repeat interval in seconds, factory default: OFF.

Enables or disables Device to send extended telemetry data via PGN 130831 «Proprietary YD: Voyage Recorder Status».

ON value enables Device to send telemetry via PGN 130831 with default repeat interval of 60 seconds. You can also set desired PGN 130831 repeat interval with integer setting x (range 1..59, value in seconds).

OFF or 0 value disables the Device to send PGN 130831.

Contact our Technical Support to get details on PGN 130831 structure.

21. BIN_FLAGS=OFF|ON|x

Where x – decimal number from 0 to 60, PGN repeat interval in seconds, factory default: OFF.

Enables or disables Device to send basic telemetry data via standard NMEA 2000 Digital Switching PGN 127501 «Binary Status Report» (and react to incoming PGN 127502 «Switch Bank Control»).

ON value enables Device to send basic telemetry via PGN 127501 with default repeat interval of 5 seconds. You can also set desired PGN 127501 repeat interval with integer setting x (range 1..59, value in seconds).

OFF or 0 value disables the Device to send PGN 127501.

Note that you also need to set correct «Binary Device Bank Instance» with the next setting.

22. BIN_BANK=x

Where x – decimal number from 0 to 255, factory default: 2.

Sets «Binary Device Bank Instance» for outgoing PGN #127501 «Binary Status Report» and incoming PGN #127502 «Switch Bank Control».

Table 2. Device's basic telemetry flags available via PGN 127501 and corresponding actions

DS Switch number	**Get current mode: read PGN 127501. Switch status = 1 (ON) indicates:**
1	**Device CAN bus transceiver is in «error passive» state.** Too much CAN bus errors. Device may go offline soon. Check the backbone wiring integrity, bus power distribution and CAN bus termination.
2	**MicroSD card is missing. All flags below will be OFF.** Check the card is inserted, replace the card.
3	**MicroSD card initialization error.** Check the card file system for errors.
4	**Data file recording error.** Check the card file system for errors.
5	**Audio file recording error.** Check the card file system for errors.
6	**Audio clipping detected.** Reduce audio signal volume or lower the GAIN setting (refer to Sections II.2 and VII.12).
7	**Free space left on a card is below 10%** (triggers only when automatic file deletion is disabled with DELETE =NO). Backup data, delete old files to free card space.
8	**No free space left on a card** (triggers only when automatic file deletion is disabled with DELETE =NO). Backup data, delete old files to free card space.

Table continued

9	**Device power voltage is too low**, card operation stopped, but Device is still online, waiting for power voltage to raise above the safe threshold to resume recording. Possible issues with bus power distribution. Check bus voltage at the Device's connection point (refer to Section II.1). Adjust VTRIP_HI and VTRIP_LOW (refer to Sections VII.23 and 24).

Device's basic telemetry can be viewed on any NMEA 2000 display device that supports showing «Switches» via standard NMEA 2000 Digital Switching PGN 127501 «Binary Status Report» (see example on Figure 4 below).

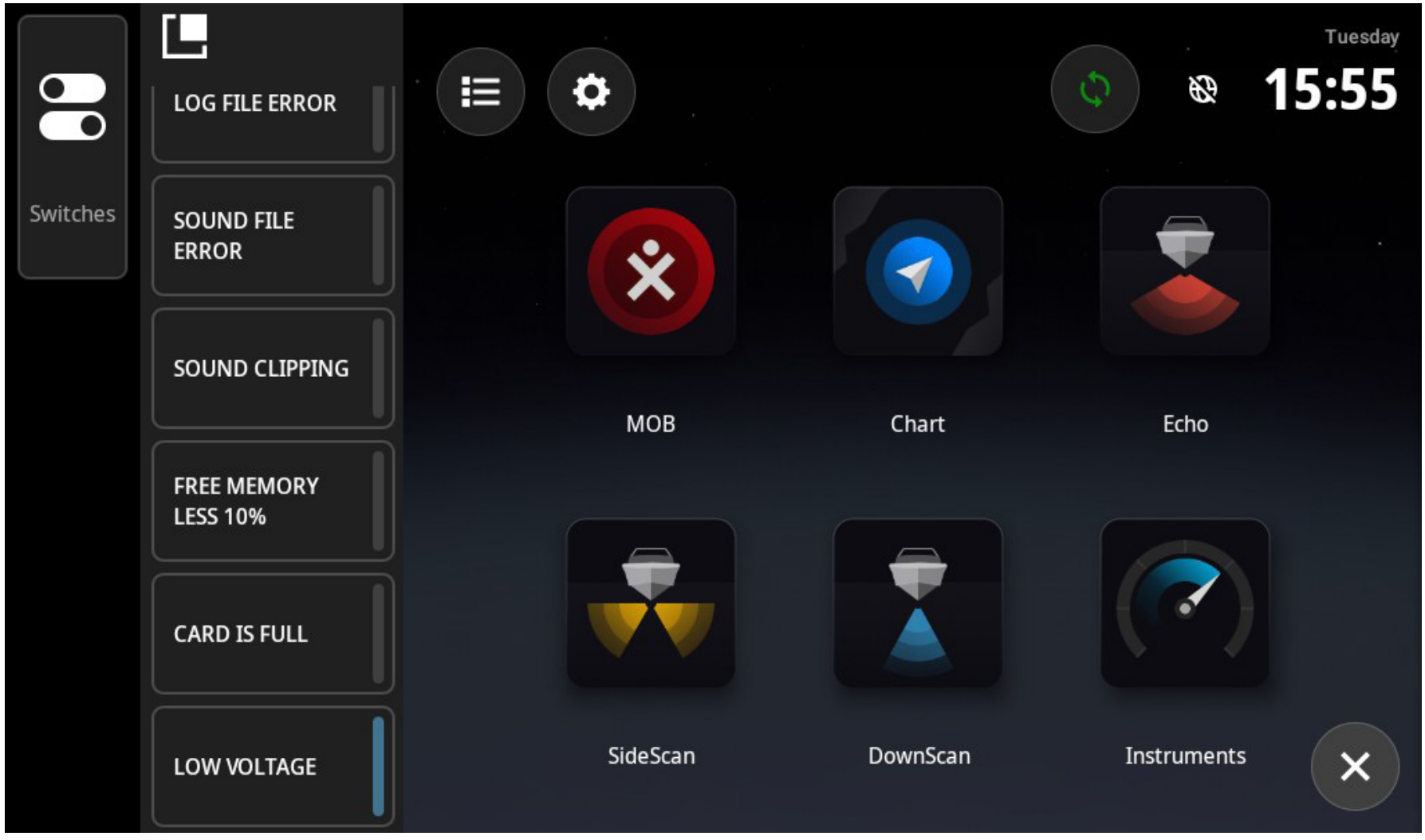

Figure 4. Simrad NSX series MFD shows Device basic telemetry status on a «Switches» panel. Observe that Device reports «Low Voltage» status flag.

If your NMEA 2000 display device supports controlling the switches via standard NMEA 2000 Digital Switching PGN 127502 «Switch Bank Control», you can even clear the status flags.

23. POWERDOWN=x

Where x – decimal number from 7.00 to 16.00.

Adjusts VTRIP LOW threshold in Volts. Refer to Section II.1. Use values lower than 10.5 with caution, too low setting may lead to card file system issues! Make sure to set in tandem with POWERDOWN setting to allow for at least 0.3 Volt hysteresis!

Factory default: 10.30, note that if set to default value, this settings will not be shown in YDVRSAVE.TXT file.

24. POWERUP=x.x

Where x.x – decimal number from 7.00 to 16.00.

Adjusts VTRIP HI threshold in Volts. Actual VTRIP HI will be +0.3 Volts higher than this value. Refer to Section II.1. Make sure to set in tandem with POWERDOWN setting to allow for at least 0.3 Volt hysteresis!

Factory default: 10.50, note that if set to default value, this settings will not be shown in YDVRSAVE.TXT file.

VIII. Processing Data on Computer

To process the data, files must be copied or moved from the memory card to the computer in any convenient manner.

If the operating system offers to execute a scan on the card, you should refuse this offer, unless you have specific reasons to do so (see IV.7). Scanning the card is recommend only after transferring the data to the computer.

The software for data processing is available free at www.yachtd.com and works on Microsoft Windows, Linux and Mac OS X:

- YDVR Converter software (also known as PC Software for Voyage Recorder) allows generation of tracks in GPX format with extended sailing data (including tracks of other vessels with AIS, weather conditions, detailed data about engine operation, etc.), can export data to a spreadsheet applications (CSV format), can generate the editable and printable log books by template, and convert files with recordings to other formats (including .XML and .CAN).

- CAN Log Viewer is a free viewer, player and converter of files in .CAN format. This format is used in the player mode of Voyage Recorder (see Section X). The Device instance and system instance of the Recorder can be changed using this program.

Documentation for the software is available in digital format along with the software download.

IX. Firmware Updates

Download an actual version of the firmware file from our site: https://www.yachtd.com/downloads/

Extract the YUPDATE.BIN file from the archive.

Prepare a MicroSD card with FAT or FAT32 file system, and copy YUPDATE.BIN file to the root folder.

Power down the Device, insert card and power up the Device with card inserted.

From 5–10 seconds after powering on, the Device's LED will emit several alternating RED and GREEN flashes, indicating that the firmware update is successfully completed.

If the Device is already using the given version of the firmware or if the Device cannot open the file or the file is corrupted, the bootloader immediately transfers control to the main program. This is done without visual cues.

The Device information including the firmware version is displayed in the list of NMEA 2000 devices (SeaTalk NG, SimNet, Furuno CAN) or in the common list of external devices on the chartplotter (see third line at Figure 1 on the next page). Usually, access to this list is in the Diagnostics, External Interfaces or External devices menu of the chartplotter.

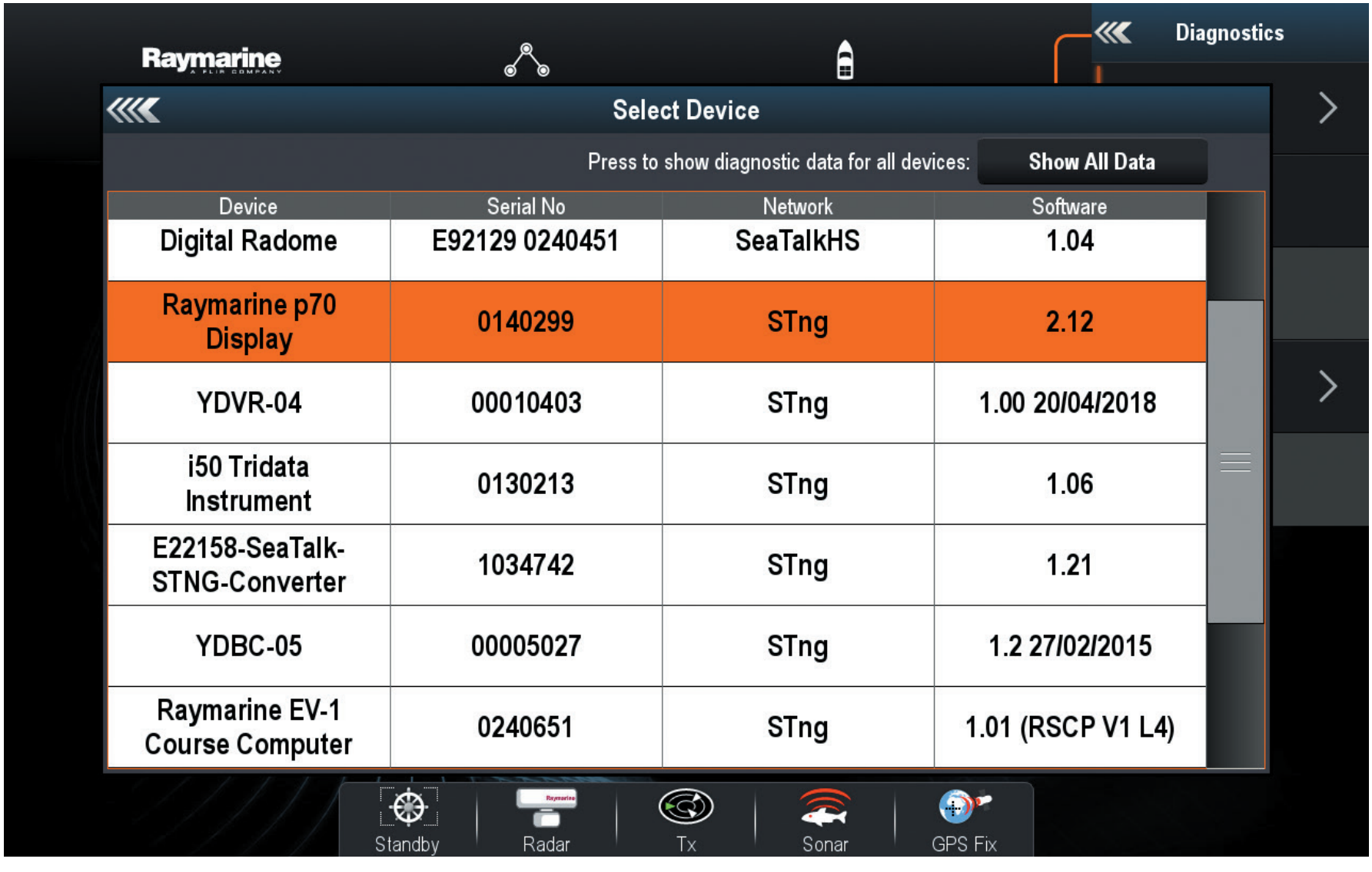

Figure 5. Raymarine c125 MFD «Device List» showing YDVR-04 unit.

X. Player Mode

This mode is intended for demonstration, emulation or testing of marine equipment. Use this mode at your own risk. This mode may affect operation of other equipment and possibly damage it.

The player mode is activated by the setting PLAYER=ON in the configuration file (see VII.16).

If the mode is activated, the Device checks the root folder of the MicroSD card for the PLAYNOW.CAN file. If this file is absent, the Device checks for a PLAY.CAN file. If neither file is not found (or in case of a file read or format error), the Device produces three long (1 second) RED flashes and falls back to recording mode.

Otherwise, the Device produces three long (1 second) GREEN flashes and playback begins.

CAN files contain the internal Device time stamps. In the case of a PLAYNOW.CAN, Device set its internal time to the time of the first file's record, and actually begins playback of data immediately. In the case of a PLAY.CAN file, the Device waits until its internal time is the same as the time of the first file's record. Note that the time counter in the CAN file overflows and resets to zero every 1024 minutes, so playback start may be delayed up to 17 hours.

The Device tries to send messages from a file to a network with the same rate and intervals between messages as they were recorded. Those timings accuracy also depends on the actual CAN bus load.

A CAN file may contain data received from two CAN interfaces (the Recorder has only one). Each message in a file contains a mark indicating whether it was received

by a recording device (RX) or transmitted (TX). The Device will play back to the bus all messages marked with an RX flag, regardless of what interface (CAN0 or CAN1) they were received from during recording. The Device supports 11-bit and 29-bit messages with variable payload data length (DLC, can be from 1 to 8 bytes).

When playback is completed, the Device behavior depends on the LOOP setting value (see VII.17). If LOOP is set to OFF, Device stops playback and turns RED LED constantly ON; if you need to restart playback, you will need to eject and re-insert the card or power cycle the Device. If LOOP is set to ON, it starts playback again from the beginning (in case of PLAY.CAN file, the playback will be re-started with the same delays, like the first time).

To convert Voyage Recorder's .DAT files to .CAN format, use our free YDVR Converter software. To edit messages in .CAN files or filter messages, use our free CAN Log Viewer application (see Section VIII).

CAN Log Viewer allows export of .CAN files to and import from .CSV (Comma Separated Values) format. Files in CSV format may be opened in any spreadsheet application, like Microsoft Excel or LibreOffice Calc. CAN Log Viewer also can convert .CAN files back to .DAT format. The .CAN log format is open and described in the CAN Log Viewer documentation.

The .DAT format contains assembled NMEA 2000 messages (so-called «fast-packet» PGNs that are transmitted in more than one CAN frame) and is designed to save space during NMEA 2000 recording. If you need to reproduce an exact equipment behavior at the CAN bus Media Layer (for example to capture malformed «fast-packet» PGNs which may be useful for bus health and equipment firmware diagnostics), or you are using the Recorder not on an NMEA 2000 network (for example, on a J1939 or CANOpen bus), choose the CAN format using the FORMAT setting (see VII.3).

Appendix A. Example of Configuration File

All parameter values listed below correspond to factory settings.

```
# Voyage Recorder YDVR-04 (www.yachtd.com), serial number: 99999999
# Firmware version: 1.10 02/10/2024

# Settings in this file match the settings in device's EEPROM

# SAVE TO EEPROM
# To save settings, rename this file to YDVR.TXT and remove # symbol
# from the line below
# CFGSAVE

# NMEA 2000 RECORDING
NMEA2000=ON
FORMAT=DAT
AIS=ON
DELETE=YES
FILTERTYPE=BLACK
FILTERPGN=
FILTERADDR=
FILTERMASK=
SPEED=AUTO
SILENT=OFF

# AUDIO RECORDING
AUDIO=ON
COMPRESSION=OFF
```

```
GAIN=2.70
DELAY=30.0
FILTER=ON
THRESHOLD=2.50

# LOG & NMEA 2000 STATUS
STATUS=OFF
BIN_FLAGS=OFF
BIN_BANK=2

# PLAYER MODE (disables recording when ON)
PLAYER=OFF
LOOP=OFF
MAX_DELAY=OFF

# End of file
```

Appendix B. Troubleshooting

Situation	Possible cause and required actions
No startup LED indication (short GREEN flash, three GREEN flashes) after the NMEA 2000 network is powered on	**1. No power supply on the bus.** Check if the bus power is supplied (NMEA 2000 network requires a separate power connection and cannot be powered by a plotter or another Device connected to the network). **2. Loose connection in the power supply circuit.** Treat the Device connector with a spray for cleaning electrical contacts. Plug the Device into another connector.
Regular short (500 ms) RED flashes	**1. MicroSD card is missing. Insert the card.** **2. MicroSD card issue.** Check if the card is formatted with a supported file system (refer to Section II). Check the card file system for errors. Reformat the card. Replace the card if the issue persists. **3. There is no space left on the card and automatic old file deletion is disabled.** Delete old files manually or enable automatic old files deletion.
Regular very short (250 ms) RED flashes	**1. Power voltage is too low. Refer Section II.1**

Table continued

Device is in normal recording mode, card is inserted, but there is no three GREEN LED flashes on power up	**1. Connectivity issue in the NMEA 2000 / CAN bus network.** The network segment is not connected to the chart plotter or there are missing terminators in the network. Plug another device into the selected connector and make sure it appears in the list of devices on the chart plotter. **2. There is a NMEA 2000 / CAN bus network connection issue.** Loose connection in the data circuit. Treat the Device connector with a spray for cleaning electrical contacts. Plug the Device into another NMEA 2000 connector. **3. Incorrect CAN bus baud rate.** Refer to Section VII, SPEED setting.
Device CAN bus recording is enabled, card is inserted, three are three GREEN LED flashes on power up, but Device is not visible in the list of NMEA 2000 devices on a chartplotter	**1. Device covert mode is activated.** Refer to Section VII, SILENT setting **2. NMEA 2000 connectivity issues, see above.**

Table continued

Device is in normal recording mode, card is inserted, audio signal is present, audio recording is enabled, but constant flashes of varying length sometimes or always are RED instead of GREEN	**1. Audio signal level is too high.** Adjust audio source volume or Device's GAIN setting.
MicroSD card file system is corrupted	**1. Device have not managed to correctly close the files during power down.** Use higher grade card, refer to Section IV. **2. V trip low is set too low.** Refer to Section III, POWERDOWN setting.
Audio is not recorded	**1. Issues with audio source.** Check that audio source is correctly connected to the Device. Check that source outputs the audio signal. Check audio cables and connectors integrity. **2. Audio recording is disabled.** Refer to Section III, AUDIO setting. **3. Audio threshold is set too high.** Refer to Section III, THRESHOLD setting.

Table continued

Audio signal is too quiet	**1. Audio source volume too low.** Increase audio source volume or Device's gain, Refer to Section III, GAIN setting.
Audio signal is clipped	**1. Audio source volume too high.** Decrease audio source volume or Device's gain, Refer to Section III, GAIN setting.
Audio signal if of normal amplitude, but of too low quality	**1. Turn band-pass filter** ON, compression OFF, refer to Section III, FILTER and COMPRESSION settings.

Appendix C. NMEA 2000 Messages Supported by the Device

PGN	Name	Receive	Transmit
Mandatory NMEA 2000 Service Layer support			
59392	ISO Acknowledgment	Yes	Yes
59904	ISO Request	Yes	Yes (1)
60160	ISO Transport Protocol (DT)	Yes	No
60416	ISO Transport Protocol (CM)	Yes	No
60928	ISO Address Claim	Yes	Yes
65240	ISO Commanded Address	Yes	No
126208	NMEA Group Function	Yes (3)	Yes
126464	PGN List (Received / Transmitted)	No	Yes
126993	Heartbeat	No	Yes
126996	Product Information	No	Yes (2)
126998	Configuration Information	No	Yes
Time keeping			
126992	System Time	Yes	No
129029	GNSS Position Data	Yes	No
129033	Local Time Offset	Yes	No
Telemetry data			
127501	Binary Status Report	No	Yes (4)
127502	Switch Bank Control	Yes (4)	No
130831	Proprietary «YD: Voyage Recorder Status»	No	Yes (4)

(1) The Device sends PGN 126996 (Product Information) request to all equipment present on the network once every 60 minutes, so you can later track which devices are on-bus; rather high interval was chosen in order to avoid excessive bus load.

(2) Transmission of this message can be turned off with SILENT setting (see VII.17) for the purpose of running the Device in covert mode.

(3) Device's NMEA 2000 «Device Instance» and «System Instance» can be changed in the standard way via PGN 126208 «Group Function», method «Write Fields» supported in our CAN Log Viewer (refer to Section VIII) or other software.

(4) Telemetry needs to be enabled first (refer to Section VII).

Appendix D. Data File Format (.DAT Files)

This section is intended for those who plan to develop a custom data extraction and processing software or integrate such features into their own software.

DAT file format is open and free for commercial or non-commercial use.

Each DAT file contains a set of records of variable length. Each record contains either received NMEA 2000 PGN, or a service record. Fast-packet (multi-frame) PGNs, listed in (6) below, if correctly received and assembled by the Device will be stored in assembled form (just meaningful data saved, frame sequence numbers omitted). Fast-packet PGNs that can not be correctly assembled (due to missing frames or incorrect payload length or assembly timeout will not be recorded. Records have the following structure (each letter stands for a single byte; d[B] means an array of «d»with «B» size):

mm PPPP (ddd | dddddddd | sB d[B])

Where:

1. **mm** – Internal time of the Device in milliseconds from the moment of powering on. Resets after reaching 60000.
2. **PPPP** – Identifier of NMEA 2000 messages consisting of PGN and addresses of the sender, receiver, and other fields. Or the value 0xffffffff for the Recorder's service records.
3. **(1 | 2 | 3)** – One of three options for saving message data.
4. **ddd** – Three-byte message data, used only with PGN 59904.
5. **dddddddd** – Eight-byte message data, used with all PGN except those mentioned in points 4 and 6.

6. **s** – Sequence number (sequence counter used to distinguish separate fast-packet frames of the same PGN), used for those PGNs: PGNs: 65240, 126208, 126464, 126720, 126983-126988, 126996, 126998, 127233, 127237, 127489, 127496-127498, 127503, 127504, 127506, 127507, 127509-127514, 128275, 128520, 129029, 129038-129041, 129044, 129045, 129284, 129285, 129301, 129302, 129538, 129540-129542, 129545, 129547, 129549, 129551, 129556, 129792-129810, 130052-130054, 130060,130061,130064-130074, 130320-130324, 130567, 130577, 130578, 130816.
7. **B** – Fast-packet PGN data length in bytes.
8. **8.d[B]** – Fast-packet PGN payload, byte string, length of B bytes.

Service records (field PPPP is 0xffffffff) have fixed 8 bytes length and may be of three types:

a) The ASCII text **«YDVR v04»** – is the mandatory first record in a file with the number of the data format version (v04 in this case).

b) **'E',TT,FFFF,o** – last record in the file, where: 'E' is an ASCII character 'E'; TT- length of the file in minutes (unsigned 16-bit integer); FFFF – time of the last record in FAT (32-bit, FAT modification date and time records, note the resolution is 2 seconds, local time), o – offset from GMT to local time in 15-minute intervals (signed 8-bit integer).

c) **'T',NN,LL,rrr** – record between messages between which more than 1 minutes has passed. 'T' is an ASCII character 'T'; NN is the internal Recorder time, in minutes, of the next message; LL – internal time of the Recorder, in minutes, of the last message; rrr – reserved field in version v04 (value 0xffffff). The internal time of the Recorder in minutes is reset to zero every 10 days.

d) **‘Y’,‘W’,FR,FE,TT** – record with the link to the audio file. FR – folder number (unsigned 16-bit integer), FE – file number (for example, if FR is 1 and FE is 2, the record pointing to the file YDVR0001\00010002.WAV). The highest bit of TT is set if the file is already closed (otherwise, it is still recording); other bits of TT contain the length of the recording in seconds at this moment. During audio recording, links to the current audio file are stored to the data file every second.

When power is turned off (see IV.7), the Recorder does not save the contents of the internal cache (up to 512 bytes) to the data file. Neither does it save the type b) service record to the end of file. So in a file whose size is an exact multiple of 512 bytes, the last network message might not be complete, and the record of type b) may be absent.

The format of NMEA 2000 messages is available in documents which can be obtained on the site www.nmea.org.

Appendix E. Device Connectors

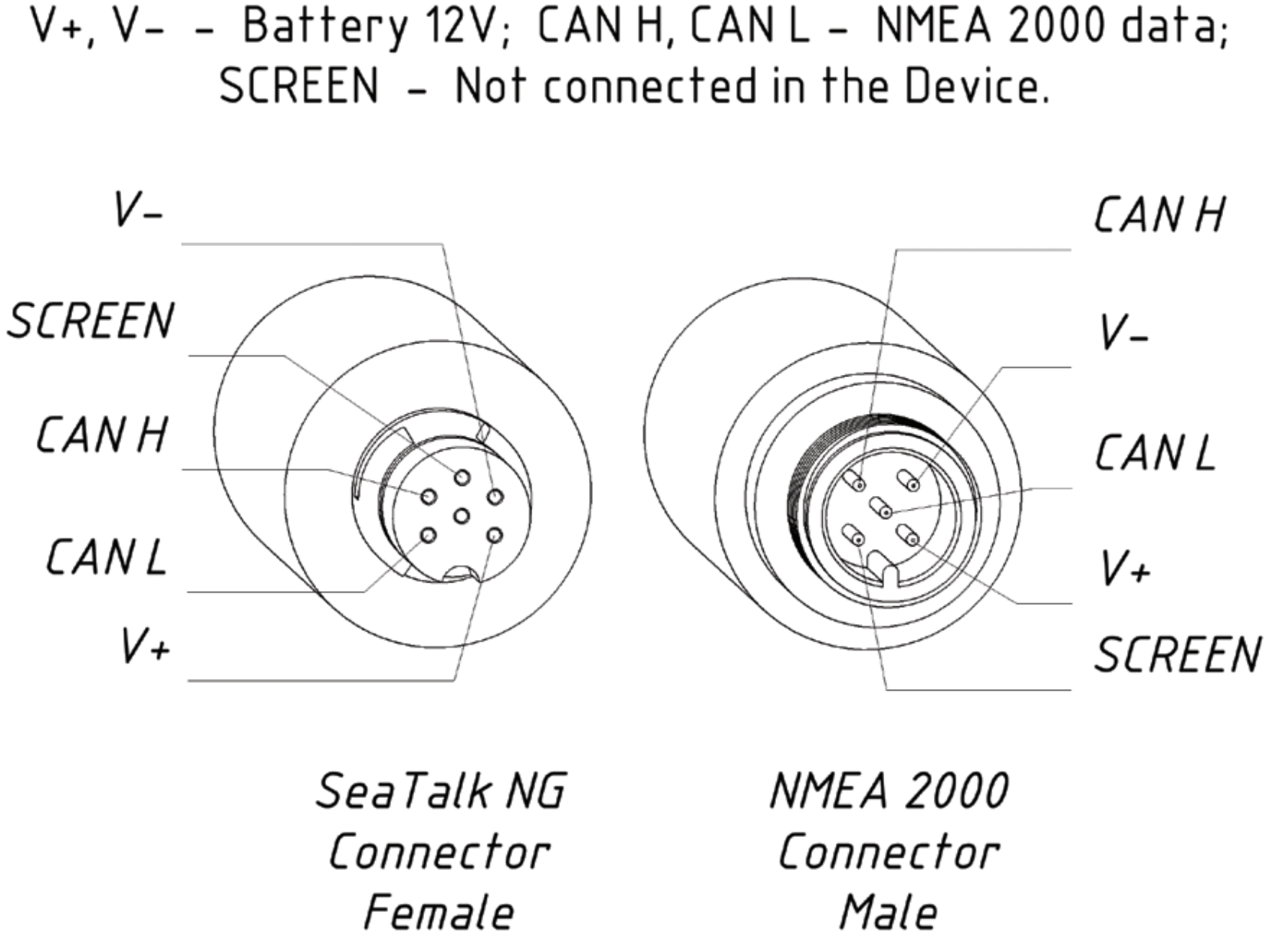

Figure 1. NMEA 2000 connectors of the YDVR-04R (left) and YDVR-04N (right)

NOTES

NOTES